APPENDIX A

California Green Chemistry Initiative: Phase One Options Report—January 2008

Executive Summary

California Green Chemistry Initiative

Phase 1: A Compilation of Options

January 2008

CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY

Executive Summary

Introduction

Every week, news headlines report on toxic substances discovered in consumer products. The public assumes that the government tests products for chemical safety, but that is not true for most items. We know little about how the thousands of industrial chemicals in use today affect people and the environment. Consumers do not always know when they are being exposed. Businesses lack information about their supply chains. These information gaps prevent the free market from working properly to stimulate the development of safer substitutes.

Green Chemistry can prevent toxic substances from contaminating the environment and our bodies. It is a sharp departure from managing industrial wastes by disposal or incineration. Green Chemistry is a way to make products using less toxic materials, less energy, and less waste. Renewable feedstocks, recycling, sustainability, and other life-cycle attributes are incorporated into the design of new products and processes. This "cradle-to-cradle" approach of Green Chemistry means fewer hazardous substances along with improved air quality, cleaner drinking water, and a safer workplace.

Meanwhile, global markets are increasing their demand for less toxic products, especially in Europe, Canada, and Japan. California has the opportunity to grow its economy and lead the nation by creating safer substitutes for export to new markets and creating new jobs and products.

In her April 20, 2007, memorandum, Linda S. Adams, Secretary for Environmental Protection, directed the California Department of Toxic Substances Control (DTSC) to launch the California Green Chemistry Initiative in collaboration with the other California Environmental Protection Agency (Cal/EPA) boards, departments, and offices and other state agencies. The Secretary requested a broad public process to generate ideas that could fill these information and safety gaps, develop overall policy goals, and identify an array of policy options. DTSC Director Maureen Gorsen organized teams for the initiative and hosted an extensive public process known as the "Conversation with California."

The California Green Chemistry Initiative continues California's pre-eminence as a global environmental leader. The Initiative is an opportunity to accelerate technological innovation in materials science. It will catalyze research at California universities. Consumers will gain additional protection from toxic products. Less floating rubbish will help marine life and make our beaches cleaner. Fewer landfills and hazardous waste sites will be passed to future generations. The California Green Chemistry Initiative is a far-reaching, market-driven strategy with ambitious aim—the launch of a new chemicals policy framework and a quantum shift in environmental protection.

What is Green Chemistry?

Green Chemistry is a strategy to reduce the use of toxic substances so that they do not harm the public or contaminate the environment. It seeks to fundamentally remake the way we make things via the design and manufacture of products with little or no hazardous substances. It reduces the overall "footprint" of goods and processes.

Much like the Hippocratic code in medicine, Green Chemistry promotes chemicals and processes that do no harm or reduce harm to human health and the environment. Green Chemistry seeks to transform industrial activity to create a zero-waste society. It is a marked departure from past practices in which industrial wastes were dumped or burned. Rather than manage the risks, Green Chemistry seeks to reduce or eliminate them

12 Principles of Green Chemistry

Paul T. Anastas and John C. Warner first published their 12 principles of Green Chemistry in their 1998 book, Green Chemistry: Theory and Practice. Both serve as members of the California Green Chemistry Science Advisory Panel. In summary, the 12 principles are:

1. **Prevent waste rather than treating it or cleaning it up.**
2. **Incorporate all materials used in the manufacturing process in the final product.**
3. **Use synthetic methods that generate substances with little or no toxicity to people or the environment.**
4. **Design chemical products to be effective, but reduce toxicity.**
5. **Phase-out solvents and auxiliary substances when possible.**
6. **Use energy efficient processes, at ambient temperature and pressure, to reduce costs and environmental impacts.**
7. **Use renewable raw materials for feedstocks.**
8. **Reuse chemical intermediates and blocking agents to reduce or eliminate waste.**
9. **Select catalysts that carry out a single reaction many times instead of less efficient reagents.**
10. **Use chemicals that readily break down into innocuous substances in the environment.**
11. **Develop better analytical techniques for real-time monitoring to reduce hazardous substances.**
12. **Use chemicals with low risk for accidents, explosions, and fires.**

by making products benign by design. Green Chemistry focuses on improving the building blocks of manufacturing—the molecules, feedstocks, and catalysts—so products can be engineered safer, be readily broken down in the environment, and be easily reused. This "cradle-to-cradle" philosophy stands in sharp contrast to the current "cradle-to-grave" model in which products are manufactured and pass briefly through the hands of a consumer en route to incineration, disposal, or otherwise being rendered useless. Existing laws and regulations clean up the chemical pollution; Green Chemistry avoids the generation of the pollution in the first place.

Green Chemistry is a tool to help slow global warming. Warming threatens California's economy and natural resources. About 98% of the organic chemicals synthesized in the United States are made of petroleum. Petroleum refining consumes about 15% of the energy produced in the country. Green Chemistry emphasizes energy conservation and renewable chemical feedstocks. Green Chemistry can help California meet the 30% reduction in emissions by 2020, which the *California Global Warming Solutions Act of 2006* requires.

Source: Green Chemistry: Theory and Practice

Green Chemistry is a philosophical and scientific approach to reinvent the economy through fundamental changes in science and engineering. It offers large-scale reductions in the use of toxic chemicals so California can achieve improved air quality, less greenhouse gas emissions, safer workplaces, cleaner beaches, and purer drinking water.

The California Connection

California leaders have always met big challenges with bold ideas. Today, California is well positioned to develop the nation's first comprehensive chemicals policy to cut pollution while strengthening the economy.

Environmental protection began in the 19th century with Henry David Thoreau and John Muir extolling nature's grandeur. In the 20th century, Rachel Carson led a second wave focused on industrial pollution. In the 21st century, the third wave will focus human ingenuity and technological prowess on solving climate change, ocean degradation, and toxic build-up of the planet. California is uniquely situated to lead this new movement.

Governor Schwarzenegger joined this new wave with the signing of the *California Safe Cosmetics Act of 2005*[1/]—the first state in the nation to regulate toxic ingredients in cosmetics. He signed legislation,[2/] authored by Senator Don Perata, establishing the California Environmental Contaminant Biomonitoring Program to identify toxics

Extensive debris in the ocean and on our beaches harms wildlife and destroys the scenic beauty of our coastal resources. Most of the debris floating in the world's oceans is plastic and nearly all junk on beaches consists of plastic materials. In the north Pacific, floating plastic debris covers an area nearly twice the size of Texas. Californians generate about 21 million pounds of plastic waste daily, but only 3% gets recycled and much of it washes into the ocean. Plastic debris, which persists for centuries and is toxic to wildlife, has been found inside 43% of seabirds and 86% percent of marine animals studied.

Source: University of California Public Policy Research Center

accumulating in Californians. He also signed a new law,[3/] authored by Assemblywoman Fiona Ma, to ban phthalates from children's plastic products. And, he signed the landmark *California Global Warming Solutions Act of 2006,*[4/] by Assembly Speaker Fabian Núñez.

California was at the forefront when it adopted the nation's first air pollution and pesticide control laws 60 years ago. Californians launched the modern environmental movement after the 1969 Santa Barbara oil spill. Aggressive controls on tailpipe emissions revolutionized clean vehicle technology and led to substantial declines in smog. The State's ambitious solid waste reduction measures achieved recycling rates in excess of 50%. And, California will be a world leader in reducing emissions that contribute to climate change and global warming.

But today, toxic chemical threats outstrip the government's response. Californians use more than 164 million pounds of chemical products daily from solvents to adhesives to personal care products. The United States produces or imports 42 billion pounds of chemicals daily and global production is expected to double every 25 years.[5/] Contaminants show up in the human fetus, workers, toys, clothing, low-income neighborhoods, furniture, jewelry, breast milk, and pet food. Recycling helps, but hazardous substances inexorably end up in landfills and

our environment. And the implementation of the principal federal hazardous chemicals reduction law, the *Toxic Substances Control Act* (TSCA), has failed to ban a single substance in over 20 years. The National Academy of Sciences and the U.S. Government Accountability Office concluded TSCA has been ineffective.

California lawmakers responded with more than 50 bills regarding

toxic chemicals last year. But, the piecemeal approach taken since TSCA has several shortcomings. Sometimes, regulations fix one problem, but cause another, such as when methyl tertiary butyl ether (MTBE), the smog-fighting fuel additive, polluted water supplies. More regulation adds significant red tape, costs, and uncertainty for business.

California can leverage its natural advantages to build the nation's first far-reaching chemicals policy. The University of California system and other leading universities could become engines of technological innovation and scientific breakthrough. California's clout as the nation's biggest consumer market could be enhanced through partnerships with the European Union, Canada, and Pacific Rim economies. California is the leading state for venture capital investment; materials science projects captured about one-third of the $3.6 billion cleantech investment last year. The California Public Employee Retirement System (CalPERS) and the California State Teachers Retirement System (CalSTRS) committed $870 million for cleantech investments in energy, water, and material technologies to reduce carbon emissions, conserve natural resources and improve energy efficiency.

Following are examples of companies turning to Green Chemistry practices to cut waste, save energy, and reduce liability and costs:

- Dow Chemical Company reduced its solid waste by 1.6 billion pounds globally, wastewater by 183 billion pounds, and energy by 900 trillion BTUs–enough to heat 8 million U.S. homes–due in part to Green Chemistry practices. Dow's costs: $1 billion; Dow's savings: $5 billion.
- Kaiser Permanente created an entirely new market for reformulated carpet in 2002 by requiring its supplier to produce a product free of polyvinyl chloride (PVC) and made from post-consumer recycled materials. The initiative was part of the company's commitment to Green Chemistry.
- Dell Inc. identified 50 toxic chemicals for elimination in products and required suppliers not to use them. Dell has eliminated all halogenated flame retardants from its desktop, laptop and plastic computer chassis—one of the first Fortune 500 corporations to go beyond existing U.S. regulations and adhere to international chemicals polices.

California has demonstrated that prudent policy can spur economic growth. The State's quest for a lesser-polluting car in the 1990s revolutionized automotive technology. More recently, the *California Global Warming Solutions Act of 2006* signed by Governor Schwarzenegger, as well as other energy conservation measures, will reduce per capita electricity consumption and greenhouse gas emissions by 50%. An estimated 89,000 new jobs in clean energy technology will be created by 2020, according to the University of California. California's $3 billion investment in stem-cell research under Proposition 71 is expected to lead to breakthroughs in disease prevention.

The Green Chemistry Initiative will promote innovation, create new jobs, and keep people safe from harmful substances. It will ensure that California's historic role as an environmental leader will continue into the new century.

Conversation With California

Following the Secretary's directive, Director Gorsen and DTSC launched the Conversation with California, an innovative, interactive, and inclusive dialogue to explore Green Chemistry ideas. All of the policy options in this report flow from this dialogue. The Conversation with California engaged participants as problem-solvers; and DTSC compiled options suggested by the participants.

Over 600 participants joined the Conversation with California. They provided more than 400 pages of written comments. Among the participants were representatives from companies such as DuPont, Procter & Gamble, Panasonic, Dow Chemical Company, Rohm & Haas, and Pfizer Inc.; from trade organizations including the American Chemistry Council, the Consumer Specialty Products Association, the Chemical Industry

Council of California, the Cosmetic, Toiletry, and Fragrance Association, the Soap and Detergent Association, the Western States Petroleum Association, and the Silicon Valley Leadership Group; from environmental, labor, and community organizations, including the Sierra Club, Environmental Defense, Californians for a Healthy And Green Economy, California Association of Professional Scientists, and Environment California; from public health advocates,

including The Breast Cancer Fund; from foreign governments, including Japan and Canada; from the U.S. Environmental Protection Agency (USEPA); and from academic institutions, including the University of California, Berkeley, UCLA, and the University of Massachusetts.

The Conversation with California consisted of five major components: brainstorming sessions, Green Chemistry symposia, a web log, the Science Advisory Panel, and preparation of this report. Each is discussed below.

Brainstorming Sessions

From June through December 2007, six brainstorming sessions were held in Los Angeles, Sacramento, San Jose, and San Diego. Director Gorsen opened each Green Chemistry session with a presentation. This was followed by a panel discussion on toxic chemicals management issues, including the efficacy of the *Toxic Substances Control Act*; the European Union's Registration, Evaluation, Authorization and Restriction of Chemical substances regulation (EU REACH); the Canadian "Domestic Substances List;" the evaluation of chemical alternatives; risk and hazard assessment; financial incentives; and timely, accurate information about chemicals. Next, a facilitator organized all participants into small groups and tasked them with developing solutions to these four major challenges:

- Cradle to Cradle—How do we build products so they become raw materials for new products or nutrients for nature at the end of their useful life?
- Toxics by Accident—How do we prevent hazardous substances from inadvertently being incorporated into products through supply chains, illegal activity or foreign manufacturers?
- Toxics by Design--How do we reduce or eliminate hazardous substances intentionally built into products to improve performance or reduce costs?
- The Green Chemistry leadership team, consisting of senior managers from Cal/EPA, the California Health and Human Services Agency, and the State and Consumer Services Agency and the Department of Public Health, helps guide the overall effort and participated in each part of the Conversation with California.

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Green Chemistry Symposia

Three Green Chemistry symposia

were held in Sacramento between October 2006 and December 2007 and led by Director Gorsen. The symposia brought together experts from government, industry and academia. The first symposium featured Mike Wilson of UC Berkeley; Jeff Wong of DTSC; John Ulrich, acting general manager of the Chemical Industry Council of California; Leif Magnuson, USEPA pollution prevention coordinator; Tim Shestek, director of state and local affairs for the American Chemistry Council; John Warner of the University of Massachusetts; and Terry Applebury of Applied Process Technology, Inc., and many more.

The second symposium, titled "Chemicals Policy for a Sustainable California," featured Assemblymember Jared Huffman; Cal/EPA Secretary Linda Adams; John Froines of UCLA; Mark Schapiro of the Center for Investigative Reporting; Richard Denison of Environmental Defense; Jo Ann Foley of the Silicon Valley Leadership Group; Bill Magavern of the Sierra Club; and Thomas Jacob of DuPont, and many others. The third symposium, "Synthesis of Success," featured Catherine Hunt of the American Chemical Society; Bill Greggs of Procter & Gamble; Jill Reed of AMPAC Fine Chemicals; Katy Wolf of the Institute for Research and Technical Assistance; and Michelle Smith of Rohm and Haas, among others.

The Office of Environmental Health Hazard Assessment (OEHHA) within Cal/EPA also convened a Green Chemistry Conference; OEHHA participated throughout the process and provided technical staff and support for the Nanotechnology Symposia and Biomonitoring Symposium.

The Green Chemistry Symposia provided vital expert testimony about business practices, scientific and engineering research, regulatory initiatives in other jurisdictions, international chemicals policies, economic investment opportunities and environmental and health impacts.

Green Chemistry Web Log ("Blog")

To stimulate on-going dialogue about Green Chemistry ideas between the stakeholder meetings and symposia, Director Gorsen launched a web log ("blog") site. It is the first time a California agency utilized an interactive web-based forum to solicit comments, stimulate discussion and build public policy. Similar to a "wiki" interactive approach, in which participants develop the content, California invited scientists, environmentalists, industry leaders, public interest groups, governments and the general public from around the world to join the California Green Chemistry Initiative. The result: a total of 611 participants joined the Conversation with California and provided 411 pages of written comments.

The department can report substantial state, national, and global interest in California's Green Chemistry

Initiative. Participants welcomed the invitation to directly participate and help shape the program. DTSC staff promptly posted all comments to the blog site and collected all the recommendations for inclusion into the menu of policy options contained in this report.

Science Advisory Panel

To engage the scientific community, Director Gorsen and Deputy Director Jeff Wong assembled a Green Chemistry Science Advisory Panel consisting of 23 of the nation's leading scientists and engineers. The panel is a major asset to the program as it will guide the department on scientific matters and provide the technical basis for the Green Chemistry Initiative.

Panel members include: John Warner, Ph.D., of the Warner Babcock Institute of Green Chemistry; John R. Balmes, M.D., of UCSF and UCB; Paul Anastas, Ph.D., of the Massachusetts Institute of Technology; Nicholas Ashford, J.D., Ph.D., of MIT; Eric J. Beckman, Ph.D., of the University of Pittsburgh; William Carroll, Ph.D., of Occidental Chemical Corporation;
Gail Charnley, Ph.D., principal at Health Risk Strategies; Richard Denison, Ph.D., of Environmental Defense; Daryl Ditz, Ph.D., of the Center for International Environmental Law; Michael Dourson, Ph.D., director of Toxicology Excellence for Risk Assessment; Kenneth Geiser, Ph.D., University of Massachusetts; Lynn Goldman, M.D., M.P.H., of Johns Hopkins; John D. Graham, Ph.D., of RAND Graduate School; Robert Grubbs, Ph.D., of Caltech; Neil C. Hawkins, Ph.D., of Dow Chemical Company; Lauren G. Heine, Ph.D., principal for the Lauren Heine Group and Senior Science Advisor with Clean Production Action; James Hutchinson, Ph.D., University of Oregon; Vistasp M. Karbhari, Ph.D., of UC San Diego; John Peterson Myers, Ph.D., of Environmental Health Services; Mary O'Brien, Ph.D., Grand Canyon Trust; Barry Trost, Ph.D., of Stanford; Michael P. Wilson, Ph.D., of UC Berkeley; and Katy Wolf, Ph.D., director of the Institute for Research and Technical Assistance.

Report Preparation

A Green Chemistry Working Group, consisting of senior managers within the Cal/EPA departments and the Department of Public Health, sorted the ideas, suggestions, and comments collected throughout the Conversation with California. The Working Group sorted the policy options at the close of the public comment period. They organized those options into eight categories, which are contained in this report and offered to inform policy discussions about next steps.

Options

In her memo of April 20, 2007, Secretary Adams directed the department and other state agencies to prepare options for a California Green Chemistry Initiative. The

Conversation with California was launched, resulting in scores of letters, meetings, symposia, and blog comments. Those 818 ideas and comments, which have been grouped and distilled into 37 options and sorted into eight chapters, are offered to build the next steps for California Green Chemistry Initiative. The chapters, into which the comments were organized, are: data collection and use, economic incentives and markets, statutory and regulatory requirements and enforcement, voluntary measures, research and technology, technical assistance, and recognition, awards, and certification. Each is discussed below. These are options to be considered; none have been selected or are recommended.

Data Collection and Use: Numerous stakeholders commented on a lack of information about chemicals. Several noted that a functional marketplace requires access to timely information about goods and services, yet this is often missing when it comes to assessing toxic chemicals in products. The 2006 report, "Green Chemistry in California: A Framework for Leadership in Chemicals Policy and Innovation," which was prepared by the U.C. Public Policy Center for the Legislature, identifies gaps in our understanding of toxic chemicals in products. These information gaps were a focal point for all sectors. A majority of commenters told DTSC that businesses do not always know substances in their products or supply chains; consumers do not have access to information about chemical contents in products they buy; and regulators do not have the information to identify and prioritize chemical hazards.

To close the gaps, many participants said California could build a statewide chemical inventory identifying chemical uses by type, industry sector and toxicity. This effort could be aided by data collected under memorandums of understanding with the European Union and Canada. The database could help create a chemical roadmap, showing hazardous substances flows, changes and endpoints. Several commenters suggested that California could create an on-line clearinghouse so the public, researchers, industry, non-governmental organizations and other governments could access the information with protections for certain types of information.

By collecting such information, commenters said, businesses and consumers could begin making informed decisions based on exposure, human toxicity, bioaccumulation and ecotoxicity. Currently, the Canadian Environmental Protection Act screens approximately 23,000 industrial chemicals for impacts on the environment and human health; high priority substances are targeted for risk-reduction measures, including life-cycle analysis and possible elimination. For more information about data collection and information options, see Chapter 1.

Economic Incentives and Markets: Exposure to toxic chemicals in consumer products and the environment can be an example of failure in the free market, a number of participants pointed out. Third parties often bear the costs in illnesses and environmental degradation. If manufacturers do not pay these costs, they have little incentive to change manufacturing inputs and processes, so business as usual prevails. To correct this problem, several participants said California could create incentives and penalties to encourage corporate responsibility and accountability.

Among these comments, incentives may include low-interest loans, grants, and tax credits. Such measures may have the added benefit of attracting cleantech venture capital for Green Chemistry. Numerous participants remarked that California has extensive experience using economic incentives, including recyclable container deposits, rebates for energy efficient products and specific usage fees. Conversely, penalties, including fines and fees, shape markets by impacting a company's bottom line or its reputation in the industry or the community.

California could engage industry as partners, some suggested. Several commenters stated that government could develop codes of practice for design, manufacture, distribution and disposal of products. Participants also remarked that the State could promote product stewardship by requiring companies to take back harmful products at the end of their useful life as auto batteries and some electronic wastes are handled now.

Finally, a number of stakeholders stated California government could use its procurement power to advance Green Chemistry. This would establish leadership and create marketplace demand for clean technologies. These measures could grow the economy, stimulate innovation and create jobs. For more information on economic and market options, see Chapter 2.

Statutory and Regulatory Requirements, Enforcement: The majority of stakeholders said new laws and regulations should be among the options that decision-makers consider for the California Green Chemistry Initiative. The options they presented include requirements for data collection, reporting, and disclosure; prohibitions on uses of or bans for harmful chemicals; product labeling; programs that require manufacturers take back certain products at the end of use; and other regulatory options. A voluntary Green Chemistry program could be augmented with enforceable measures. Commenters also suggested a broad range of risk or hazard assessment strategies along with metrics to evaluate those strategies. For more information about statutory and regulatory requirements and enforcement options, see Chapter 3.

Voluntary Measures: Voluntary measures to develop chemical information and data, reduce toxics

use, and find safer substitutes can be an important tool to advance Green Chemistry, several participants said. They noted that many voluntary measures—including existing public-private partnerships and programs—could be expanded to encourage companies to design and sell less toxic products. For more information on voluntary measures, see Chapter 4.

Education and Outreach: While some in business, government, and the environmental community are well acquainted with Green Chemistry, most participants noted that the general public is not familiar with Green Chemistry. They said political will, public support, and informed consumer choice will be necessary for a successful Green Chemistry program. Participants also said California must train a new generation of scientists and engineers who conceive of molecules in a societal context. Some commenters also recommended augmenting the present Education and the Environment curriculum for K-12 students to include Green Chemistry principles. Participants recognized that today's students will be tomorrow's consumers, workforce, and leaders. They suggested that higher education and research institutions train young scientists and engineers in Green Chemistry principles. The University of California Extension could offer courses for mid-career professionals. The community colleges could design and implement certificate programs for a new Green Chemistry workforce, several commented.

Smart and simple messages could be developed to engage consumers, news media, and non-governmental organizations and leveraged across various media, according to participants. Messages could include

information about toxicity and chemicals in products, alternatives and safe use and disposal of products. For more information on education and outreach options, see Chapter 5.

Research and Technology: As in earlier eras, research and discovery will be key drivers for the third wave of change, participants noted. New chemical designs can replace processes where life-cycle factors are included before production and use. Several participants called for research in Green Chemistry, noting that considerable and much needed scientific information could be generated. Laboratories and research institutions could conduct research in new screening methods, production methodologies, and safer

substitutes and alternatives. From raw materials to a final product's end-of-useful life, several commenters said additional scientific research and technological innovation is needed for a Green Chemistry transformation. For more information about research and technology, see Chapter 6.

Technical Assistance: Not all businesses—several commented—have the resources or expertise to explore alternatives to the chemicals and processes they use. Participants said the State can help these companies by providing expertise, best management practices, and other information. Collaborations with trade groups, professional societies, consumer groups and academia could also help businesses, participants suggested.

Some participants proposed that the State establish a Green Chemistry business program to promote access to information for businesses. Such a program might include demonstration projects, workshops, training and education, mentoring and curriculum development. For more information, see Chapter 7.

Recognition, Awards, and Certification: Public acknowledgment for a job well done can be a powerful inducement for high performance, according to participants. Awards are also marketplace signals, guiding consumers to products from companies of distinction. California can amplify these market signals, some suggested, by certifying exemplary products and services. Participants highlighted similar programs include the Presidential Green Chemistry Awards administered by the USEPA, Green Seal, and the German Blue Angel awards. For more information, see Chapter 8.

Key Elements

Like molecules, several elemental parts or building blocks will be essential for a successful California Green Chemistry program. From the multitude of options shared by all commenters, the following components recur throughout the array of possible options:

Collect accurate and comprehensive chemical information. Businesses, consumers and regulators often lack complete and standardized information on chemical toxicity and uses. Businesses find it difficult to identify hazardous chemicals in their supply chains; consumers do not know what is in the products they buy; government agencies lack information needed

to identify and prioritize chemical hazards. These information gaps prevent the free market from working properly to stimulate innovation of safer substitutes. Protection of certain types of information needs to be provided.

Disseminate information on toxic chemicals. California's leadership position in information technology should be leveraged to develop new ways to communicate chemicals and toxicity to the public.

Empower consumers to make informed choices. Information about toxicity in products should appear proximate to the products as an information label or notice. Public awareness campaigns similar to the Flex Your Power program could also help close information gaps.

Account for chemical toxicity and impacts in state procurement decisions. California must lead by example and adhere to the same standards it proposes for the private sector. State agencies can leverage their influence in the marketplace by including cradle-to-cradle and life-cycle cost analyses in purchasing decisions.

Train a new generation of scientists and engineers. California needs experts trained to think holistically about chemicals. California universities should offer scholarships, promote research and development, issue technology licenses and train students in ecotoxicity, life-cycle analysis and Green Chemistry principles.

Include Green Chemistry principles in an Environmental Education Initiative. Students from kindergarten through 12th grade will be tomorrow's workforce and consumers. Environmental education curriculum should be expanded to include understanding of toxic chemicals, risk, consumer choice and sustainability.

Forge strategic international partnerships. California can leverage its position as the United States' biggest consumer market by entering into memorandums of understanding with the European Union and Canada to share information about toxic chemicals. Such information is already being collected under the 2007 Registration, Evaluation and Authorization of Chemicals initiative (EU REACH) in Europe and the "domestic substances list" generated under the *Canadian Environmental Protection Act* (CEPA) of 1999. California participation would help harmonize these international efforts.

Strengthen consumer protection laws. Laws to protect consumers are scattershot. Some lack standards, others lack enforcement mechanisms. An effective system is needed to protect consumers from hazardous substances in products.

Expand California's pollution prevention program. California can prime the pump for Green Chemistry by growing existing pollution prevention programs. The program, called P2, helps businesses reduce toxic chemicals while increasing

profits. But the investment has been modest and limited. Green Chemistry is a long-term solution, but expanding pollution prevention to include more companies and spread technology across industrial sectors would achieve short-term gains.

DTSC will conduct the next phase of the California Green Chemistry Initiative this year and will gather detailed input on how some of the

options presented in this report might be implemented, by whom, over what timescale, in what manner, etc. While the process is still being formulated, it will be transparent, open, and inclusive. The Department will seek public input as well as expert advice and will evaluate different frameworks to select the appropriate portfolio of options and effective enforcement and compliance provisions. The Department will present potential integrated policy solutions, including voluntary, regulatory and incentive-based measures, in recommendations to the Secretary for Environmental Protection by July 1, 2008.

Going Forward

Chemistry has fueled remarkable advances in medicine, pharmaceuticals, agriculture, and industry over the past century. It has revolutionized electronics, transportation, energy, and manufacturing and improved every facet of life. But industrial chemicals and waste have exacted a high price on the environment and human health.

Green Chemistry seeks to build on scientific advances while challenging science to perform at its noblest. It seeks to make products better without making the planet worse. It is a call to leadership and imagination.

In the book, *Cradle to Cradle: Remaking the Way We Make Things,* author Bill McDonough asks, if we could restart the industrial revolution, knowing what we know now, would we create a system that:

- Releases billions of pounds of toxic material into the air, water and soil every year?
- Makes materials so dangerous they will require constant vigilance by future generations?
- Produces gigantic quantities of waste?
- Buries valuable materials in holes where they cannot be retrieved?

- Demands thousands of complex regulations – not to keep people and natural systems safe, but to keep them from being poisoned too quickly?

A California Green Chemistry Initiative would chart a new course to a better world. It would engage academia, business and government in partnership to stimulate economic growth using clean new technologies. It would cut toxic waste while increasing markets and global competitiveness working together with nations. It could replace the current piecemeal approach with a market-driven strategy that favors innovation. Green Chemistry is an opportunity to get it right, a chance to reinvent invention and lead the nation in the 21st century.

(Endnotes)

1 **Chapter 729, Statutes of 2005, adding article 3.5 (commencing with section 111791, chapter 7, part 5, division 104) of the Health and Safety Code (Senate Bill 484, Migden).**

2 **Chapter 599, Statutes of 2006, adding chapter 8 (commencing with section 105440, part 5, division 103) of the Health and Safety Code (Senate Bill 1379, Perata).**

3 **Chapter 672, Statutes of 2007, adding chapter 11 (commencing with section 108935, part 3, division 104) of the Health and Safety Code (Assembly Bill 1108, Ma).**

4 **Chapter 488, Statutes of 2006, adding division 25.5 (commencing with section 38500) of the Health and Safety Code (Assembly Bill 32, Nunez).**

5 **University of California Public Policy Research Center**

CALIFORNIA GREEN CHEMISTRY INITIATIVE

Phase 1—A Compilation of Options

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Chapter 1—Data Collection and Use Options

Acquiring information needed to address the
health and environmental impacts of chemicals

SYNOPSIS

Many participants said that better data and information about chemicals is essential to address the four challenges presented by the Green Chemistry Initiative. Many others—while not explicitly calling for better data and information—recommended options that include improving how chemical data, risk or hazard information, and toxicity and other related information is collected, shared, and used. Data collection and use represented roughly 17% of the total number of comments received throughout the Conversation with California. More than 140 options involving chemical data and information were submitted.

The comments related to data collection and use addressed several common themes. These are compiled in this chapter into the following seven major options:

- Systematically collect data and information needed to categorize and prioritize chemicals; take actions to reduce toxics in products.
- Use the best elements of existing programs such as the Canadian Environmental Protection Act (CEPA) and the European Union's Registration, Evaluation and Authorisation of Chemicals (EU REACH) program as models for better data collection and use.
- Use the best elements of other programs in the United States as sources of data or as models for information collection and use.
- Establish mechanisms and tools to facilitate the sharing, use and analysis of data.
- Collect data for life-cycle assessments to inform actions.
- Build a toxicological and exposure potential database on chemicals used in California.
- Map chemicals that are produced in and imported to California and how these chemicals are transported, used, and managed through end-of-life.

Stakeholder comments included a range of data collection mechanisms, including: (i) collection of new data by the State and independent entities; (ii) compiling existing information from national, international, and state programs; and (iii) requesting additional data from chemical manufacturers, either making it mandatory or voluntary. However, this chapter focuses on compiling stakeholder comments regarding what data and information could be collected and how the data could be used, rather than on data collection mechanisms.

BACKGROUND

Although not an exhaustive list, State agencies administer several programs that collect certain chemical data and information. These include:

- Health-related chemical data: The California Department of Public Health (DPH) collects or monitors certain chemical data and human health information for various health-related programs, including childhood lead, occupational health, indoor air, and other programs.
- Pesticide data: The California Department of Pesticide Regulation (DPR) maintains the most extensive pesticide use reporting system in the United States. Recent data show a decline in the use of high-toxicity chemicals.
- Cancer and reproductive harm chemical data: The Office of Environmental Health Hazard Assessment (OEHHA) administers the Proposition 65 program and maintains data used in reviewing chemicals for possible listing as known to cause cancer or reproductive harm.
- Fish advisory chemical data: OEHHA collects and disseminates to consumers information on levels of chemicals in fish.
- Water and sediment quality chemical data: The State Water Resources Control Board (SWRCB) and the nine Regional Water Quality Control Boards collect discharger and receiving water data to assess water quality and sediment quality.
- Air quality and toxic air contaminants data: The State Air Resources Board (ARB), along with the local air districts, gathers chemical concentration data for ambient air and emissions for certain criteria air pollutant and toxic air contaminant chemicals.
- Biomonitoring chemical data: A new multi-agency program (DPH, DTSC, and OEHHA) will begin to identify and track data on chemicals of concern in biota, beginning this year.
- Hazardous waste data: Pursuant to the *Hazardous Waste Source Reduction and Management Review Act of 1989*,[1/] DTSC collects data on hazardous waste generation and source reduction from the State's largest waste generators every four years.
- Pollution prevention chemical data: Local governments are beginning to collect data on green business and pollution prevention programs. The data will measure the progress of small businesses in reducing waste.

DISCUSSION OF OPTIONS

OPTION DC-1: Systematically collect data and information needed to categorize and prioritize chemicals, and take actions to reduce toxics in products.

Many stakeholders recommended establishing a program to identify, assess, and manage priority chemicals based on an evaluation of hazard, including toxicity and potential for exposure. From the comments received in the Conversation with California, the concept of systematically collecting appropriate chemical data has broad-based support from industry, environmental organizations, and academia. The challenge of addressing the human and environmental impacts of the myriad of chemicals in use today in California and present in everyday products is formidable. To tackle this challenge, participants said a better understanding of the potential for human and ecosystem exposures to these chemicals, their toxicological and physicochemical properties, how long they can persist in the environment, and their tendency to bioaccumulate in living organisms is needed. Further, many stakeholders noted the need to reduce toxics in products, but to make sure the replacement technology or chemical is safer, while retaining

product effectiveness, and price competitiveness. Thus, other types of information would need to be collected on available alternative technology and chemical substitutes.

Many commenters also noted that data collection efforts could ensure that most of the information sources are tapped to the fullest extent possible, and that the collected data would then be used in a prioritization process to rank chemicals for further action.

To be most effective, participants said new and expanded data collection efforts could include the following elements:

1. **An Inventory**—The universe of chemicals used in commerce in California could be defined and captured in a registry which would include a summary of the physicochemical properties, toxicity, and use data for each chemical.

2. **Exposure Data**—In order to prioritize chemicals by hazard, there needs to be some measure of potential for exposure. The types of exposure information that could be collected include:

    a. ***Chemical production and use patterns***. Data on the production, distribution, and use—in industrial processes as well as in final products—could be collected, several participants said. They noted that this information could be used to develop a "Chemicals Map for California." In concept, this database would include information on the flow of chemicals in California; what the chemicals are, where they are produced, and how much is produced; how the chemicals are used, in what quantities, and by whom; and the fate or the wastes generated. Among other things, "the map" would identify which industry sectors generate or use the most toxic products. (See Option DC-8, below, for a more detailed discussion of the "chemicals map" topic.) Participants recommended evaluating what data are currently available from USEPA, Canada, and others that could be used in developing a "chemicals map" for California.

    b. ***Biomonitoring data***. Several commenters suggested making use of biomonitoring data, or doing more biomonitoring. Biomonitoring is the measurement of chemicals (or their metabolites) in wildlife or people (body fluids or tissues). Such data reflects total exposures to the measured chemical from all sources (for example, from air, soil, water, dust, and food) over the individual's life. Suggestions included collecting available biomonitoring data to evaluate exposures occurring within the State. National-level data are currently collected as part of the Center for Disease Control and Prevention's National Biomonitoring Program.[2/] European and Canadian biomonitoring efforts are also underway. Finally, recently enacted law[3/] established the California Environmental Contaminant Biomonitoring Program, which will generate valuable information to complement existing and future chemicals-related programs in the State.

    c. ***Data on persistence and bioaccumulation potential***. The environmental persistence and tendency of a chemical to bioaccumulate affect the potential for exposures to that chemical. Participants recommended using (or modifying as appropriate) existing criteria for identifying chemicals as persistent and/or bioaccumulative. They said this information could be used for classifying chemicals into tiers based on degree of persistence or bioaccumulation potential.

d. ***Exposure simulation models***. Some stakeholders suggested that, if appropriate, California could use physicochemical and use data in models simulating exposure scenarios to inform decisions involving common chemicals in commonly used products.

3. **Toxicity data—**Many commenters stated that California could gather information on the toxicity of chemicals used in commerce in California. They said this data would support a prioritization effort. Information collected on the toxicological properties of chemicals used in commerce could include available animal studies, epidemiological (human) studies, and ecological studies. Some suggested that the data be used to create lists of carcinogens, mutagens, reproductive toxicants, developmental toxicants, neurotoxicants, endocrine disruptors, and any other compound capable of causing serious or irreversible harm. Regarding toxicity information, several stakeholders from various sectors recommended:

   a. Devising strategies to ensure that data collection efforts will access all readily available sources. Sources include: primary scientific literature; Cal/EPA health assessments; USEPA assessments (as identified in sources such as the Integrated Risk Information System[4/]); publicly available chemical toxicity profiles developed by Health Canada and Environment Canada under CEPA; other states' evaluations; and assessments conducted by industry and submitted to U.S. EPA under voluntary programs, such as the High Production Volume (HPV) and Voluntary Children's Chemical Evaluation Program (VCCEP). Additionally, participants said California could evaluate the publicly available chemical dossiers developed under the EU REACH program as they become available (this program is not yet implemented).

      Several participants also noted California could enter into memoranda of understanding with the Canadian government and the European Chemicals Agency to access chemicals data in those programs. Under such agreements, governments might share data on chemical properties, toxicity, and information that is not publicly available or data claimed as confidential business information.

   b. Obtaining tiered sets of toxicity information according to usage, amounts produced or imported, or other indicators of exposure—starting with chemicals in the very high and high concern categories. This may involve requiring toxicity testing data from chemical manufacturers. Some noted that California could encourage the use of alternatives to animal testing where possible.

   c. Where data are not available, using Quantitative Structure-Activity Relationship (QSAR) models[5/] to predict and quantify the toxicity of untested or minimally tested chemicals. Founded on the principle that chemicals with sufficiently similar structures exert similar qualitative toxicities, these models infer the toxicological properties of a chemical based on known properties of a structurally and chemically related substance. Environmental persistence, bioaccumulation, and exposure potential may similarly be estimated based on a chemical's molecular structure. (The USEPA "PBT Profiler[6/]," for instance, is a web-based evaluation tool that predicts the environmental persistence, bioconcentration potential, and aquatic toxicity of discrete chemicals based on molecular structure.)

      Stakeholders across sectors recognized that in order to address chemicals of greatest concern first and use limited resources most efficiently, they said chemicals could be

prioritized by level of hazard**.** Commenters urged that criteria for prioritization be clearly defined, and that both exposure and toxicity (including ecological toxicity) be considered. Some participants recommended considering worker exposure, as workers tend to have the highest exposures. A number of commenters noted that the criteria used by Canada for its CEPA prioritization [see discussion under Option DC-2] could be evaluated for their applicability to California, and modified as appropriate to better suit the State's needs. Several noted that prioritization could emphasize protection of the most vulnerable populations and resources. For example, theses comments highlighted the potential for children to be exposed to chemical in toys and consumer products used by or on children. They pointed out that immature, developing organisms, such as children, are more sensitive to the effects of the chemical in question, could warrant assigning a higher priority to the chemical and/or product(s).

Many stakeholders noted that the prioritization process would classify chemicals into tiers according to levels of concern. Chemicals designated as being of highest concern could then be: (a) comprehensively evaluated, similar to the Canadian CEPA program's chemical-specific toxicity profiles and/or (b) used less according to pre-determined criteria defining the consequences of manufacturing or using chemicals in the various tiers. Finally, several stakeholders stressed that California could include the climate impacts and energy requirements of chemicals (that is, energy required to manufacture, transport, use, dispose, and remediate contamination, etc.) when evaluating need for use reduction and safer substitutes.

4. **Data on types of, efficacy, and cost of alternative technologies**—Following the prioritization process, many stakeholders recommended: (1) taking chemicals of top priority concern; (2) identifying the specific applications or industry uses posing the greatest risk from those chemicals; and (3) applying a collaborative process of agency, industry and third-party experts to identify or develop viable alternatives that can maintain efficacy, but reduce risk in those targeted applications. The comments also noted that partnerships (discussed in Chapter 7, Technical Assistance) are necessary to ensure that chemical substitution or process redesign (for example, to reduce or eliminate the need for a toxic chemical) incorporates product efficacy, and concepts of designing for the least environmental impact overall. Many comments noted that products could be designed with recyclability and re-use in mind. Different types of information—beyond chemical data—are needed to assess economic aspects, technical feasibility, and effectiveness of the substitute technology.

5. **Iterative Data Updates**—Several stakeholders stated that a Green Chemistry program depends upon current chemicals use information for California and must be capable of incorporating new information on use, toxicity, and exposure as it becomes available. Thus, they recommended an iterative process as part of data collection and use.

OPTION DC-2:	***Use the best elements of the Canadian Environmental Protection Act (CEPA) and the European Union's Registration, Evaluation and Authorisation of Chemicals (EU REACH) program as models for data collection and use.***

Many stakeholders recommended using elements from other governments that have developed chemicals policies, such as the Canadian Environmental Protection Act of 1999 (CEPA)[7/] and

the European Union's Registration, Evaluation and Authorisation of Chemicals (EU REACH).[8/] They noted that these programs rely on methodical collection and evaluation of data on a well-defined universe of substances. Several commenters recommended following the EU REACH approach—which shifts the burden of proof from government to industry for gathering chemical information, assesses chemical safety, and selects appropriate risk management measures.

Stakeholders said California could draw upon the regulatory framework created by CEPA and EU REACH. They pointed out the useful knowledge and experience gained by Canada and the European Union in implementing these programs. Rather than adopting international programs wholesale, several commenters recommended that California evaluate the best elements of each program and then incorporate or adapt those as part of a California Green Chemistry program. For example, participants said, California could move quickly by leveraging priorities identified in the Canadian Chemical Management Plan. Since the Canadian chemical inventory may not be exactly the same as California's, the state would need to include a means for adding and deleting priority chemicals based on unique California circumstances. Stakeholders noted that prioritization processes and criteria adopted under CEPA and EU REACH could similarly be considered as California develops its own process and criteria.

OPTION DC-3: Use the best elements of other programs in the United States as sources of data or as models for data collection and use.

Several stakeholders said California could act quickly where others have found a problem in terms of a chemical's persistence or toxicity. Other states have implemented programs aimed at reducing the use of toxic chemicals. A number of comments stated that California could evaluate those programs and adopt appropriate elements to reduce exposure to toxic chemicals in the state. Notable examples of other state programs include:

- **Massachusetts Toxic Use Reduction Act (TURA)**[9/] as amended in 2006. This law requires manufacturing companies using certain toxic materials above a threshold volume to file a report describing their use of the chemical and to develop a Toxics Use Reduction Plan for each chemical. The law has reduced toxic chemical usage, chemical waste, and chemical emissions. TURA has saved industry millions of dollars and provided Massachusetts significant health and environmental benefits. Several commenters suggested that California use TURA data on process-specific chemical usage.

- **Oregon Toxics Use and Hazardous Waste Reduction Act (TUHWR)**[10/] as amended in 2005. Under this Oregon law, users of toxic materials as well as large and small quantity hazardous waste generators are required to develop a reduction plan and report completion of the plan. Business must complete an Implementation Summary describing how the plan was implemented and their successes, challenges, and future opportunities for toxic waste reduction. Several comments noted that California could collect data submitted under TUHWR and use the information on process-specific chemical usage.

- **Oregon Executive Order—Elimination of Persistent, Bioaccumulative, and Toxic Pollutants**. The Executive Order (EO 99-13) requires identification of persistent, bioaccumulative, and toxic (PBT) pollutants; tracking the production and use of those chemicals; and eliminating them in the environment through education, technical assistance, pollution prevention, economic incentives, procurement policies, and compliance and permitting activities. Stakeholders commented that Oregon's identification

criteria, its PBT chemicals list, and its information on industries using or producing PBT chemicals could be useful for a California Green Chemistry effort.

- **USEPA Inventory Update Rule.** As part of the effort to use existing data, participants said California could leverage the recently assembled U.S. Inventory Update report. This report includes volume, use, and exposure information; it identifies uses and user industries for the high priority chemicals that raise the greatest concern. Stakeholders said California could request producers of priority chemicals and manufacturers with high concern uses to provide hazard and exposure information from this program.

OPTION DC-4: Establish mechanisms and tools to facilitate sharing, use, and analysis of data.

From the Conversation with California, stakeholders indicated broad support for filling California's data needs as much as possible by accessing data collected and compiled by other states, nations, researchers, industry, consumer groups, and other entities. Several stakeholders noted a need for new data generated by manufacturers voluntarily or pursuant to a State requirement. They recommended that such data to be compiled and made widely accessible. As noted by one participant:

> *"By leveraging its preeminence in data management and mining and information technologies, in partnership with the information technology sector (for example, Internet search firms), California could organize the world's chemical data and facilitate access to this information for consumers, businesses and regulators. Currently, the dossiers for the USEPA High Production Volume (HPV) Chemical Challenge program, and the related European program are often difficult to find, and the data difficult to extract. By partnering with the information technology sector (for example, Internet search firms), the State could expand access to chemical information, support its local industry and raise awareness of chemical safety information currently available."*

In devising strategies for promoting the exchange, use, and analysis of shared data, a number of Conversation with California participants stated that the State could consider options for the following:

- **Linking databases**. Stakeholders said existing databases containing chemical use, toxicity, and hazard information could be linked to encourage sharing and use of data. Further, linking databases on chemical production, use, and exposure, with spatial data (for example, through Geographic Information Systems) whenever possible can reveal geographic trends and patterns that could then be considered in decision-making.

  Databases created under existing regulatory programs provide discrete pieces of information on the hazardous substances used and handled by California businesses. Examples include: facility-specific airborne emissions data from the California Air Toxics Hot Spots Program; facility-specific releases to air, water, or land from the USEPA Toxic Release Inventory; and information from individual local businesses (not yet in a database) regulated under the California Accidental Release Prevention Program. Linking this information into a single database would make obtaining information considerably easier,

particularly where businesses already submit data under one program or another. Where not prohibited by their governing laws or regulations, reporting forms could also be modified to gather additional data on industrial chemicals manufactured and used in California.

- **Analytical tools**. Many stakeholders noted that availability of existing software designed to evaluate relative hazards of chemicals developed by a number of organizations for various purposes. The State could evaluate the utility, applicability, and validity of these tools and, where appropriate, promote their use by entities faced with the need to make determinations regarding chemical safety. Participants mentioned several examples in their comments, including Dolphin Software,[11/] the "Green Screen for Safer Chemicals,"[12/] Chemical Compliance Systems,[13/] and The Blue Angel.[14/]

- **Web-based information clearinghouse**. Several commenters stated that California could create a public website that presents a variety of information to a variety of users, including: chemical hazard and use data; toxic chemical ingredients in common consumer products; safer alternatives; and web-based assessment tools for identifying safer alternatives (for example, existing tools such as the Green Screen, Chemical Compliance Systems, Pfizer's Solvent Alternatives, as well as new or modified software specifically designed to meet California's needs). Further, to promote the safe use, handling, and disposal of chemicals in households, stakeholders said the State could develop an interactive web-based program describing a "Safe-Home" environment, with information geared towards children.

  In populating the information clearinghouse, several stakeholders noted that California could catalog and make easily available information regarding best practice screening processes, green chemical design, and existing collaborative efforts. These efforts include the American Chemical Society Green Chemistry Institute; Cleangredients; USEPA programs such as Design for Environment, Performance Track, eChemPortal, and EPEAT; the DTSC Technical Resource Center, and international efforts such as the Global Harmonization System. According to several commenters, many medium and small companies lack knowledge and resources; they will need assistance in taking advantage of Green Chemistry practices. Providing incentives for the sharing of data and best practices will help all companies.

  Since transparency is a key to any effective government program, stakeholders said the clearinghouse and its contents could be readily available to interested parties, understandable, and useful. Visitors to the site could have access not only data on chemical use, exposure, and toxicity, but also information on how these data were applied for various purposes, such as prioritizing chemicals into categories of concern, and assessing hazard.

- **Database of chemical or technological alternatives.** Several comments proposed that California develop a database of chemical or technological alternatives that compares a number of sustainability parameters. The parameters may include performance, price, human health and environmental factors (such as toxicity, bioaccumulation, persistence), carbon footprint, and source sustainability.

- **"Wiki" Approach to Data Collection**. To maximize its ability to collect information, participants said, California could employ a "wiki" approach in compiling a database on chemicals in commerce, their uses, and toxicity, and emerging green chemistry technologies. Wikipedia pioneered this approach as an open, collaborative process for

compiling a multilingual, web-based, free content encyclopedia. [See http://en.wikipedia.org/wiki/Wikipedia:About] Volunteers from all around the world can contribute content to Wikipedia which, since its creation in 2001, has grown rapidly into one of the largest reference websites. The wiki approach has likewise gained popularity in recent years as a way to obtain information and ideas from interested parties.

- **Develop a data audit system.** Some commenters noted that the State could have a system to evaluate the scientific validity of information gathered from external sources to ascertain whether the data the State uses to prioritize chemicals are appropriate, up-to-date, and inclusive of all toxicological endpoints. Others noted the importance of data validation and data quality in any information collection system.

- **Establish partnerships with states to create an interstate clearinghouse of environmental health and safety data.** A few stakeholders thought California could establish a clearinghouse of information related to green chemistry and reducing toxics in our environment by tapping into other states to establish an interstate clearinghouse of data on chemicals in commerce that provides environmental health and safety information. This could include information generated by other state's environmental and public health agencies on chemicals of common concern. Some commenters further suggested that other public and private sector entities could use a multi-state clearinghouse.

OPTION DC-5: Collect data needed to conduct life-cycle analysis of high-use products and develop a life-cycle analysis prototype.

Green Chemistry is part and parcel of sustainable development. Several stakeholders expressed the need to evaluate use of chemicals in products by looking at the product as a whole and analyzing every aspect of that product's life cycle—from the harvesting and processing of raw materials to that product's ultimate disposal or "end of life." Since efforts to use renewable resources and "clean" energy to support manufacturing are involved in sustainable development, life-cycle analysis (LCA) can be used to evaluate this aspect of a product's production. Several comments said life-cycle analysis would aid process and product re-design, substitution, and alternatives. Partnerships with industry, several participants stated, would be beneficial in developing a prototype life-cycle analysis methodology. Some recommended that California consider using LCA guidelines established by the Society of Environmental Toxicology and Chemistry. These guidelines include water, energy, and raw materials used in the product as well as the transportation and waste streams from those processes.

OPTION DC-6: Build a toxicological and exposure potential database on chemicals used in California.

Among the data to be collected, several stakeholders recommended including information on chemicals in use, where and how they are used, which companies produce them, chemical ingredients in products, toxicity data, physiochemical properties, and exposure-related data. They said that a well-constructed, well-managed database could be a critical tool for collecting, retrieving, and evaluating chemicals. They also noted that such a database would help identify data gaps.

As the comments indicated, a database could be initially populated with toxicity and exposure information identified from a baseline assessment of what is already available. To fill gaps, some stakeholders recommended certain measures. Many stakeholders wanted data to be publicly accessible, as much as possible, to allow a free flow of information among users, researchers, the public, and industry. Stakeholders from several sectors noted that California could develop measures to improve information flow along the supply chain from chemical manufacturers, through businesses using chemicals to make products, and ultimately to consumers.

OPTION DC-7: "Map" chemicals that flow into and out of the state and how they are used in California.

Participants in the Conversation with California identified a need for California to develop a full understanding of how chemicals flow into and out of the state. They recommended creating a "chemicals map" for the state. As proposed in the comments, the chemical map would be a database of information on:

- Chemicals that are produced in or imported into California;
- The location where the chemical is produced or enters the state and who manufactures or imports the chemical;
- Where and to whom the chemicals move in the state (that is, the downstream suppliers and users);
- Production or import volumes of the chemicals;
- How the chemicals are produced and processed;
- How the chemicals are used, in what applications, processes, or products, and in what physical forms and concentrations; and
- The fate of the chemicals (that is, whether they are discharged into the environment, exported out of the state for other uses or as waste, etc.).

Comments indicate that a "chemical map" database would allow the state to track geographically the identity, volume, the manner of production, uses and ultimate fate of chemicals flowing into and out of the California environment. The database could be searched and analyzed using traditional methods, but could also be represented and manipulated using geographic information systems (GIS). The chemical map could also be linked to toxicity information already available from state agencies (such as the Department of Toxic Substance Control [DTSC], Department of Pesticide Regulation [DPR], State Air Resources Board [ARB], Department of Public Health [DPH], and the Office of Environmental Health Hazard Assessment [OEHHA]) and federal agencies (such as the U. S. Environmental Protection Agency [USEPA]) to identify chemicals of particular concern in California.

During the Conversation with California, significant discussion occurred about a chemical map for the state. These lengthy discussions are summarized here in a short question and answer form.

How could a "chemical map" be developed?

A chemical map for California could be compiled using several approaches:

- Use information already available to the state, such as:
  - Certified Unified Program Agencies (CUPA) data, collected under the California Accidental Release Prevention Program, on use and handling of hazardous materials by businesses in California
  - Hazardous chemical substances data collected as part of the state's *Hazardous Waste Source Reduction and Management Review Act of 1989* ("SB 14" program) and Chapter 881, Statutes of 1998, ("SB 1916") which encourages hazardous waste generators to implement pollution prevention programs
  - California Air Toxics Hot Spots Program emissions inventory data
  - California Toxic Air Contaminant monitoring network data
  - California Pesticide Use Report data
  - California Public Drinking Water System monitoring data
  - USEPA Toxics Release Inventory data

- Use information already available to companies, by requiring companies that do business in California to submit any relevant information on the chemicals or chemical products they produce in, import, sell, distribute, or use in California that they have already submitted or are required to submit to other government agencies, including:
  - Federal agencies such as the USEPA under the TSCA Inventory Update Rule, including information designated confidential business information (CBI), or under the HPV Challenge Program
  - European Chemicals Agency under EU REACH
  - Health Canada and Environment Canada under *CEPA*
  - Foreign or other state governments for relevant chemical information, including CBI that they possess, pertaining to chemicals used in California

Several stakeholders noted that existing programs might serve as a model to collect relevant data and develop a chemical map. For example, the Hotspots Analysis and Reporting Program (HARP), currently used by many industrial facilities in California to report airborne emissions, could be adapted to collect additional required data. Comments also pointed out that the existing pesticide use reports include several data that may be useful in designing a comprehensive chemical map. Participants cautioned that evaluating these existing programs in terms of required resources, task-based costs, statutory requirements, state/federal cooperation, industry costs, stakeholder opinions, tracking requirements, and potential implementation pitfalls would be critical to the development of the comprehensive chemical map for California.

What are the benefits of a "chemical map" and how will it be used?

Stakeholders stated that reliable, current, and comprehensive information on what chemicals are produced and how they are used is an important element of any chemical prioritization scheme.

Generating a broad base of production, use, and fate information about most all chemicals would also aid efforts to identify chemicals that pose little or no risk to people or the environment.

- *Improve Worker and Consumer Safety*

As participants stated, information on production, use, and fate is directly relevant to assessing the potential for release of a chemical or exposure to it, whether to workers, consumers, the general public, or the environment. Release and exposure information can then be used in a number of ways. First, several comments noted, it can be used directly, as well as in conjunction with hazard information, to gauge the extent of risk posed by a chemical. Second, it can be used to screen chemicals in order to identify those of most concern or to prioritize among multiple chemicals, so that those with significant exposure can be targeted for toxicological studies, further assessment, or control. Stakeholders noted the benefits of not only identifying chemicals warranting further scrutiny (for example, those used in consumer products intended for children), but also those posing little or no concern (for example, chemical intermediates that are never removed from process equipment). Third, release and exposure information can be used to help determine the extent and types of hazard information that are needed for a chemical, and hence can be used to set and prioritize testing and risk assessment needs.

- *Improve Risk Management and Homeland Security*

Ready access to chemical production, use, and fate information is critical for protecting public safety in a natural disaster or other emergency, some commenters noted. A chemical map could aid emergency preparedness and planning efforts. It would also provide a baseline and a means of tracking the effectiveness of risk management plans. Most chemical production, use, and fate information is, by definition, geographically specific, so several stakeholders said it makes sense to collect it at the state level.

Where release or exposure to chemicals is already known, a chemical map database could be useful in identifying the range of and individual sources of potential exposure, their relative magnitude, and contribution to the total. With this information, commenters said chemical users and the state could direct emergency efforts more effectively.

- *Enhance Pollution Prevention (P2)*

Several participants noted that chemical map type information could also be used to identify economic priorities and opportunities. Chemicals in commerce in California are likely to be concentrated in certain sectors and associated products. Stakeholders stated that factors such as critical uses of chemicals, job and economic impacts, and other sector data is useful in setting priorities and considering various policies options.

Finally, several stakeholders mentioned that chemical information and data empowers people to make better decisions about chemicals they produce, sell, purchase, or use. Access to such information could improve the chemicals market, enhance market-based incentives to provide better information, and increase demand for safer chemicals, even without direct government intervention.

CHAPTER TEAM

The following Green Chemistry team staff members served as principal editors for this chapter, Data Collection and Use:

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The team compiled each of the comments relating to chemical information and chemical data collection and use. They organized the comments that stakeholders made during the Conversation with California. The chapter team worked closely with the overall team, whose members are given in the Acknowledgements. The references for each of the seven major options summarized in this chapter are presented in the next section of this report.

REFERENCES

The tables below cross-reference each option to Appendix B. The figures shown in the first column represent the "challenge area" and the option number.

OPTION DC-1:	***Systematically collect data and information needed to categorize and prioritize chemicals, and take actions to reduce toxics in products.***
1-4	Develop and establish mandatory criteria that must be addressed for all substances used in commerce. Take into account toxicity, effectiveness, volume used/reduction in use, long and short term health and environmental impacts (life cycle).
1-5	Develop and establish balancing criteria for all substances used in commerce. Take into account long and short term costs/economics, "alternative analysis," and public acceptance.
1-6	Prioritize and address chemicals by toxicity, risk, and volumes used and/or released into commerce and the environment.
1-10	Mandate full disclosure of substances contained in products. "Green labeling" should be used with restraint.
1-13	Realign and leverage with existing federal, state and local mandated reporting activities to avoid duplication and waste of resources.
1-17	Standardize terminology/definitions to promote the necessary and real change towards creating more sustainable, social, and environmental solutions.
1-18	Prioritize protection from chemical harm in decision-making. Use data on all toxicological end-points, including cancer, reproductive effects, developmental effects, etc.
1-20	Use EU REACH as model.
1-26	Support development of a chemical risk analysis process, such as that now being implemented in Canada.
1-27	Support mandatory reporting and enforcement of chemical use by manufacturers and distributors.
1-30	Rethink the processes for allowing chemicals into the market.
1-36	Establish mandatory requirements needed to fill gaps about chemicals. In addition to CMR data, other end-points—neurotoxicity, long-term toxicity, endocrine disruption, immunotoxicity, etc.—are needed. Industry should be responsible for developing these data, with the government as auditor/verifier.
1-93	Map the flow of chemicals in California by developing and sharing chemical production and use information.
1-94	Require California producers, importers, and users to submit and update information on production and processing (amounts, facility locations), uses (including in products), and post-use management.
1-110	Create lists of chemicals of concern at different levels of evidence or certainty. There may be chemicals that are of concern as possible toxic air contaminants or carcinogens but that do not make it onto the lists of the Toxic Air Contaminants or the Proposition 65 chemicals, for example. There could be "feeder" lists that would provide an early view on potential chemicals of concern.

OPTION DC-1:	***Systematically collect data and information needed to categorize and prioritize chemicals, and take actions to reduce toxics in products.***
1-115	Understand the information needed by businesses using chemicals to make informed choices and evaluate how to address these information needs throughout the supply chain (i.e., information transfer up and down the supply chain between manufacturers to chemical users).
1-204	Screen all chemicals (new and existing) to determine further information needs in a tiered, risk-based approach.
2-4	Base environmental regulation on thorough scientific data that has clear evidence of harm to human health and environment.
2-9	Compile a comprehensive list of all reports that must be filed with federal, state and local agencies, including the information and data submission requirements for each; determine whether current reports provide sufficient baseline information, and if additional information should be obtained.
2-11	Prioritize protection of the most vulnerable people (e.g., children) and resources (e.g., endangered species, critical resources). In other words, identify currently unaddressed ways children are exposed to potentially harmful substances.
2-27	Identify priority chemicals for toxics use reduction. Create a list as targets for toxics use reduction.
2-29	Require businesses that use large quantities of toxic chemicals to report annually on the quantities of toxic chemicals used, and prepare and biennially update toxics use reduction plans.
2-30	Survey California businesses regarding information about each facility it owns or operates in the state, the full-time equivalent number of employees at that facility, and whether a listed substance is manufactured, processed, or otherwise used in a facility. Establish the total quantity used statewide as a baseline against which toxics use reduction progress can be measured.
2-42	Ensure that chemical producers generate, distribute, and communicate information on chemical toxicity, ecotoxicity, uses, and other key data.
2-43	Strengthen government tools for identifying, prioritizing, and mitigating chemical hazards.
2-62	Require California producers, importers, and users to submit and update information on amounts, facility locations, and uses (including in products).
2-64	Require disclosure of chemicals in consumer products, perhaps initially on priority chemicals.
2-65	Prioritization is essential.
2-66	Leverage opportunities in other state-mandated activities (e.g., the Biomonitoring Program).
2-70	Ensure that information is transmitted through all consumers in the supply chain.
2-74	Focus research on impacts of chemicals on early childhood development.
2-86	Use the most sensitive receptors as the basis for acceptable risk.
2-87	Prioritize chemicals that should be restricted.
2-99	Incorporate biomonitoring as part of the Green Chemistry policy.
2-118	Prioritize based on exposure.
2-124	Do not reinvent the process, as a whole new process could have a negative effect. Study, instead, Canadian list, EU REACH, and others to determine their usefulness/validity.
2-141	Evaluate elements of EU REACH and CEPA; choose those elements most relevant to California.
2-148	Adopt a phased approach for existing / new chemicals, as with CEPA.

OPTION DC-1:	***Systematically collect data and information needed to categorize and prioritize chemicals, and take actions to reduce toxics in products.***
2-151	Identify less hazardous chemicals, as Canada did.
2-257	Develop an integrated state program that features the following actions: (a) Introduce a regulatory requirement that all existing chemicals undergo a tiered process of scrutiny for their environmental, social, health, and toxicity impacts. (b) Introduce a regulatory requirement that this information should be passed in a standard form along the supply chain. (c) Require manufacturers to label consumer products with all chemicals and materials (including nanotechnology) that the product contains. (d) Develop interactive consumer tools and technologies that assist consumers to interpret and use labeling data in their shopping. (e) Require industry to conduct green chemistry assessments for chemical products sold or used. (f) Expand greatly the investment of resources into green chemistry education and research at the UC system. And, (g) Introduce a modest toxicity tax on all intermediates and chemical products used or sold within the State of California.
3-1	Develop science-based criteria for determining whether a particular product is greener or safer than alternatives.
3-7	(a) Prioritize chemicals used in commerce in California based on exposure potential and toxicity; work to reduce exposure to the most hazardous substances. To do this, California should gather data regarding all chemicals manufactured in or used in commerce in California, including in what products, how, and in what volumes they are used. Additional data regarding available toxicity characteristics should also be gathered for each of those chemicals. Gaps in toxicity and exposure data should be identified. (b) Use the above data to prioritize or rank chemicals in terms of hazard as a function of toxicity and exposure. Tools for such ranking are available from other efforts such as Canada's CEPA program and USEPA, which should be evaluated for use in California. Subsequent efforts should then focus on working with industry to find viable, safer alternatives for the highest ranked chemicals (i.e., those that pose the biggest threat in terms of toxicity and exposure), while at the same time engaging industry and our University system to fill in important gaps regarding toxicity and exposure data. (c) Tap biomonitoring efforts to help fill exposure gaps. In evaluating and ranking chemicals, considerations should be given to the performance and feasibility of alternatives.
3-10	(a) Prioritize protection of most vulnerable people and resources. For example, get information on exposures of children to harmful substances through toxics in products and seek changes to reduce or eliminate these toxics chemicals. Focus on consumer products with lots of exposure potential. This needs a regulatory action. (b) Look for initial easy fixes by integrating existing programs that have identified actual sources of pollutants. (c) Drive the demand for cleaner products through state procurement practices. (d) Designate the Occupational and Environmental Health at UC Berkeley and UCLA as lead entities within the UC system to address research relevant to Green Chemistry and Chemicals Policy in California.

OPTION DC-1:	***Systematically collect data and information needed to categorize and prioritize chemicals, and take actions to reduce toxics in products.***
3-12	(a) Use the Green Chemistry principles in developing useful approaches to pollution prevention. (b) Leverage resources with USEPA programs, Canadian CEPA, etc. (e.g., information from the HPV program, VCCEP program, and ICCA Global Initiative on HPV chemicals). (c) Conduct a baseline assessment to determine needs. (d) Study available hazard and exposure data and how California can best use these data. (e) Identify "green approaches" that have worked as well as those that have not worked.
3-34	Require responsible parties to identify the individual constituents of their products or, if that information was considered to be confidential business information, to provide the appropriate health information on their products. Responsible parties should be required to report new factual information regarding adverse health effects of their products or of the individual constituents of their products. This information could be reported to a centralized, publicly addressable database. The adverse effects reporting requirements for pesticides, as set forth in Section 6 (a) (2) of the *Federal Insecticide, Rodenticide, and Fungicide Act*, could be used as a starting point.
3-35	Require chemical manufacturers, importers, and users to supply Cal/EPA with the structure of chemicals in use in California commerce, physicochemical properties, and all available toxicity and hazard data. California should use Quantitative Structure-Activity Models to evaluate exposure potential and predict toxicity where data are not yet available. This information should go into any prioritization scheme.
3-38	Use EU REACH program as a model and do the following: (a) Register all chemicals in commerce in California and require a summation of the chemical properties, toxicity, and hazard of each in order to be registered for use. (b) Develop a list of chemicals of concern based on usage and toxicity or hazard information. (c) Register products containing these hazardous materials including imported products and publish this information. (d) Require tiered sets of toxicity information according to usage, amounts produced/imported, or other indicators of exposure. (e) Eliminate the use and/or require strict regulation of use of highly persistent or bioaccumulative chemicals, carcinogens, mutagens, reproductive toxins developmental toxins, neurotoxicants, and any other compound capable of causing serious or irreversible harm. (f) Develop models to simulate exposure scenarios for common chemicals in common products to inform decisions on chemical management.
3-39	Evaluate best practices for chemical management schemes pointed out in the April 2007 report entitled "Not That Innocent: A comparative analysis of Canadian, European, and United States Policies on Industrial Chemicals by Richard Denison for application to a California Green Chemicals Policy.
3-44	Develop clear criteria for identifying chemicals as persistent or bioaccumulative.
3-45	Use Quantitative Structure Activity models to help identify toxicity potential and exposure potential of chemicals used in commerce in California.
3-52	Use data on toxicity and use; prioritize chemicals into low, medium, high, and very high concern categories. Develop clear criteria for manufacturers and users of chemicals prioritized into very high, high, medium, and low concern.
3-54	Use data from the Canadian CEPA program summaries of chemicals in their prioritization program, and any summaries that come from EU REACH program.

OPTION DC-1:	***Systematically collect data and information needed to categorize and prioritize chemicals, and take actions to reduce toxics in products.***
3-55	Look at available data sources to obtain information on chemical toxicity. These include USEPA's various programs (IRIS, HPV, and VCCEP); TSCA test submissions of unpublished technical reports, European Chemical Substance Information System, OECD member countries, and International Programme on Chemical Safety.
3-56	Ensure access to information and data gathered by others by: (a) Requiring companies submitting data under Canada's CEPA and EU REACH to submit it to California. (b) Negotiate for access to CBI data submitted under CEPA and EU REACH. (c) Enhance IT infrastructure to receive and share data.
3-57	Map the flow of chemicals in California, require submission of data from California producers/users on amounts of chemicals produced/used, and where, amount and use in products and post-use management.
3-59	Require disclosure of chemicals in consumer products, focusing initially on high concern chemicals.
3-106	Move toward a model in which hazard traits are prioritized. This will be essential in protecting and growing the California economy. While the EU may accept risk management as a premise, hazard trait analysis can provide our companies with a competitive advantage by enabling them to develop/choose safer alternative chemicals and to respond to shifts in international regulatory frameworks as they occur.
3-107	Develop a system that focuses on a chemical's rank relative to environmental performance and impacts on health, including worker health.
3-109	Focus on the 500 high priority substances identified in Canada's program. To address unique circumstances that might exist in California, the State could have a process to add substances to the high priority list, as necessary, based on hazards, uses and exposures to workers and consumers in California. Once the high priority chemicals are identified, use and exposure should be considered to determine whether there are impacts on human health and/or the environment. .
3-113	Map the flow of chemicals in California using information drawn from existing sources such as USEPA's Inventory Update Reporting (IUR), the data received by Canada during its data call-ins for high priority chemicals, and other contributions from the public.
3-118	Establish a program to identify, assess, and manage priority chemicals based on an evaluation of hazard and potential for exposure. Move quickly by leveraging priorities identified in the Canadian Chemical Management Plan. Create a collaborative effort between California and Canada to accelerate progress in both geographies. Include a means for adding and deleting priority chemicals based on unique California circumstances. Leverage the recently assembled U.S. Inventory Update report to provide initial volume, use and exposure information. Identify uses and user industries for the high priority chemicals that raise the greatest concern. Expect producers of priority chemicals and manufacturers with high concern uses to provide hazard and exposure information on those chemicals/uses to the program. Provide the agency with authority and a due process to establish restrictions for uses of priority chemicals that have unacceptable risks.
3-120	Encourage the use of alternatives to animal testing and require testing only as a last resort, in pursuing the objective of the Green Chemistry Initiative to expand toxicology information on chemicals. Cal/EPA and the UC system could work with other experts to provide assistance on alternative screening methodologies that can be utilized to provide adequate toxicology information for recommendations and decisions about priority chemical uses.

OPTION DC-1:	***Systematically collect data and information needed to categorize and prioritize chemicals, and take actions to reduce toxics in products.***
3-126	Consider existing data and information already available to California and the public before making judgments on additional chemical specific data and information needs. There are existing programs such as the High Production Volume (HPV) Challenge Program and the Extended HPV Program, which have provided valuable toxicology and exposure information that is publicly available. Hazard information from such sources can be used in light of exposure scenarios to evaluate potential risk and ensure appropriate risk management. In addition, the information from the recent evaluation and categorization of chemicals on the Canadian Domestic Substance List (DSL), Canada, should be considered by California.
3-141	Integrate GIS data with workplace use, health, ecological, and other data to identify patterns that affect chemical impacts. We need to understand, in particular, the distributional effects of chemical exposures.
3-146	Prioritize chemicals for screening, testing, and appropriate restrictions. We suggest building upon the model of Canada's analysis and prioritization as well as the Proposition 65 review process. Chemicals of high concern should be allowed for targeted, low-exposure uses as determined in an open process. The use of a transparent and rigorous process to evaluate risk factors as indicated by toxicological, epidemiological, and exposure data will allow us to compare the relative importance and safety of chemicals as well as determine whether any restrictions or substitutions are appropriate.
3-153	Build chemical data development efforts on existing statutory and regulatory structures, voluntary initiatives, and data development efforts, and collaboration by California in ongoing work by other government agencies to assess chemicals and consumer products. Leverage efforts by Health and Environment Canada in addressing priority chemicals in the Chemicals Management Plan. California could also participate in the e Security and Prosperity Partnership (SPP) under the Montebello Agreement involving trilateral cooperation among the governments of Canada, the United States and Mexico to share chemical information and safety assessments.
3-159	Conduct a detailed, comprehensive assessment of existing chemical toxicity reporting and data availability programs and ensure access to those data as applicable to California. Assurances of some measure of formulation confidentiality would encourage producers and manufacturers to make toxicity and use data available.
3-161	Avoid a static, required list of toxicity tests as check-the-box toxicology. Instead, tiered, thoughtful testing strategies should be pursued with flexibility and creativity. For example, bioaccumulation, biopersistence, solubility, and other physicochemical parameters should be determined prior to conducting dose-related evaluations such as percutaneous absorption testing; moving up from there would involve a full characterization of the chemical or material using in vitro cell and tissue assays. For the sake of flexibility as science advances a list of required tests promulgated legislatively should be avoided.
3-163	Keep pace of new methods to evaluate toxicity other than new animal testing. These include: OECD QSAR Toolbox and other International QSAR Foundation activities, OECD and NTP toxicogenomics initiatives, ILSI/HESI's Tiered Toxicology Testing Proposal for Pesticide Chemicals, OECD Integrated Approaches to Testing and Assessment workshop (taking place in December 2007), and others, such as those presented at the October 1-2, 2007, workshop.
3-164	Analyze the human health and environmental profile of the chemicals, and manage chemicals in an appropriate way in accordance with their profile. EU REACH is a good example of such responsibility. Such a system should give clear certainty to industry that a chemical can continued to be used once the assessment is completed and approved, and it should also not continuously be challenged on the basis of data which are not scientifically sound.

OPTION DC-1:	***Systematically collect data and information needed to categorize and prioritize chemicals, and take actions to reduce toxics in products.***
3-167	Establish a California-specific chemical evaluation process to identify uses of concern for priority chemicals that were not on the original CEPA categorization process or that will not be addressed under the Montebello Agreement in the timeframe required. The process should utilize a tiered approach, in which chemicals and their uses are prioritized for further evaluation. The process should also utilize risk-based screening and should focus on potential “data needs” versus “data gaps”. Producers and users of identified priorities should be engaged in a collaborative process to bring hazard, use and exposure information to improve decision-making. As California proceeds with its process, it should leverage information already generated or that will be generated under regulatory or voluntary chemical evaluation programs. California must be transparent in the processes used to make risk evaluation and risk management decisions.
3-171	Adopt a proactive approach to obtaining data needed to assess hazard traits. The current practice is for the state to consult various lists and data sources to try to track down whatever information is available to assess hazards of chemicals. The information available varies enormously, and little is available for many chemicals. The State needs to have the authority to obtain the information and test results needed to assess and characterize the hazards of chemicals.
3-172	Use methods that reflect current understanding of issues—including the importance of timing of exposure and how effects at different life stages can differ; differences in susceptibility including the particular susceptibility of children; the importance of multiple exposures to multiple chemicals; and the significance of biological perturbations in increasing likelihood of diseases or disorders. Cal/EPA should engage experts to work toward incorporating current science into better methods for assessing the hazards of chemicals. These would likely include use of genomics and related technologies and other high through put approaches. It would also include systematic validation. Such efforts should be guided by the policy goal to adopt the best currently available methods.
3-178	Find an acceptable way to prioritize chemicals for additional testing. Hazard traits are certainly one criterion, but it is only part of the story. Green Chemistry must not consider hazard at the exclusion of exposure. If so, there would be a misalignment of limited resources for marginal value.
3-179	Consider risk versus hazard. Admittedly too much emphasis has been placed in prior year on reducing exposure (risk) and too little emphasis on reducing toxicity (hazard). The transition movement within the chemical industry, however, has begun. Emphasis on a transition to hazard reduction (i.e. green chemistry) is and will continue to build. However, GCI needs to forthrightly acknowledge that elimination of all toxicity through chemical substitution is not possible. At best there will always be trade-offs, which will need to be evaluated via life-cycle analysis (LCA) methodologies.
4-1	Assess chemicals within the context of alternatives. Criteria for better or worse green products should be clear.
4-11	Use sound scientific information to define what is "toxic" and "non-toxic."
4-12	Identify specific industry sectors that generate the most toxic products and identify green production and processing for those sectors.
4-44	Require responsible parties to report new factual information regarding adverse health effects of their products or of the individual constituents of their products to a centralized, publicly accessible database. The adverse effects reporting requirements for pesticides as set forth in Section 6 (a) (2) of the *Federal Insecticide, Rodenticide, and Fungicide Act*, could be used as a starting point.
4-45	Require responsible parties to identify the individual constituents of their products or, if that information is considered to be confidential business information, to provide the appropriate health information on their products.
4-50	Require manufacturers to know what is going into products they produce.

OPTION DC-1:	***Systematically collect data and information needed to categorize and prioritize chemicals, and take actions to reduce toxics in products.***
4-54	Require EU REACH-like analysis, reporting, and removal of toxics in products.
4-63	Develop legislation that would require new chemicals to be tested for toxicity prior to marketing in California. Toxicity testing would also be required for existing chemicals already being used and marketed in California. The set of required toxicity tests would be developed by a group of scientists with input from California government agencies and the public. California government agencies would evaluate the results of the toxicity testing and decide whether the chemical would be marketed (new chemicals) or whether the chemical would have to be removed from the market (existing chemicals). The criteria for deciding on this "up or down" vote on a chemical would be predetermined by the group of scientists who designed the toxicity test battery, along with input from California government agencies and the public.
4-64	Expand the budget of OEHHA to speed the evaluation of toxicity test results and determination of whether particular chemicals pose an unacceptable risk.
4-66	Develop clear criteria for prioritizing chemicals by level of concern based on a range of factors including chemical production volume and uses, exposure criteria such as persistence and bioaccumulation, and toxicological characteristics. Follow through with safety assessment and appropriate action.
4-69	Create a map of chemical production and use in California. Show how chemicals flow into the state, who produces them, and how they are used.
4-74	Build technical capacity in state agencies such as OEHHA in the use of QSAR (quantitative structure activity relationship) models; review and consider how these methods can be applied in identifying chemicals of concern as well as safer alternatives.
4-88	Ensure data requirements, analyses, and decision-making processes: (a) Incorporate new science demonstrating the importance of low doses, as well as the significance of background exposures, synergistic effects, and the timing of exposures during the lifecycle. (b) Address the effects of cumulative exposures. (c) Provide comprehensive protection, including protecting the most vulnerable populations, endangered species, and water quality. (d) Consider environmental justice and worker impacts. And, (e) Are based on a full cost accounting including costs to communities.

OPTION DC-2:	***Use the best elements of the Canadian Environmental Protection Act (CEPA) and the European Union's Registration, Evaluation and Authorisation of Chemicals (EU REACH) program as models for data collection and use.***
1-4	Develop and establish mandatory criteria that must be addressed for all substances used in commerce. Take into account toxicity, effectiveness, volume used/reduction in use, long and short term health and environmental impacts (life cycle).
1-5	Develop and establish balancing criteria for all substances used in commerce. Take into account long and short term costs/economics, "alternative analysis" and public acceptance.
1-6	Prioritize and address chemicals by toxicity, risk and volumes used and/or released into commerce and the environment.
1-10	Mandate full disclosure of substances contained in products. "Green labeling" should be used with restraint.
1-13	Realign and leverage with existing federal, state and local mandated reporting activities to avoid duplication and waste of resources.
1-17	Standardize terminology/definitions to promote the necessary and real change towards creating more sustainable, social and environmental solutions.
1-18	Prioritize protection from chemical harm in decision making. Use data on all toxicological endpoints including cancer reproductive effects developmental effect etc.
1-20	Use EU REACH as model.
1-26	Support development of a chemical risk analysis process such as that being implemented in Canada.
1-27	Support mandatory reporting and enforcement of chemical use by manufacturers and distributors.
1-30	Rethink the processes for allowing chemicals into the market.
1-36	Establish mandatory requirements needed to fill gaps about chemicals. In addition to CMR data, we need other endpoints: neurotoxins, long-term toxicity, endocrine disruption, immunotoxicity. Industry should be responsible for developing these data, with government's role is to audit/verify.
1-90	Negotiate for access to confidential business information (CBI) submitted under the European Union's REACH Regulation and under the Canadian Environmental Protection Act.
1-91	Require companies making/importing chemicals in California that are subject to REACH or CEPA to submit the same information to California officials.
1-118	Implement the policy that "no data means no market," meaning that chemicals for which safety data are not available are to be banned from sale or use.
2-4	Base environmental regulation on thorough scientific data that has clear evidence of harm to human health and environment.
2-9	Compile a comprehensive list of all reports that must be filed with Federal, State and local agencies, including the information and data submission requirements for each; determine whether current reports provide sufficient baseline information, and if additional information should be obtained.
2-11	Prioritize protection of the most vulnerable people (e.g., children) and resources (e.g., endangered species, critical resources). In other words, identify currently unaddressed ways children are exposed to potentially harmful substances.

OPTION DC-2:	***Use the best elements of the Canadian Environmental Protection Act (CEPA) and the European Union's Registration, Evaluation and Authorisation of Chemicals (EU REACH) program as models for data collection and use.***
2-27	Identify priority chemicals for toxics use reduction and create a list as targets for toxics use reduction.
2-29	Require businesses that use large quantities of toxic chemicals to report annually on the quantities of toxic chemicals used, and prepare and biennially update toxics use reduction plans.
2-30	Survey California businesses regarding information on each facility it owns or operates in the state, the full-time equivalent number of employees at that facility, and whether a listed substance is manufactured, processed, or otherwise used in a facility. The total quantity used statewide should be established as a baseline against which toxics use reduction progress can be measured.
2-42	Ensure that chemical producers generate, distribute, and communicate information on chemical toxicity, ecotoxicity, uses, and other key data.
2-43	Strengthen government tools for identifying, prioritizing, and mitigating chemical hazards.
2-62	Require California producers, importers, and users to submit and update info on amounts, facility locations, and uses (including in products).
2-64	Require disclosure of chemicals in consumer products, perhaps initially on priority chemicals.
2-65	Prioritization is essential.
2-66	Leverage other state-mandated activities (e.g., the Biomonitoring Program).
2-70	Ensure that information is transmitted through all consumers in the supply chain.
2-74	Focus research on impacts of chemicals on early childhood development.
2-86	Use the most sensitive receptors should be the basis for acceptable risk.
2-87	Prioritize chemicals that should be restricted.
2-99	Incorporate biomonitoring as part of the green chemistry policy.
2-118	Prioritize based on exposures.
2-124	Do not reinvent the process, as a whole new process could have a negative effect; instead study Canadian list, EU REACH and others to determine their usefulness and validity.
2-141	Evaluate elements of EU REACH and CEPA and choose those most relevant to California.
2-148	Adopt a phased approach for existing / new chemicals, as with CEPA.
2-151	Identify less hazardous chemicals, as Canada did.
3-1	Develop science-based criteria for determining whether a particular product is greener or safer than alternatives.

OPTION DC-2:	***Use the best elements of the Canadian Environmental Protection Act (CEPA) and the European Union's Registration, Evaluation and Authorisation of Chemicals (EU REACH) program as models for data collection and use.***
3-7	(a) Prioritize chemicals used in commerce in California based on exposure potential and toxicity; work to reduce exposure to the most hazardous substances. To do this, California should gather data regarding all chemicals manufactured in or used in commerce in California, including in what products, how, and in what volumes they are used. Additional data regarding available toxicity characteristics should also be gathered for each of those chemicals. Gaps in toxicity and exposure data should be identified. (b) Use the above data to prioritize or rank chemicals in terms of hazard as a function of toxicity and exposure. Tools for such ranking are available from other efforts such as Canada's CEPA program and USEPA, which should be evaluated for use in California. Subsequent efforts should then focus on working with industry to find viable, safer alternatives for the highest ranked chemicals (i.e., those that pose the biggest threat in terms of toxicity and exposure), while at the same time engaging industry and our University system to fill in important gaps regarding toxicity and exposure data. (c) Tap biomonitoring efforts to help fill exposure gaps. In evaluating and ranking chemicals, considerations should be given to the performance and feasibility of alternatives.
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3-12	(a) Use the Green Chemistry principles in developing useful approaches to pollution prevention. (b) Leverage resources with USEPA programs, Canadian CEPA, etc. (e.g., information from the HPV program, VCCEP program, and ICCA Global Initiative on HPV chemicals). (c) Conduct a baseline assessment to determine needs. (d) Study available hazard and exposure data and how California can best use these data. (e) Identify "green approaches" that have worked as well as those that have not worked.
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3-38	Use EU REACH program as a model and do the following: (a) Register all chemicals in commerce in California and require a summation of the chemical properties, toxicity, and hazard of each in order to be registered for use. (b) Develop a list of chemicals of concern based on usage and toxicity or hazard information. (c) Register products containing these hazardous materials including imported products and publish this information. (d) Require tiered sets of toxicity information according to usage, amounts produced/imported, or other indicators of exposure. (e) Eliminate the use and/or require strict regulation of use of highly persistent or bioaccumulative chemicals, carcinogens, mutagens, reproductive toxins developmental toxins, neurotoxicants, and any other compound capable of causing serious or irreversible harm. (f) Develop models to simulate exposure scenarios for common chemicals in common products to inform decisions on chemical management.
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3-45	Use Quantitative Structure Activity models to help identify toxicity potential and exposure potential of chemicals used in commerce in California.
3-52	Using data on toxicity and use, prioritize chemicals into low, medium, high, and very high concern categories. Develop clear criteria for manufacturers and users of chemicals prioritized into very high, high, medium, and low concern.
3-54	Use data from the Canadian CEPA program summaries of chemicals in their prioritization program, and any summaries that come from EU REACH program.
3-55	Look at available data sources to obtain information on chemical toxicity. These include USEPA's various programs (IRIS, HPV, and VCCEP); TSCA test submissions of unpublished technical reports, European Chemical Substance Information System, OECD member countries, and International Programme on Chemical Safety.
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3-159	Conduct a detailed, comprehensive assessment of existing chemical toxicity reporting and data availability programs and ensure access to those data as applicable to California. Assurances of some measure of formulation confidentiality would encourage producers and manufacturers to make toxicity and use data available.
3-161	Avoid a static, required list of toxicity tests as check-the-box toxicology; instead, tiered, thoughtful testing strategies should be pursued with flexibility and creativity. For example, bioaccumulation, biopersistence, solubility, and other physicochemical parameters should be determined prior to conducting dose-related evaluations such as percutaneous absorption testing; moving up from there would involve a full characterization of the chemical or material using in vitro cell and tissue assays. For the sake of flexibility as science advances a list of required tests promulgated legislatively should be avoided.
3-163	Keep pace of new methods to evaluate toxicity other than new animal testing. These include: (a) OECD QSAR Toolbox and other International QSAR Foundation activities. (b) OECD and NTP toxicogenomics initiatives. (c) ILSI/HESI's Tiered Toxicology Testing Proposal for Pesticide Chemicals. (d) OECD Integrated Approaches to Testing and Assessment workshop (December 2007) and others such as those presented during the Cal/EPA workshop October 1-2, 2007.
3-164	The responsibility to analyze the human health & environmental profile of the chemicals, and manage chemicals in an appropriate way in accordance with their profile. EU REACH is a good example of such responsibility. Such a system should give clear certainty to industry that a chemical can continued to be used once the assessment is completed and approved, & it should also not continuously be challenged on the basis of data which are not scientifically sound.
3-167	Establish a California-specific chemical evaluation process to identify uses of concern for priority chemicals that were not on the original CEPA categorization process or that will not be addressed under the Montebello Agreement in the timeframe required. The process should utilize a tiered approach, in which chemicals and their uses are prioritized for further evaluation. The process should also utilize risk-based screening and should focus on potential "data needs" versus "data gaps". Producers and users of identified priorities should be engaged in a collaborative process to bring hazard, use and exposure information to improve decision-making. As California proceeds with its process, it should leverage information already generated or that will be generated under regulatory or voluntary chemical evaluation programs. California must be transparent in the processes used to make risk evaluation and risk management decisions.

OPTION DC-2:	***Use the best elements of the Canadian Environmental Protection Act (CEPA) and the European Union's Registration, Evaluation and Authorisation of Chemicals (EU REACH) program as models for data collection and use.***
3-171	Adopt a proactive approach to obtaining data needed to assess hazard traits. The current practice is for the state to consult various lists and data sources to try to track down whatever information is available to assess hazards of chemicals. The information available varies enormously, and little is available for many chemicals. The State needs to have the authority to obtain the information and test results needed to assess and characterize the hazards of chemicals.
3-172	Develop methods that reflect current understanding of issues including the importance of timing of exposure and how effects at different life stages can differ; differences in susceptibility including the particular susceptibility of children; the importance of multiple exposures to multiple chemicals; and the significance of biological perturbations in increasing likelihood of diseases or disorders. Cal/EPA should engage experts to work toward incorporating current science into better methods for assessing the hazards of chemicals. These would likely include use of genomics and related technologies and other high through put approaches. It would also include systematic validation. Such efforts should be guided by the policy goal to adopt the best currently available methods.
3-178	Find an acceptable way to prioritize chemicals for additional testing. Hazard traits are certainly one criterion, but it is only part of the story. GCI must not consider hazard at the exclusion of exposure. If so, there would be a misalignment of limited resources for marginal value.
3-179	Consider risk versus hazard. Admittedly too much emphasis has been placed in prior year on reducing exposure (risk) and too little emphasis on reducing toxicity (hazard). The transition movement within the chemical industry, however, has begun. Emphasis on a transition to hazard reduction (i.e. green chemistry) is and will continue to build. However, GCI needs to forthrightly acknowledge that elimination of all toxicity through chemical substitution is not possible. At best there will always be tradeoffs which will need to be evaluated via Life Cycle Analysis (LCA) methodologies.
4-1	Assess chemicals within the context of alternatives. Criteria for better or worse green products should be clear.
4-11	Use sound scientific information to define what is "toxic" and "non-toxic."
4-12	Identify specific industry sectors that generate the most toxic products and identify green production and processing for those sectors.
4-44	Require responsible parties to report new factual information regarding adverse health effects of their products or of the individual constituents of their products to a centralized, publicly accessible database. The adverse effects reporting requirements for pesticides as set forth in Section 6 (a) (2) of the *Federal Insecticide, Rodenticide, and Fungicide Act,* could be used as a starting point.
4-45	Require responsible parties to identify the individual constituents of their products or, if that information is considered to be confidential business information, to provide the appropriate health information on their products.
4-50	Require manufacturers to know what is going into products they produce.
4-54	Require EU REACH-like analysis, reporting, and removal of toxics in products.

OPTION DC-2:	***Use the best elements of the Canadian Environmental Protection Act (CEPA) and the European Union's Registration, Evaluation and Authorisation of Chemicals (EU REACH) program as models for data collection and use.***
4-63	Develop legislation that would require new chemicals to be tested for toxicity prior to marketing in California. Toxicity testing would also be required for existing chemicals already being used and marketed in California. The set of required toxicity tests would be developed by a group of scientists with input from California government agencies and the public. California government agencies would evaluate the results of the toxicity testing and decide whether the chemical would be marketed (new chemicals) or whether the chemical would have to be removed from the market (existing chemicals). The criteria for deciding on this "up or down" vote on a chemical would be predetermined by the group of scientists who designed the toxicity test battery, along with input from California government agencies and the public.
4-64	Expand the budget of OEHHA to speed the evaluation of toxicity test results and determination of whether particular chemicals pose an unacceptable risk.
4-66	Develop clear criteria for prioritizing chemicals by level of concern based on a range of factors including chemical production volume and uses, exposure criteria such as persistence and bioaccumulation, and toxicological characteristics. Follow through with safety assessment and appropriate action.
4-69	Create a map of chemical production and use in California. Show how chemicals flow into the state, who produces them, and how they are used.

OPTION DC-3: Use the best elements of other programs in the United States as sources of data or as models for data collection and use.	
1-39	Legislate something similar to the State of Massachusetts (S-1268 & H-2275) *The Act for a Healthy Massachusetts: Safer Alternatives to Toxic Chemicals.*
3-10	(a) Prioritize protection of most vulnerable people and resources. For example, get information on exposures of children to harmful substances through toxics in products, and seek changes to reduce or eliminate these toxics. Focus on consumer products with lots of exposure potential. This needs a regulatory action. (b) Look for initial easy fixes by integrating existing programs that have identified actual sources of pollutants. (c) Drive the demand for cleaner products through state procurement practices. (d) Designate the Occupational and Environmental Health at UC Berkeley and UCLA as lead entities within the UC system to address research relevant to Green Chemistry and Chemicals Policy in California.
3-46	Evaluate what other states have done and utilize appropriate elements from those programs, including the Massachusetts Toxics Use Reduction Act, the Oregon Toxics Use and Hazardous Waste Reduction Act, , and Oregon's Executive Order to reduce persistent and bioaccumulative Toxicants.
4-12	Identify specific industry sectors that generate the most toxic products and identify green production and processing for those sectors.
4-69	Create a map of chemical production and use in California. Show how chemicals flow into the state, who produces them, and how they are used.
4-107	Use the recently assembled U.S. Inventory Update Rule report to provide initial volume, use, and exposure information. Identify uses and user industries for the high priority chemicals that raise the greatest concern. Expect producers of priority chemicals and manufacturers with high concern uses to provide hazard and exposure information on those chemicals/uses to the program.

OPTION DC-4: Establish mechanisms and tools to facilitate sharing, use, and analysis of data.	
1-35	Develop a database of ingredients used in consumer products similar to the Skin Deep database that is currently available for cosmetics. In order to ensure accuracy, California would need the regulatory authority to regulate consumer products and to require disclosure of ingredients in consumer products.
1-37	Develop an information clearinghouse on DTSC's website. This information would include hazard and use data as well as information about safe alternatives.
1-42	Develop an automated, web-based assessment of "green" chemicals, products and processes for product design and procurement.
1-43	Use web-based MACS emissions and health risk assessment modules.
1-44	Use an automated web-based system for identifying munition and non-munition chemicals of concern (Chemical Homeland Security System [C–HoSS]).
1-73	In 2000, the U.S. Army Defense Ammunition Center (DAC) began working with Chemical Compliance Systems, Inc. (CCS) to use CSS's extensive centralized Relational Chemical and Product Databases as the basis for a series of integrated, web-based modules within what has become the Munitions Analytical Compliance Suite (MACS). (The CCS centralized databases include over 650 regulatory lists.) MACS include eight modules. In a few months, the 9th and 10th automated modules the Emissions Risk Assessment and Human Health Risk Assessment–will be added. The most comprehensive of the MACS modules is the "Green" Munitions Analytical Compliance System (G-MACS).
1-155	Provide consumer education on what will be hazardous when product is thrown away, wake up consumers that there is no "away.
2-10	Develop a centralized database of chemicals and properties.
2-26	Develop a "Safe Home Environment" place for children to visit/learn.
2-69	Create a database of "safe" chemical alternatives.
2-71	Enable the public to drive green chemistry by providing them with information, such as through a database with green information
2-139	Certify products. The German environmental certification, "The Blue Angel," (www.blauer-engel.de/englisch/navigation/body_blauer_engel.htm), can be used as a model for the certification of products and services.
2-154	Employ wiki data and other new and emerging technologies for consumers, industry and others.

OPTION DC-4: Establish mechanisms and tools to facilitate sharing, use, and analysis of data.	
3-4	(a) Expand consumer education regarding product life cycle costs and impacts (e.g. appropriate selection, use, disposal, and alternative materials or practices) since well-informed consumers will not only handle and dispose of chemicals more safely, and will demand safer products. (b) Disseminate information through traditional media as well as outreach through community partners as well as the private sector. (c) Educate people how chemicals are created, screened for use, and managed through a process. Show people "a day in the life of a chemical." (d) Provide complete, transparent chemical risk information in a way the public can access, understand, and absorb. (e) Create convenient, credible chemical evaluation tools that businesses, schools or individuals can easily use when selecting chemical products. These could use prior art such as the Green Screen or Pfizer's Solvent Alternatives Chart. These tools could show examples of the risk as well as hazard, and define hazard/risk as high, medium and low and compare to products and services used by consumers everyday. If something is a hazard, show the alternatives or how the risk relates to the pathways for exposure. (Is it in a product, or solely for use in a process? If it is in a product, what entails safe use? Etc.)
3-7	(a) Prioritize chemicals used in commerce in California based on exposure potential and toxicity, and work to reduce exposure to the most hazardous substances. To do this, California should gather data regarding all chemicals manufactured in or used in commerce in California, including in what products, how and in what volumes they are used. Additional data regarding available toxicity characteristics should also be gathered for each of those chemicals. Gaps in toxicity and exposure data should be identified. (b) Use this data to prioritize or rank chemicals in terms of hazard as a function of toxicity and exposure. Tools for such ranking are available from other efforts such as Canada's CEPA program, and USEPA, and should be evaluated for use in California. Subsequent efforts should then focus on working with industry to find viable, safer alternatives for the highest ranked chemicals (i.e., those that pose the biggest threat in terms of toxicity and exposure), while at the same time engaging industry and our University system to fill in important gaps regarding toxicity and exposure data. (c) Tap biomonitoring efforts to help fill exposure gaps. In evaluating and ranking chemicals, considerations should be given to the performance, and feasibility of alternatives.
3-51	Evaluate products already available to screen chemicals in products including the Chemical Compliance Systems tool used by the DOD and US Army to evaluate munitions, paint, etc.
3-64	Require companies to generate comprehensive safety and health data based on the hazard traits of chemicals for all chemicals in their products by 2016.
3-115	Expand product-specific chemical ingredient disclosure for consumer products which currently do not have that requirement.
3-121	(a) Expect and encourage manufacturers of consumer products to communicate information about the ingredients in products, either on the package or on the internet at the manufacturer's discretion and with appropriate provisions for protection of Confidential Business Information. (b) Expect and encourage chemical and product manufacturers to update their MSDS document to the new 16-section ANSI standard and to reflect the latest hazard information from voluntary (e.g. HPV) and regulatory (e.g. Canada CMP) programs. (c) Encourage companies in important value chain sectors to work together to identify "beyond MSDS" information needs both upstream and downstream and to establish processes for communication to meet those needs. (d) Leverage California's capability and interest to assemble a chemical information system on hazard, use and exposure from global sources.

OPTION DC-4: Establish mechanisms and tools to facilitate sharing, use, and analysis of data.	
3-134	Work with affected industries to implement a means of ingredient communication that would provide consumers with the information they can use to make even better informed decisions regarding the products they use in their homes.
3-135	Work with scientific experts to examine best practices and to develop a toolkit for safety assessment programs and for safety assessments. Companies also could make a description of their safety assessment process available on the Internet. This could help provide context for product ingredient communication.
3-155	Work with industry to implement a means of ingredient communication that would provide consumers with the information they can use to make informed decisions regarding the products they use in their homes.
3-174	Provide clear and transparent characterization of chemical hazards to the public. Many entities can and are making decisions and take action that contribute to adoption of safer or lower hazard chemicals and products. To support such efforts, businesses, agencies, and the public need comprehensive, current, accurate, and reliable information about the relative hazard of different chemicals. The State of California should develop a matrix of information about the hazard traits of chemicals in use or considered for use, presented in ways that are useful and understandable to various audiences. This matrix should also make clear when gaps in data exist, so that businesses and individuals can choose to avoid chemicals with unknown hazards as well as those that are higher hazard.
4-12	Identify specific industry sectors that generate the most toxic products and identify green production and processing for those sectors.
4-14	Use tools that are already available for decision-makers (such as purchasing managers) which collect and analyze information on environmental hazards, health hazards and cost of chemical inventories and products (e.g., Dolphin Software, www.chemply.com).
4-69	Create a map of chemical production and use in California. Show how chemicals flow into the state, who produces them, and how they are used.
4-120	Catalog, and make easily available, information regarding best practice screening processes, green chemical design, collaborative efforts, international efforts, and examples of product development decisions and substitutions that have resulted in reduced waste produced and energy inputs.

OPTION DC-5: Collect data needed to conduct life-cycle analysis of high-use products and develop a life-cycle analysis prototype.	
1-122	Look at a product from all the various aspects of its life cycle. It is critical to ensure the total picture of benefits and impacts is understood. Failure to look across the entire life cycle when making decisions can lead to unintended consequences and often fail to solve the issue of concern. Dissecting a product into all the various processes that contribute to its production and disposal can help us better understand how our production and consumer habits affect the environment.
1-129	Alleviate concerns over the trend to use LCA as a marketing tool by using the Society of Environmental Toxicology and Chemistry (SETAC) guidelines. SETAC guidelines can be used by both governmental and private agencies; these include a code of ethics. Consider following this type of standard.
1-210	Use life-cycle assessments, which offer the greatest opportunity in establishing flexible approaches and more holistically evaluate the balance between societal needs, protection of public health and the environment, and sustainable production and consumption, rather than through traditional regulatory paradigms.
1-211	Base decisions of preference and substitution on the comparative life-cycle impacts of a chemical and its potential substitute. While a safety-based characterization scheme may focus on toxicity, persistence and bioaccumulation, there are a number of other parameters which are relevant to the sustainable use of a particular chemical in a formulation such as raw material sourcing and carbon footprint. All relevant aspects of sustainability should be taken into consideration for a potential substitution decision. Similarly, any plan to consider substitution of chemicals should require that the efficacy and benefits of that compound be considered as any diminution of efficacy may negatively impact public health and well-being through reduced hygiene and sanitation.
1-213	In order to facilitate informed substitution of high priority substances towards those with a more favorable environmental and human health profile, develop database of chemical alternatives that compares a number of sustainability parameters: performance, price, human health and environmental (e.g., toxicity, bioaccumulation, persistence) including carbon footprint and source sustainability.
3-76	Consider using life-cycle analysis guidelines established by the Society of Environmental Toxicology and Chemistry in using LCA to compare water, energy, raw material use to generate products, and the transportation and waste of same.
3-100	Use life-cycle assessment to more holistically balance between societal needs, protection of public health and the environment, sustainable production and consumption.
3-108	While a safety-based characterization scheme may focus on toxicity, persistence and bioaccumulation, consider a number of other parameters which are relevant to the sustainable use of a particular chemical in a formulation such as raw material sourcing and carbon footprint. All relevant aspects of sustainability should be taken into consideration for a potential substitution decision.
3-111	For alternatives identified, require a separate life-cycle assessment by an outside party, or state-funded Center for Excellence in order to confirm that there is no loss in performance with the alternative, to avoid unintended consequences, and to assist in commercialization. Develop a Cooperative Extension-type program to assist companies in cradle-to-cradle product design/formulation and assist in adoption of new alternative chemistries and processes.
3-143	Strengthen the recognition and pursuit of Green Chemistry processes and products by establishing clear criteria and voluntary certification based on comprehensive lifecycle considerations. Equally important, consumers need to be educated about responsible choices and practices.

OPTION DC-5: Collect data needed to conduct life-cycle analysis of high-use products and develop a life-cycle analysis prototype.	
3-149	While the focus of the Initiative has been on chemical safety, incorporate an accounting of embedded energy, C02 impact, water usage, packaging, recyclability, and so forth. Industry on the whole is already moving toward a greater consideration of these factors in our practices. The difficulty of quantifying and ascribing relative importance to these factors points to the need for commonly-held practices or industry standards.
3-189	Begin an immediate effort to ramp-up the state's life-cycle analysis capability. Unquestionably, one cannot envision competency in cradle-to-cradle techniques without enhanced in-house LCA capability.
4-100	In developing and implementing the use of life-cycle analysis, be sure to: (a) Understand that data reliability and quality will vary greatly and acknowledge this transparently (b) Clearly articulate the scale (e.g. global, local) (c) Understand that uncertainty is everywhere—LCA will be refined as more and better quality data is available (d) Understand that comparisons between life-cycle studies are difficult due to differing up front assumptions (e) Understand that no single, globally accepted method exists for LCA work (f) Consider guidelines developed by the Society of Environmental Toxicology and Chemistry (SETAC) for conducting life-cycle analyses by both governmental and private agencies.

OPTION DC-6: Build a toxicological and exposure potential database on chemicals used in California.	
1-35	Develop a database of ingredients used in consumer products similar to the Skin Deep database that is currently available for cosmetics. In order to ensure accuracy, California would need the regulatory authority to regulate consumer products and to require disclosure of ingredients in consumer products.
1-120	Create a unified database that includes data from sources around the world. This database would have to be designed to be accessible to different users (chemical products users; consumers, etc) and should be made public. (The "E-Chem" unified data portal newly introduced by OECD might be considered a "baby step" toward this.)
1-131	Provide consumers with accurate information upon which they can make informed decisions. This can be a very useful tool in driving changes. There are many programs that are predicated on consumer choice. Cars are labeled with expected fuel efficiency ratings. Major home appliances have energy labels which can be used for comparisons. Plumbing fixtures show the water use. The clear intent is that consumers will use these labels to make more informed purchasing decisions.
1-132	Polls have shown that consumers want to have the information they desire readily available to them so that they are able to make informed decisions about the products they purchase. This must be a shared responsibility of the value chain.
1-180	Create a clearinghouse of best green chemistry practices. There are numerous initiatives being conducted around the world with an existing and developing body of knowledge that can be leveraged to speed implementation.
3-112	Develop database of chemical alternatives that compares a number of sustainability parameters: performance, price, human health and environmental (e.g., toxicity, bioaccumulation, persistence) including carbon footprint and source sustainability.
4-16	Develop mechanisms for improving the flow of information through the manufacturing process.
4-22	Build toxicological and exposure database on chemicals in use in California.
4-62	Make a baseline assessment of chemical information that is already available to the State.
4-141	Create a database on alternatives that compares a number of sustainability parameters: performance, price, human health and environmental (e.g., toxicity, bioaccumulation, persistence) including carbon footprint and source sustainability.

Chapter 2—Economic Incentives and Market Options

Economic Incentives, Markets, and Funding
Capitalizing on market forces to advance Green Chemistry

SYNOPSIS

Participants in the California Green Chemistry Initiative suggested a number of options that include using economic incentives, market forces, and funding as possible drivers that can spur green chemistry innovation and technologies. They said economic tools could help overcome resistance to change and "level the playing field" between toxics and greener choices for chemicals, products, and technologies. Economic and market-related topics represented roughly 22% of the total number of comments received throughout the Conversation with California. More than 177 options involving economic and other incentives were submitted. Stakeholders also presented different funding options, creating a linkage in some instances to economic incentive options.

From the comments, the economic and market-related options include:

- Establishing incentives and disincentives;
- Using market drivers and correcting market failures;
- Encouraging corporate responsibility and accountability;
- Leveraging government procurement systems;
- Instituting awards and recognition; and,
- Developing funding sources for green chemistry activities.

Many comments suggested that government may have a role in influencing market forces toward more environmental preferable products through economic incentives. Commenters proposed many economic options, such as positive incentives—low interest loans, grants, or tax credits, to encourage the development of, demand for, and use of green products, processes, and technologies. Similarly, participants also suggested disincentives, such as fines or penalties, to discourage the continued use of hazardous substances in consumer goods, finished products, and the workplace.

Stakeholders also suggested the public sector, through its large volume of purchases, has the ability to drive an increased demand for safer alternatives. They said consumer preferences could be influenced by providing accurate, reliable information to consumers using a variety of means, including product certification and labels. (In addition to the market attributes of certification options, stakeholders submitted many options relating to recognition, awards, and certification. These are summarized in Chapter 8.) Participants also noted that product certification and labeling could also motivate manufacturers to modify their products in order to meet certification criteria.

A number of comments suggested that government could engage industry as a partner in green chemistry. For many different reasons, an increasing number of businesses are adopting corporate responsibility and product stewardship. Commenters suggested that this trend is an opportunity for green chemistry. Finally, several participants indicated awards and

recognition programs could provide indirect incentives that often translate into economic benefits, through increased sales.

BACKGROUND

Although not an exhaustive list, State agencies administer several programs that involve economic tools, such as incentives. These include:

- Environmentally Preferable Purchasing: This program identifies greener products that state agencies and departments can purchase; it encourages other businesses to buy environmentally preferable products. DTSC, OEHHA, CIWMB, SCSA, and the Environmentally Preferable Purchasing Task Force work together in guiding this program.
- Take It Back Partnership: DTSC, in collaboration with CIWMB, has established partnerships with retailers who take back universal wastes from consumers at their retail stores.
- Extended Producer Responsibility: CIMWB leads efforts to shift responsibility for end-of-life management of products from consumers to producers.
- Green Vehicles and Fleets: SCSA administers a statewide program for fuel-efficient and alternative fuel vehicles for state vehicle and fleet operations.
- Green Paints and Cleaning Products: OEHHA works Green Seal and other stakeholders in the development of national standards for green paints and cleaning products.
- State Pension Fund Investments: SCSA, along with CalPERS and CalSTRS, works to invest state pension funds in environmental technology and sustainability companies.
- State Buildings and Public Schools: SCSA, DPH, and CIWMB work on ways to improve the sustainability of new and existing state facilities. They are developing standard methods and certification practices for public buildings. In conjunction with the Collaborative for High Performance Schools, state agencies are developing and using incentives for greener school facilities.
- Financial Assistance (Loans and Grants): Many state agencies and departments (including CIWMB, SWRCB, DPR, DTSC, DPH, and ARB) manage various financial assistance programs that help reduce air and water pollution, solid waste, and energy usage. Several of these programs provide incentives for cleaner equipment, vehicles, wastewater and drinking water treatment technologies, runoff control, and recycling and reuse.

DISCUSSION OF OPTIONS

OPTION EI-1:	***Establish incentives and disincentives to encourage or discourage specific actions.***

In concept, monetary incentives provide an inducement for businesses and consumers to select an intended alternative or course of action that may not be the most economically sensible choice. Direct economic incentives are designed to tip the scales in favor of more environmentally preferable choices by easing the cost burden or reducing the perceived economic risk associated with these choices.

Many stakeholders suggested a range of economic incentives, including low-interest loans, grants, tax credits, capital investments, subsidies, and venture capital. California's experience with economic incentives that have been effectively used in the past to influence manufacturers or consumers to make more environmentally desirable choices, stakeholders told us, includes product-specific usage fees, recyclable container deposits, and rebates for energy efficient products. They pointed out state financial assistance programs for innovative technologies in specific sectors, such as lower-emission equipment and vehicles, pollution prevention, water and wastewater treatment or recycling, power generation, etc. CIWMB, for example, offers loans to businesses that use post-consumer or secondary waste materials to manufacture new products or that reduce waste from manufacturing. Several commenters also noted that federal agencies sponsor—through grants and contracts—research and development in environmental, energy, science, chemistry, and related sectors.

Stakeholders proposed several specific options as economic incentives:

- **Loans and grants.** Many participants suggested grants or low-interest loans to encourage business investment in a safer alternative process without the need to increase product price. Options for state-issued financial assistance also included grants to third-party entities, such as educational institutions, to research, investigate, design and develop safer alternatives, as well as to demonstrate and implement these. Stakeholders indicated these research and development grants would accelerate technology implementation, yield new knowledge that would benefit all businesses, especially smaller and medium-sized ones, and, in some cases, overcome industry's reluctance to adopt new processes in the face of uncertainty. Another option suggested research grants to fund studies to develop chemical toxicity data.

- **Tax incentives**. In many instances, safer alternatives are not well known or have yet to be developed. Larger companies with the technical expertise to develop such alternatives may have little incentive to do so if the high cost of research results in a short-term competitive disadvantage. To counteract this, a number of comments proposed tax incentives for private sector investment in new research, new processes, new technologies, and new products and formulations. Some stakeholders indicated that tax incentives could also be offered to businesses that have replaced hazardous chemicals and processes with safer alternatives.

- **Reporting incentives**. The effectiveness of any chemical management policy is closely connected to type and amount of information collected. Commenters pointed out that companies have little incentive to provide or share such information, especially if it is to

be made publicly available. Compiling and submitting this information can be time-consuming and costly. And, it may be perceived as revealing information that can compromise a competitive advantage. Some participants thought a monetary incentive may help offset reporting costs and promote sharing of data and best practices information.

- **Product rebates**. A commenter suggested rebates to persuade consumers to select a greener option by reducing the cost of that option relative to other choices.

In addition to economic incentives, some comments suggested disincentives, such as eliminating subsidies or direct monetary penalties assessed for undesired activities. Some participants indicated that disincentives can effectively steer businesses and individuals toward environmentally preferable choices by increasing the costs associated with less optimal choices, making these less economically attractive. Some stakeholders suggested that positive and negative incentives work best in tandem.

Some of the economic disincentive options which participants submitted include:

- **Usage fees**. Some commenters suggested usage fees as one way to reflect all costs, including external costs, in a product's price. Some participants thought these fees could capture costs resulting from the impacts of the use of hazardous substances in a product throughout its life cycle. Some participants suggested that in addition to generating revenue that could support relevant government programs, a usage fee would make a product less appealing to consumers, thus reducing market demand. A number of comments suggested a sliding scale for fees, where the amount of the fee is based on the amount of hazardous chemical present, or degree of hazard associated with the chemical. In this way, commenters said, a usage fee could serve both as disincentives and incentives. According to the commenters, largest fees might be assessed on products that pose the greatest degree of concern. At the opposite end of the scale, products containing green chemicals (representing lesser or no hazard) could qualify for payments or subsidies.

- **Deposit and refund schemes.** In several comments, some participants favored a deposit and refund scheme, which represents a disincentive when a fee is charged at the time of purchase and an incentive when the fee is refunded upon returning the containers for recycling. Stakeholders referenced the California Redemption Value (CRV) scheme for recyclable beverage containers as a possible model for this option.

- **Taxes**. Some commenters suggested considering taxes known as "sin taxes," which are imposed on undesirable products or activities, such as cigarettes and alcohol. Stakeholders stated that taxes could be assessed on products that are not defined as "green" or for using virgin materials. Another option, a few stakeholders said, would be imposing a tax on toxic chemicals used in chemical products or intermediates in California. Several participants said another approach would be to impose an excise tax on chemical sales to provide a large fund that could be used to upgrade manufacturing processes and equipment.

- **Fines**. A few participants suggested imposing monetary penalties for violating regulatory requirements. They pointed out that jewelry products that exceed allowable lead

concentrations are subject to fines under current law.[15/] (Other regulatory and statutory options are summarized in Chapter 3.)

OPTION EI-2:	***Use market drivers to accelerate the demand for safer products in the marketplace.***

Many stakeholders suggested options to increase demand for greener products, reduce uncertainty about those products, and make them more affordable. One commenter proposed devising a method to provide exclusivity within the marketplace for a reformulated product for a given time period. Other participants suggested options for promoting greener products and processes.

Several commenters said government could use its procurement process to increase demand for greener products and make them more affordable for the market as a whole. They pointed out that the State is a major consumer in California. And, they noted that the state procurement process includes preferences for disabled veteran business enterprises and for certain products, such as recycled paper products. Some commenters suggested expanding the State's procurement preferences to add criteria for green products. Several participants said that government purchasing could be based on a product's life cycle. One suggested option included a public-private partnership to develop a "green product" purchasing standard that can be applied statewide. Another option is a "green chemistry scorecard" that the government publicizes to recognize innovative vendors. Other participants pointed out that government procurement decisions are often viewed as endorsements of the quality and desirability of products. They said government purchases of reformulated or safer products could encourage other public agencies and private entities to buy greener goods and products.

Some participants suggested that government could pay a premium for promising greener products. One commenter gave an example—glass beads used for roadway markings. The imported product now used contains lead and arsenic but the domestically produced glass beads typically do not. The commenter stated that a state purchasing preference for green products would likely result in procurement of beads that do not contain heavy metals.

Some stakeholders recommended that government engage consumers as allies in moving green chemistry forward by providing them with ready access to information. They stated a well-informed public would recognize the need to select and buy greener products. Several comments suggested easily understandable, well-publicized information about chemicals, their toxicity, environmental fate, and other relevant properties, as well as safer substitutes for common household products, could be disseminated through a variety of means. Additional options for public education are further discussed in Chapter 5, Education and Outreach.

Participants also thought labeling and certification programs that identify "green" products through an easily recognizable logo can supply consumers with the information they need for purchasing decisions. Additionally, stakeholders suggested these product labels have the added benefit of motivating manufacturers to produce products that meet certification criteria. Many commenters pointed out that a number of green certification programs are currently in use, but no single green standard has yet been established. Chapter 8, Recognition, Awards, and Certification, includes more discussion about certification options presented during the Conversation with California.

OPTION EI-3:	***Encourage corporate responsibility and accountability by helping businesses make informed, green choices.***

Participants talked extensively about their perspectives regarding the role of manufacturers and companies in green chemistry. "Corporate responsibility" (also referred to as "corporate social responsibility") is a concept whereby companies integrate environmental and social concerns in the business operations and in their interaction with stakeholders on a voluntary basis.[16/] Stakeholders noted that the concept frequently overlaps with similar approaches such as corporate sustainability, corporate sustainable development, and corporate citizenship.[17/] Fundamentally, commenters said during the dialogue, corporate responsibility presumes that businesses can be expected to consider the social and environmental impacts of their business activities, and take measures to mitigate or prevent potential harm. Several stakeholders said many corporations have adopted corporate responsibility as an operating principle. In terms of environmental responsibility, in particular, corporations seek ways to go "beyond compliance" (that is, beyond what is required by statute or regulation) and take more proactive steps in minimizing their ecological footprint.

A number of commenters suggested government could engage businesses as partners in green chemistry, and where possible, assist and build upon their efforts to be more environmentally responsible citizens. Some stakeholders recommended developing jointly codes of practice governing the design, manufacture, distribution, use, disposal, or recycling of products through these partnerships. Several participants added that partnerships could also promote related concepts, such as product stewardship. They described "product stewardship," which involves all entities associated with a product—the manufacturer, retailers, users, and disposers—sharing responsibility for reducing the environmental impacts of the product. The "Take It Back Partnership" is a current example of a partnership between DTSC and retailers, wherein the retailers agree to take back universal waste (e.g., batteries, lamps, and electronic devices) from consumers at retail stores. Some participants indicated that responsible business entities could adopt systems to manage their products at the end of their useful lives. If the costs associated with end-of-life management are high, they said, a company would be motivated to design a more benign product with lower end-of-life costs and impacts.

To help businesses to take a more active role in applying green chemistry principles, some commenters recommended clarifying and communicating the definitions of green chemistry and associated criteria. In addition, participants suggested government could support greener products and practices by re-evaluating existing requirements and specifications to add a priority for greener approaches. One participant gave an example where outdated military specifications hamper switching from an old process to cyanide-free electroplating solutions.

Some stakeholders suggested governmental entities could allow regulatory tradeoffs to industries that employ green practices. Some participants pointed out that tradeoffs, in an ideal situation, would occur naturally since an industry that reduces its use of toxic substances would likely have fewer reporting and permitting requirements if emissions or discharges are reduced. Stakeholders suggested public-private partnerships to develop and enhance such opportunities would benefit everyone.

OPTION EI-4: Institute awards and recognition that provides a market advantage to their recipients.

Many participants stated awards and recognition could play an important role in stimulating green chemistry and green engineering. They said government-sponsored programs could encourage product and process designers, manufacturers, and researchers to find new environmentally friendly solutions. Stakeholders noted that a number of programs already exist to do this. The examples they gave include: the DTSC Chemical Industry Challenge partnership, the USEPA Presidential Green Chemistry Challenge Awards, and various eco-labeling schemes, such as Green Seal, EnergyStar, the Germany "Blue Angel" program, and Leadership in Energy and Environmental Design (better known as "LEED") certification for green buildings. Some stakeholders indicated monetary awards could help stimulate innovation, particularly to encourage research and development of innovative products and process. Other commenters suggested even recognition could be a strong motivator, driving business decisions, and providing assurance to consumers wanting to make green buying decisions. See Chapter 8, Recognition, Awards, and Certification, which summarizes these options.

OPTION EI-5: Develop funding sources for green chemistry activities.

A number of stakeholders included suggestions for funding green chemistry activities, both for state government and within industry. As mentioned earlier, in some of the fee and tax options suggested, participants thought the collected funds could be used in a variety of ways:

- Fund government programs, such as technical assistance, public outreach and education, or data collection;
- Offset subsidies or other positive financial incentives;
- Provide technical assistance or capital funding to industry for projects such as retrofitting equipment or processes; and
- Address long-term environmental impacts.

Stakeholders also suggested ensuring adequate funding or increasing funding in general. Some commenters referenced specific programs to facilitate green chemistry, research, technical assistance, and data. Chapter 3, Statutory/Regulatory Requirements and Enforcement, also discusses some options suggested for funding approaches.

CHAPTER TEAM

The following Green Chemistry team staff members served as principal editors for this chapter, Economic Incentives:

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The team compiled each of the comments relating to economic and market-related options. They organized the comments which stakeholders made during the Conversation with California. The chapter team worked closely with the overall team, whose members are given in the Acknowledgements. The references for each of the five major options summarized in this chapter are presented in the next section of this report.

REFERENCES

The tables below cross-reference each option to Appendix B. The figures shown in the first column represent the "challenge area" and the option number.

Option EI-1: Establish direct incentives and disincentives to encourage or discourage specific actions.	
1-3	Foster participation in development of innovative alternatives through incentives for stakeholders. Do not regulate.
1-11	Mandate a surcharge on chemicals and products to support a fund which would address long-term environmental impacts.
1-22	Foster on-going and continual progress rather than one-time improvements.
1-45	Change policy to change materials flow (i.e. eliminate special tax treatment for extraction of virgin materials and subsidies for agriculture).
1-46	Tax the use of virgin materials.
1-47	Regulate mining, oil, gas, and nonhazardous solid wastes under RCRA. Eliminate special tax treatment for extraction of virgin materials and subsidies.
1-48	Establish depletion quotas on extraction and import of virgin materials. Tax the production of virgin materials.
1-50	Mandate consumer separation of materials for recycling. Establish weight or volume-based fees.
1-51	Tax hard to dispose products. Establish deposit fund for packaging hazardous products.
1-52	Establish a fee rebate based on energy efficiency.
1-56	Change how we use taxes and charges; make the individual actor pay for the full cost. For example, pro-rate charges based on emissions, pounds of waste disposed, etc. to encourage reuse and recycling. Include everyone, from household wastes all the way up to the big chemical companies and corporations. "Pay by the bag" approach.
1-68	Introduce government subsidies as temporary measures, being phased-out when wider policy goals are achieved.
1-69	Consider the importance of timing for incentives. A recession is a bad time to introduce a new tax.
1-70	Consider a "feebate" scheme to reward or penalize consumers of specified chemicals.
1-71	Link fiscal instruments (tax changes) and regulations (emissions standards); these work best in parallel.
1-72	Tax exemptions seem to have a psychological effect on taxpayers that is out of proportion to the benefits received.
1-109	Lower the barrier to obtaining access to data and create incentives for the production of data, rather than maintaining the current framework, which actually provides incentives to avoid producing data.

Option EI-1: Establish direct incentives and disincentives to encourage or discourage specific actions.	
1-142	Ensure that a solution is economically viable in the long run. Unending subsidies and credits are not appropriate and can disrupt markets. However, these tools can be very powerful to initiate, develop and commercialize new technologies and products. Rewarding early adopters should be the objective. These risk sharing mechanisms between the private and public sectors should have a finite limit.
1-143	Remember that not all incentives require revenue or an exchange of money. Expedited permitting or regulatory relief can be very important to companies and cost governments little to implement and can even streamline the government processes in some cases.
2-16	Remove known chemical hazards from the market immediately via Proposition 65, Silent Spring/Harvard study, tax incentives etc.
2-17	Establish regulatory framework that drives green chemistry through prohibitions, cost structures, etc. (i.e. disincentives for using practices that are not in agreement with green chemistry principles).
2-18	Provide government incentives for the implementation of sustainable technologies.
2-31	Establish fees for businesses that use toxic chemicals. Such fees should be used to fund agency toxics use reduction activities, including data analysis, and the provision of technical assistance.
2-39	Pursue legislation for a Cleantech Advantage Act. Create a tax credit for cleantech research.
2-50	Increase grants to accelerate commercialization.
2-51	Add criteria to State Revolving Fund allocations to encourage use of green technologies.
2-52	Provide matching fund offsets to water providers who choose new green technologies.
2-54	Consider tax credits for developers and users developers of green technologies.
2-58	Support research and development through various initiatives (e.g., university-based center, government funding, cooperative state research, etc.).
2-80	Offer research and development tax credits as an incentive for industry.
2-81	Offer tax credits for green chemistry capital investments as an incentive for industry.
2-82	Offer low interest loans as an incentive for industry.
2-83	Offer a grants program as an incentive for green chemistry.
2-98	Recognize the value and role of industry stewardship programs (e.g., American Chemistry Council's Responsible Care, which includes evaluations of chemical products and their uses to assure that they deliver their intended benefits while protecting public health and the environment, and a management system certified by third-party auditors) and create incentives for others to take similar steps.
2-105	Provide more research and demonstration (R&D) for private/government, including R&D prior to using chemicals in products.
2-112	Offer incentives or awards for good ideas on products or project; establish a "green inventor" or "imagineer" award.
2-113	Provide venture capital to business or manufacturers that design green chemistry products or processes.
2-120	Provide funding for re-tooling manufacturing.
2-130	Consider tax incentives, phase tax/penalty approach.

Option EI-1: Establish direct incentives and disincentives to encourage or discourage specific actions.	
2-133	Invest in green chemistry research and development, develop leading university centers; invest in EDC (endocrine disrupting chemicals) research, encourage collaborative work between green chemists and EDC researchers to foster strategies for avoiding EDCs in new products; promote public education into the dangers of EDCs and the need for alternatives.
2-153	Provide incentives or public funding for research and development of alternatives.
2-165	Conduct a feasibility review for the following economic and tax incentive ideas, investment tax credits, public private partnership grants, low interest revolving fund loan, personal property tax exemption for laboratory equipment, preferred tax treatment for equity fund investment in California's Green Chemistry movement.
2-166	Host a Green Chemistry Symposium IV dedicated entirely to technology transfer, start-up funds, equity funding, and possible pension fund (CalPERS) investment in California companies with homegrown technology that solve California environmental problems.
2-167	Re-establish funding for technology development staff to review and validate the green chemistry/green engineering performance claims made by companies seeking economic incentives in the form of grants, low interest revolving loans, and preferred equity funding—without the certification component. Look at USEPA Design for the Environment program.
2-191	Make capital available to companies on preferential terms to encourage Green Chemistry and Green Engineering manufacturing process development.
2-210	Place fees on products and processes for which there is inadequate health and safety information.
2-217	Create economic penalties as part of a regulatory program for companies using toxic chemicals followed by a ban after a period of time.
2-222	Provide grants funded from revenue from fees imposed on companies using toxic chemicals to groups engaged in grassroots outreach and education on green chemistry issues.
2-255	Enact a strong environmental law that produces strict regulations and, at the same time, financial incentives for promoting and facilitating reclamation. Incentives can come in the form of financial awards; tax incentives; favorable terms by state procurement departments; R&D tax credits; tax credits given for green chemistry capital investments; and low interest loans.
2-257	Develop an integrated program that features the following actions: … 7) Introduce a modest toxicity tax on all intermediates and chemical products used or sold within the State of California.
2-258	Include the following policy elements to further Green Chemistry in California: … 5) Greater investment in pollution prevention in the short term as well as extension of the current CA Pollution Prevention model to downstream chemical users.
2-260	. . . Institute incentives that encourage the production and use of products that do not contain toxic chemicals.
2-283	Provide a positive incentive for introduction of best practices.
2-292	. . . Put incentives into place for chemical manufacturers and testing laboratories to develop and validate human-relevant methods.
2-306	Incorporate full cost accounting, including "externalities," in chemical policy decisions.
2-307	Encourage the growth of green chemistry investment and real world enterprises.
3-86	Make capital available to companies at preferential terms, whether via grant or lower interest loans, to encourage Green Chemistry and Green Engineering manufacturing process development.

Option EI-1: Establish direct incentives and disincentives to encourage or discourage specific actions.	
3-122	(a) Prime the pump to initiate early and significant advancements in Green Chemistry and to recognize and reward success. (b) Provide economic incentives for business innovation in green chemistry. (c) Provide economic support and incentives for innovation at California's university system: scholarships, research funds, technology licenses, etc. (d) Focus the above programs on development and commercialization of alternatives for restricted priority chemicals, including for small business application and on innovations that create breakthroughs in performance, value and environmental quality. (e) Establish an annual Green Chemistry recognition program for new chemicals, products and processes and for advances in research, analytical and toxicological methods that best exemplify the objectives of Green Chemistry.
3-135	Close the "technology gap" through market-based incentives to support green chemistry. This could include funding for university research grants, scholarships, and similar programs, as well as awards for innovation, tax credits, low-interest loans, and other incentives. These positive incentives should be open to all companies that are innovators and sell products in California – not simply be limited to companies located in California.
3-3	Evaluate things that have worked in the past to reduce toxics in products and the environment, including gaps and opportunities; consider legislating toxic reduction efforts, such as: (a) Legislation has helped on numerous toxic reduction efforts. (b) Mandatory emissions standards for automobiles in California. This has had a tremendous impact by mandating a shift in demand allowing the auto manufactures to voluntarily comply if they want to participate in the California market. (c) Usage fees (taxes) can help to move a product's sales price closer to the total product life cycle costs (inclusive of decommissioning, disposal, clean up, associated human health care cost, and environmental rectification costs that are now born by tax payers). (d) Bottle tax gives an incentive to be environmental conscious to reduce the toxins in the waste we consumers create. (e) Cigarette tax provides a disincentive for consumption. (f) Rebates for use of preferred product purchases; for example, rebates for hybrid automobile purchases.
3-11	(a) Include human health and environmental considerations, performance, cost, and feasibility in evaluating alternatives materials and processes. (b) Provide positive incentives for green chemistry. Use the Green Chemistry principles (articulated by Anastas) in evaluating alternatives.
4-8	Provide funding for adequate research on toxins using modern methods.
4-31	Scrutinize who is liable for a toxic product in the chain from manufacturing to sale and ensure there are consequences for the responsible party.
4-36	Encourage media publicity and engagement on toxics in products.
4-46	Strengthen relevant liability law to provide greater incentive for consumer protection from toxics in products.
4-56	Develop a process for rapid removal of products found to be toxic by new studies that is fair to industry—State subsidized transformations.
4-60	Establish green chemistry scholarships and international exchange programs for students and/or scientists (sponsored by California government and/or industry).

Option EI-1: Establish direct incentives and disincentives to encourage or discourage specific actions.	
4-86	Impose fees on companies that either directly use toxics in their products and processes or use inputs or processes that result in toxics in products. Apply these fees over a specified period of time; at the end of that time take action to phase-out or restrict particular chemicals/processes.
4-98	Consider a wide range of incentives to motivate changes in the behavior of industry and/or consumers: production tax credits; rebates to consumers or business; investment tax credits; R&D tax credits; R&D grants; equipment grants; loans or loan guarantees; public infrastructure development; government support to deploy environmentally preferred products or technologies; public/private partnerships; employee training and workforce development; CEQA exemption on qualified projects or other regulatory relief and special status once qualified (fast track permits; environmental leaders programs) or other expedited permitting programs; government preferred purchasing or government sponsored preferences; government specified product standards; use of consensus standards; use of third party standards and certification; product labeling programs; web-based consumer information.
4-99	Construct incentives that: (a) Foster innovation in the private sector and academia. (b) Create markets. (c) Facilitate increasing demand for the desired products and solutions. (d) Periodically are reviewed to assess the ongoing need of the incentives change. (e) Are as comprehensive and equitable as possible. (f) Provide transparent and user friendly information to consumers.

OPTION EI-2: Use market drivers to accelerate the demand for safer products in the marketplace.	
1-4	Develop and establish mandatory criteria that must be addressed for all substances used in commerce. Take into account toxicity, effectiveness, volume used/reduction in use, long- and short-term health and environmental impacts (life cycle).
1-23	Advertise green businesses.
1-37	Develop an information clearinghouse on DTSC's website. This information would include hazard and use data as well as information about safe alternatives.
1-58	Recognize that a dominant position in markets for an advanced technology can lock in control of a long stream of follow-on product and process innovations, making market entry much harder for technology "followers."
1-59	Note that it might actually be to the economic advantage of manufacturers to be second rather than first – to absorb the spillovers from investments made initially by competitors (foreign or domestic) and thus start production further along the technological learning curve.
1-61	Note that the government is a significant consumer of technology in its own right as it goes about providing for our common needs. In areas ranging from national defense to infrastructure, like any other large customer, the government must open our wallet to get the technology it needs. Very often that means sponsoring research and procurement that launch new industrial capabilities.
1-131	Provide consumers with accurate information upon which they can make informed decisions can be a very useful tool in driving changes. There are many programs that are predicated on consumer choice. Cars are labeled with expected fuel efficiency ratings. Major home appliances have energy labels, which can be used for comparisons. Plumbing fixtures show the water use. The clear intent is that consumers will use these labels to make more informed purchasing decisions.
1-132	Polls have shown that consumers want to have the information they desire readily available to them so that they are able to make informed decisions about the products they purchase. This must be a shared responsibility of the value chain.
1-135	Use Environmentally Preferred Purchasing (EPP) as an effective approach to drive change by assigning an advantage in the purchasing process for products and services that meet a pre-determined set of "green" or "sustainable" attributes. Using this approach, brand owners, retailers and government regulations set the marketplace expectations and develop market demand for new technologies. It is up to manufacturers, and their suppliers, to deliver products and services that meet the market demand, or risk being left behind.
1-136	Develop and market materials to meet rising consumer demand for "green" or sustainable products.
1-138	Apply science-based EPP definitions so that measurable environmental improvements can be delivered.
1-139	Use government preferred purchasing or government-sponsored preferences.
1-141	Avoid unintended consequences from "signals" sent to markets. For example, specifying increased recycle content will significantly raise barriers to entry and delay introduction of new, innovative materials since recycling infrastructure and markets take time to develop. A flexible, performance based approach avoids the government picking technological winners and losers, but it must be done using a holistic, long-term view.
1-183	Avoid picking "winning" or "losing" products. Instead, remove barriers and create objective tools to allow companies to create new products and enable consumers to recognize and choose them.
1-186	Design a green chemistry program which promotes products which are technologically and commercially feasible to produce.

OPTION EI-2: Use market drivers to accelerate the demand for safer products in the marketplace.	
1-231	Note that speed to market of products is most important to companies than any other incentive.
1-239	Level the playing field and strive for consistency across the board.
1-240	Recognize that time-to-market is critical in any new product launch. Delays and uncertainties increase the financial risks and reduce the initiative.
2-19	Lead the way to driving demand for cleaner products through government procurement processes.
2-69	Create a database of "safe" chemical alternatives.
2-70	Ensure that information is transmitted through all consumers in the supply chain.
2-71	Enable the public to drive green chemistry by providing them with information, such as through a database with green information.
2-79	Develop labeling process for identifying and comparing green products and/or green product certification.
2-85	Develop a system for public contracting, such as preference points, that takes lifecycle costs analysis into account.
2-88	Develop a credible and effective third-party labeling system for green products.
2-94	Educate consumers. Provide green information to consumers to change the marketplace and consumer attitudes, enable informed choices, and drive green chemistry. Create a database for the public to get green information.
2-106	Make green products affordable.
2-108	Classify or rank existing chemicals (green, light green, yellow, red).
2-128	Provide a way to ensure exclusivity of a reformulated product in a market without competitors for a given period.
2-138	Include information—on websites—geared towards the general public, particularly related to the purchase and use of certain products, including: lists of manufacturers and products that have received "green" awards to motivate submission of information to state regulators for review; information on the environmental impacts of plastics; greener alternatives to household chemicals; disposal options for universal waste; information on green chemistry; a page called "What can I do to help the environment?" (which also should be posted broadly on government web pages). Increased awareness will enable the general public to put greater pressure on manufacturers and legislatures to make green chemistry and environmental protection a priority.
2-190	Pay a modest premium for a set period of time for new “green materials” that show promise in state procurement.
2-199	Support policies designed to overcome barriers to commercial applications of green chemistry research and development efforts.
2-204	Develop a marketing program to promote companies that are actively engaged in Green Chemistry and Green Engineering, and products that are the result of Green Chemistry and Green Engineering.
2-257	Develop an integrated program that features the following actions: . . . 4) Develop interactive consumer tools and technologies that assist consumers to interpret and use labeling data in their shopping.
2-286	Create a “green chemistry scorecard” for suppliers which would allow specific materials and their applications to be rewarded through favored purchasing policies.

OPTION EI-2: Use market drivers to accelerate the demand for safer products in the marketplace.	
3-5	(a) Create a labeling system that is accessible, and accurate. (b) Enable and streamline disposal of household hazardous waste (curbside pick-up or more local collection centers.), and improve the publicity of and accessibility to this disposal, and ensure safety of the collection sites. (c) Include manufacturers public disclosure of product selection and chemicals used in those products as part of public education and outreach. Define or identify toxic and non-toxic chemicals in specific products, proper use, dangers of inappropriate use, and include information about disposal. Include life-cycle analysis and impacts thereof.
3-10	(a) Prioritize protection of most vulnerable people and resources. For example, get information on exposures of children to harmful substances through toxics in products, and seek changes to reduce or eliminate these toxics. Focus on consumer products with lots of exposure potential. This needs a regulatory action. (b) Look for initial easy fixes by integrating existing programs that have identified actual sources of pollutants. (c) Drive the demand for cleaner products through state procurement practices. (d) Designate the Occupational and Environmental Health at UC Berkeley and UCLA as lead entities within the UC system to address research relevant to green chemistry and chemicals policy in California.
3-33	Work with other state agencies, including DGS, to develop information on green purchasing, and disseminate this information to counties and cities and to private sector businesses for their use.
3-85	Pay a modest premium—for a set period of time for new "green" materials—when the state purchases chemicals for state contracts. The goal of this subsidy would be to help a new material achieve greater economies of scale, but avoid locking in an inefficient permanent subsidy.
3-87	Consider a marketing program (perhaps akin to the "California cows" and dairy advertisements currently on television) whereby the state would promote companies that are actively engaged in green chemistry and green engineering, and products that are the result of green chemistry and green engineering.
3-93	Promote green chemistry. A glass-bead product for highway markings from China may be cheaper, but has significant levels of lead and arsenic in the product. Another glass-bead product that is domestically produced and does not contain dangerous levels of these heavy metals is available.
3-168	Require manufacturers to label consumer products with all the chemicals and materials (including nanotechnology) that these contain. Consumers currently lack the information required to discriminate between products based on their toxicity impacts, so industry has few incentives to develop new green chemistry products. In parallel, develop interactive consumer tools and technologies that assist consumers to interpret and use labeling data in their shopping. The Toxics Release Inventory succeeded because information tools made its data highly accessible.
4-1	Assess chemicals within the context of alternatives. Criteria for "better" or "worse" green products should be clear.
4-21	Require manufacturers and suppliers to certify the safety of the products they sell to retailers.
4-23	Develop a "green" rating system for products with agreed upon criteria.
4-38	Develop a fact sheet on chemicals policy in the U.S. and post it on the Cal/EPA Green Chemistry Initiative website to educate the general public.
4-41	Develop guidance on what citizens of California could do to move toward greener, sustainable living.

OPTION EI-2: Use market drivers to accelerate the demand for safer products in the marketplace.	
4-43	Work with other state agencies, including DGS, to develop information on green purchasing and disseminate this information to other government agencies, including county and city level, as well as private businesses.
4-71	Create a list to be posted on the Internet of "bad actor" chemicals that have been found in products and the associated suppliers/manufacturers.
4-75	Implement the policy that "no data means no market" meaning that chemicals for which safety data are not available are banned from sale or use.
4-113	Avoid programs that require pre-market approval of chemicals or consumer products (i.e., modeled on programs used for pesticides and drugs) because these would be far too expensive.

OPTION EI-3: Encourage corporate responsibility and accountability by helping businesses make informed, green choices.	
1-34	Design with intent of end-of-life: (a) Manufacturer take back (b) Producer responsibility with idea of economic change of design (c) Facilitate COUGE recycling (d) Design to be biodegradable (e) Design to last
1-116	Encourage greater collaboration and partnership across disciplines and institutions to increase overall knowledge. For example, consider the model of how pharmaceutical companies make decisions on which chemicals are too hazardous to pursue.
1-151	Use incentives for Extended Product Responsibility (EPR), which encourage manufacturers to minimize product costs of products, spur reuse, and decrease waste disposal costs.
1-236	Ensure that producers assume responsibility for the safe stewardship of their materials in order to promote environmental sustainability. Producers should be responsible for collection through processing/disposal, financially and operationally, with no cost to local government.
1-237	Shift the responsibility for the end-of-life management of discarded materials from local government to private industry producers, through Extended producer responsibility (EPR). Incorporate the costs of product collection, recycling, and disposal into product price, and thereby encourage product design that has a reduced impact on the environment and human health. The end results are products and product chains that have a reduced impact on the environment and that costs associated with a product's impact are paid by those manufacturing or using the product, rather than general taxpayers.
2-3	Use life-cycle perspective that includes social values.
2-14	Survey a statistically significant sample of California businesses to determine if they have adopted strategies or programs to implement environmental management systems; convene a business/industry stakeholder-advisory panel.
2-41	Implement a "Pollution Prevention (P2): Design for the Environment Program."
2-68	Promote the exchange of information about best management practices, incentives, and barriers among industries and corporations, and between industry and customers. One way to do this is through a mentoring program (e.g., large corporations mentoring small ones or via the American Chemical Council).
2-78	Develop definitions for identifying green chemistry.
2-98	Recognize the value and role of industry stewardship programs (e.g., American Chemistry Council's Responsible Care, which includes evaluations of chemical products and their uses to assure that they deliver their intended benefits while protecting public health and the environment, and a management system certified by third-party auditors) and create incentives for others to take similar steps.
2-156	Promote product stewardship and manufacturer responsibility which will lead to green products and production.
2-197	Support collaborative efforts to encourage public and private partnerships to develop "greener" products and "environmentally responsible" ingredients.

OPTION EI-3:	***Encourage corporate responsibility and accountability by helping businesses make informed, green choices.***
2-213	Make companies that make or sell products in CA containing hazardous chemicals take them back at the end of their life cycle and ensure their proper disposal.
2-251	Integrate the concepts of extended producer responsibility (EPR) and Green Chemistry. Promulgate product stewardship as the manufacturer's responsibility.
2-252	Factor end-of-life into the risk equation. Promulgate total lifecycle cost for industry. Industry should price their products to incorporate the true environmental/societal costs. The concept of an end-of-life label should be introduced.
2-265	Review and identify carefully with stakeholders those barriers that impede investment in, and adoption of, sustainable technologies.
2-308	Extend producer responsibility to placing the burden of end-of-life disposal, including sustainable practices such as recycling.
3-2	(a) Develop criteria for appropriate use of cosmetic pesticides and consider banning inappropriate use. (b) Ban the most toxic cosmetic pesticides via legislation/regulation; possibly create monetary incentives for new home builders to substitute non-toxic chemicals in landscaping or create more sustainable landscaping designs (i.e., drought tolerant landscaping, water conservation, plants indigenous to the region, etc.).
3-9	Work with the military and aerospace industry as well as the plating industry, to evaluate and revise outdated mill specifications to allow for more "environmentally friendly" plating chemistries. Technological advances have generated more environmentally friendly electroplating technologies (e.g., cyanide-free plating solutions). However, a wide-spread switch to more "green" plating practices has been hampered by outdated "milspecs" (i.e., the military specifications for most plating done for military and aerospace applications).
3-27	Utilize any useful information developed by USEPA Design for the Environment program and work with industry and businesses to implement elements. These include: (a) Evaluate the human health and environmental impacts of its processes and products. (b) Identify what information is needed to make human health and environmental decisions (e.g., hazard characteristics data and identification of "safer" alternatives). (c) Consider cross-media impacts and the benefits of substituting chemicals. (d) Reduce the use and release of toxic chemicals through the innovation of cleaner technologies that use safer chemicals. (e) Reduce the use and release of toxic chemicals through the innovation of cleaner technologies that use safer chemicals. (f) Make products that can be more readily reused, refurbished, remanufactured, or recycled. (g) Monitor the environmental impacts and costs associated with each product or process. (h) Recognize that although change can be rapid, in many cases a cycle of evaluation and continuous improvement is needed. Partnerships with UC and CSUS could help implement these objectives. Incentives for applying these as core business practices might also help.
3-37	Generate environmental codes of practices and procedures in the development and design of products that encompass the manufacture, distribution, use, and end-disposal or recycling of the product that all manufacturers, importers, distributors, and users of products must follow. These practices could include bans of specific chemicals from consumer products.
3-40	Work with industry to reduce toxics in products, and where that proves difficult because no safe alternative exists, require product take-back at no cost to the consumer. This shifts the physical and financial responsibility away from local governments and consumers back to the product manufacturer.

OPTION EI-3:	***Encourage corporate responsibility and accountability by helping businesses make informed, green choices.***
3-105	Consider the problem and cost of disposal at the end of the life of the products or processes in which they are used. Impose rules on manufacturers, requiring take back and recycling, but also remember that those processes in themselves are expensive and have their own environmental or health impacts.
3-127	Rather than imposing regulatory burdens, innovation through green chemistry can be promoted with positive incentives and partnerships. Encourage Green Chemistry through the sharing of expertise, financial support for research, information exchange, and public education. Offer incentives for companies to pursue and foster Green Chemistry and Green Engineering.
3-130	Push collaborative efforts to encourage public and private partnerships, with a goal of developing greener products and environmentally responsible ingredients based on life cycle considerations. Avoid mandatory and voluntary state labeling programs that endorse green products or programs that stipulate a single third-party certification of green products or numerical ranking.
3-139	Give incentives to develop products with improved characteristics, e.g. non-PBT or polymeric chemical additives. Similarly, improved stewardship, such as driven by the BFR industry's Voluntary Emission Control Action Program (VECAP) should be encouraged and rewarded.
3-165	Recognize and encourage product stewardship programs, designed to better management throughout the supply chain of the substance and continued minimization of the impact of the substance.
3-183	Conduct a baseline review of physical and intellectual capabilities to support and nurture the green chemistry research and development initiative. Encourage public-private arrangements between universities and private industry, particularly as it relates to green chemistry solutions.
4-3	Establish corporate and manufacturing codes of conduct.
4-4	Develop best practices for supply chain management.
4-33	Require company accountability for out sourcing
4-104	Promote private business sector sponsorship of training/education programs at all levels (including elementary, high school and university). Conflict of interest concerns could be avoided by using an independent third party to manage the funding.

OPTION EI-4: Institute awards and recognition that provides a market advantage to their recipients.	
2-53	Encourage a certification program for green technology similar to USEPA ETV program.
2-56	Disseminate information on accomplishments, best practices, costs and benefits.
2-84	Develop a program to recognize green chemistry achievement, such as awards.
2-96	Create a green business program to educate and encourage companies and recognize companies incorporating green chemistry practices.
2-98	Recognize the value and role of industry stewardship programs (e.g., American Chemistry Council's Responsible Care, which includes evaluations of chemical products and their uses to assure that they deliver their intended benefits while protecting public health and the environment and a management system certified by third-party auditors). Create incentives for others to take similar steps.
2-112	Offer incentives or awards for good ideas on products or project; establish a "green inventor" or "imagineer" award.
2-131	Establish a "green seal," reflecting a specified level of greenness, or certification of approval.
2-134	Use Green Buildings/LEED Certification as a model for green labeling/product certification; include the following as criteria—use of green energy during manufacturing, waste generation, use of recyclable materials, use of non-toxic ingredients.
2-136	Establish recognition and award incentives for green products. These would be a strong motivator because they can lead to greater sales and preferential purchase by environmentally conscious consumers. Recognition with the use of a logo would be most effective; see German Blue Angel award, www.Blauer-Engel.de.
2-137	Develop a grading/award system for products that meet certain green criteria as a joint effort within Cal/EPA. Consider both green energy and green chemistry technologies. A standard, easily recognizable green logo could be used, reflecting different levels of "greenness" (bronze, silver, gold and platinum); this would enable consumers to choose green products and motivate manufacturers to invest research and energy into the development of green products.
2-138	Include information on government website(s) that is geared to the general public, particularly related to the purchase and use of certain products. Include: (a) lists of manufacturers and products that have received "green" awards which would motivate submission of information to regulators for review; (b) information on the environmental impacts of plastics; (c) greener alternatives to household chemicals; (d) disposal options for universal waste; (e) information on green chemistry; and, (f) "What can I do to help the environment?" (which should be posted on other websites). Increased awareness will enable the general public to put greater pressure on manufacturers and legislatures to make green chemistry and environmental protection a priority.
2-139	Use environmental certification in Germany, "The Blue Angel," (www.blauer-engel.de/englisch/navigation/body_blauer_engel.htm) as a model for the certification of products and services.
2-185	Encourage voluntary industry efforts to create better alternatives to high hazard substances, to mitigate risk and to make full use of market-based incentives. Give recognition for early adaptors and/or outstanding achievements in green chemistry. These would then be complemented by regulatory compliance to meet public expectations for safe chemical management.

OPTION EI-4: Institute awards and recognition that provides a market advantage to their recipients.	
2-200	Recognize companies that develop sustainable business operations, processes and/or products.
2-258	Include the following policy elements to further Green Chemistry in California: . . . 1) Strengthen the recognition and pursuit of Green Chemistry processes and products by establishing clear criteria and voluntary certification based on comprehensive lifecycle considerations.
2-272	Establish an awards program to provide financial incentive and recognition for innovations.
3-84	To further stimulate Green Chemistry and Green Engineering, consider the following incentives: (a) awards like USEPA Green Chemistry Challenge (see http://www.epa.gov/greenchemistry/pubs/pgcc/presgcc.html for more information); (b) tax incentives/subsidies/grants/low interest loans for research and development; and (c) marketing exposure for Green Chemistry processes and products.
3-122	(a) Prime the pump to initiate early and significant advancements in Green Chemistry and to recognize and reward success. (b) Provide economic incentives for business innovation in green chemistry. (c) Provide economic support and incentives for innovation at California's university system: scholarships, research funds, technology licenses, etc. (d) Focus the above programs on development and commercialization of alternatives for restricted priority chemicals, including for small business application and on innovations that create breakthroughs in performance, value and environmental quality. (e) Establish an annual Green Chemistry recognition program for new chemicals, products and processes and for advances in research, analytical and toxicological methods that best exemplify the objectives of Green Chemistry.

OPTION EI-5: Develop funding sources for green chemistry activities.	
1-11	Mandate a surcharge on chemicals/products to support fund to address long-term environmental impacts.
1-119	Increase the budget for state agencies responsible for evaluating human and ecological risk, i.e. OEHHA.
1-224	Add resources. Criticisms of TSCA to protect human health and the environment often overlook the real need for resources to properly administer the statute. Without the proper staffing and financial resources, any regulatory program will have limited effectiveness.
1-230	The Green Chemistry report argues that there is a need to close the "technology gap" through market-based incentives to support green chemistry. This could include funding for university research grants, scholarships, and similar programs, as well as awards for innovation, tax credits, low-interest loans, and other incentives. These positive incentives should be open to all companies that are innovators and sell products in California -- not simply be limited to companies located in California.
1-236	Note that it is important for producers to assume responsibility for the safe stewardship of their materials in order to promote environmental sustainability. Producers should be responsible for collection through processing/disposal, financially and operationally, with no cost to local government.
1-237	Shift the responsibility for the end-of-life management of discarded materials from local government to private industry producers through extended producer responsibility (EPR). This will incorporate the costs of product collection, recycling, or disposal into product price, and encouraging product design that has a reduced impact on the environment and human health. The end results are products and product chains that have a reduced impact on the environment and that costs associated with a product's impact are paid by those manufacturing or using the product, rather than general taxpayers.
1-243	Re-establish funding within DTSC Science Pollution Prevention and Technology Development for the technology staff to review and validate the GCI performance claims made by companies.
1-244	Encourage sufficient funding is available to conduct the necessary process steps that lie ahead.
2-31	Establish fees on businesses that use toxic chemicals. Such fees should be used to fund agency toxics use reduction activities, including data analysis, and the provision of technical assistance.
2-51	Add criteria to State revolving fund allocations to encourage use of green technologies.
2-52	Provide matching fund offsets to water providers who choose new green technologies.
2-120	Provide funding for re-tooling manufacturing.
2-122	Consider a bond act to provide funding.
2-135	Enact a "California Toxic Substances Control Act (CAL TSCA)." This would require all new chemicals to be tested for toxicity before they are marketed, as would all existing chemicals sold in the state. DTSC with assistance from OEHHA would evaluate the results. OEHHA should be given more resources to speed up its current evaluation process and to implement CAL TSCA. ARB authority should be expanded to forbid the use of aerosol products where there are greener alternatives, and of certain toxics determined under CAL TSCA as a threat.
2-153	Provide incentives or public funding for R&D on alternatives.
2-191	Make capital available to companies on preferential terms to encourage Green Chemistry and Green Engineering manufacturing process development.
2-206	Push for the investment in improved methods to allow for the detection of early evidence of effects and to allow for better ways to look at the potential for cumulative effects of mixtures.

OPTION EI-5: Develop funding sources for green chemistry activities.	
2-222	Provide grants funded from revenue from fees imposed on companies using toxic chemicals to groups engaged in grassroots outreach and education on green chemistry issues.
2-257	Develop an integrated program that features the following actions: . . . 6) Expand greatly the investment of resources into green chemistry education and research at California State-supported universities, including the UC system.
2-258	Include the following policy elements to further Green Chemistry in California: . . . 5) Greater investment in pollution prevention in the short term as well as extension of the current CA Pollution Prevention model to downstream chemical users.
2-288	Fund development of the ingredient database.
2-290	Fund the replacement of outmoded plant and equipment. Worldwide detoxification of the industry will cost something on the order of $10 trillion, perhaps $500 billion in California alone. There is only one reliable source for such funding: an excise tax on chemical sales to create a Chemical Trust Fund.
2-298	Note that industry should bear the costs associated with their chemical production or use.
3-79	Increase funding for OEHHA to evaluate alternative chemicals to determine whether alternatives pose an unacceptable risk.
4-8	Provide funding for adequate research on toxins using modern methods.

Chapter 3—Statutory and Regulatory Requirements and Enforcement Options

Creating a regulatory framework to reduce adverse health and environmental impacts of chemicals

SYNOPSIS

Approximately 382 options presented during the Conversation with California included ideas for the enactment of laws and the promulgation of regulations to address adverse human health and environmental effects of hazardous chemicals. Many of the regulatory sub-options are inter-related with one another and with other options found in other chapters. These are organized here as twelve options, which stakeholders have suggested. Collectively, options for statutory and regulatory requirements and for compliance and enforcement measures represented roughly 47% of the total number of comments submitted.

Participants suggested enacting laws and adopting regulations that might require:

- Businesses to develop and report chemical information;
- Suppliers and manufacturers to disclose information and label products;
- Producers to certify safety or life cycle attributes of a chemical commodity or consumer good;
- Government to collect data, assess chemicals, and take steps to reduce hazardous chemical use or exposure;
- Producers to extend their responsibilities;
- Government to create economic incentives to drive green chemistry changes;
- Chemical users to reduce or eliminate hazardous chemicals; and,
- Government to expand laws and regulations as well as harmonize those with other states, the federal government, and other countries.

Stakeholders stated that options discussed in this chapter may offer several benefits. The benefits of the suggested laws and rules, commenters said, could include:

- Providing a “level playing field” for all companies doing business in California;
- Clarifying regulatory expectations so the market can respond;
- Build on existing State authority (that may need to be adjusted or expanded) to implement green chemistry policies;
- Serving as regulatory backstop for voluntary measures; and
- Ensuring uniform application of requirements and penalties for failure to comply.

Many of the options discussed in other chapters of this report, particularly *Data Collection and Use*, *Economic Incentives*, *Education and Outreach*, and *Recognition, Awards and Certification*, also include options about the use or control of harmful chemicals. Many of these options may involve enabling law or work in tandem with changes in laws or rules.

BACKGROUND

Most environmental protection programs are based on legal requirements set forth in laws and regulations. Statutes authorize governmental agencies or officials to carry out specified actions, and direct government, individuals, businesses, and other entities to abide by specified directives. Since statutory provisions are often broad, regulatory agencies promulgate regulations to clarify and implement these provisions.

Many stakeholders noted that statutory and regulatory requirements can be effective in changing practices. They pointed out numerous examples, including: fuel efficiency standards resulting in cars with improved gas mileage; pesticide residue testing improving food safety; and seat belts in cars reducing injuries and deaths. Many participants also said that effective enforcement is needed to ensure compliance. Fair and predictable enforcement, they noted, creates a level playing field for businesses, and can reward businesses that are acting responsibly, while penalizing those that violate the law.

A detailed inventory of existing federal, state, and local regulatory systems was not conducted as part of the Conversation with California. For this initiative, participants focused on those existing laws and rules relating to hazardous chemicals and ways of preventing such chemicals from harming people or our environment. Participants discussed strengths and weaknesses of the existing legal framework in their detailed comments and the sub-options included as references here.

DISCUSSION OF OPTIONS

OPTION SR-1: Establish statutory/regulatory requirements for the development and reporting of toxicity and exposure data, safety assessments, and follow-up actions on chemicals, products, and processes.

Many stakeholders recommended establishing a program to identify, assess, and address priority chemicals based on risk or hazard, including toxicity and potential for exposure. As discussed in Chapter 1, collecting data about chemicals is a key theme from the Conversation with California. Participants referred to the lack of information as the "data gap." Several commenters said the federal *Toxic Substances Control Act* (TSCA) contributes to this data gap; they point out that TSCA does not require chemical producers to generate or report toxicity information. Commenters also noted that pesticides, food additives, and pharmaceuticals are regulated under separate federal statutes.

Some stakeholders asserted that TSCA could work but just has not been implemented in the way it was originally intended. However, extensive discussion countered this comment; participants presented numerous comments they said show TSCA could be improved. Stakeholders pointed out that there is actually an incentive to avoid producing data under the current system of chemical regulation. Because of the data gap, the chemical market operates generally on the function, price, and performance of chemicals since the market has little information on their hazardous properties. Participants said the data gap has made it very difficult for governments, businesses, and the public to identify, prioritize, and mitigate chemical hazards, including those found in products. Some stakeholders pointed out the existence of voluntary measures to fill the

data gap, such as the USEPA High Production Volume (HPV) Challenge Program. Other stakeholders noted that voluntary programs have been useful in generating some data, but have not been sufficient to cover the scope of the current data gap.

A number of comments called for establishing legal requirements for businesses to generate and submit toxicity, exposure, production or import volume, and use data for chemicals as one means of closing the "data gap." They said this would restructure the current system that requires government to prove harm before action is taken and, instead, put more responsibility on industry to demonstrate that the chemicals they use and the products they manufacture are safe. This information would also be useful in making the "chemical map of California" (which is summarized in Chapter 1.) Several commenters recommended harmonizing legal requirements for data with other systems—such as the EU REACH program and *CEPA*—with which many businesses must already comply.

Some stakeholders suggested imposing a reporting requirement on chemical manufacturers and chemical importers. In this scheme, they said, the responsible party would be subject to legal penalties for non-compliance and could be prevented from manufacturing, importing, or using a chemical without data (i.e., a "no data, no market" approach). Participants content that requiring businesses to provide toxicity and exposure data proactively would help prevent situations where chemicals have caused harm after having been used extensively. They said liability, cleanup, and litigation costs could be avoided under their suggested approach. Other stakeholders asserted that requiring "pre-market" data submissions for industrial chemicals would be too costly, would be impractical, and would stifle innovation. Additionally, some stakeholders noted the importance of weighing all costs in considering any new regulatory scheme. They included, for example, costs to communities in terms of lost wages from sick leave, health care costs, environmental degradation and the economic impacts that brings, expensive cleanup actions, higher education costs due to higher rates of behavioral and developmental problems in highly exposed populations, etc.

A number of stakeholders noted that data development and subsequent regulatory action (e.g., use restrictions) could be targeted toward high priority chemicals, as determined using a risk-based approach. They recommended taking into account both chemical toxicity and the extent of exposure to that chemical. The risk-based approach was strongly advocated as sound science. Other participants felt strongly that an intrinsic hazard approach could be mandated for identifying and regulating chemicals of concern. Some stakeholders emphasized taking a precautionary approach, which would essentially involve assuming a toxic chemical is "guilty" until proven "innocent." Another group of stakeholders suggested that the state could be required to evaluate the submitted data and carry out appropriate safety assessments.

In evaluating chemicals, products, and processes, many stakeholders emphasized the need for life cycle analyses and risk assessments that take into account the full range of toxicological and environmental effects, chemical interaction and synergistic effects, social factors, environmental justice, chemical/product effectiveness, long and short term economics, and alternatives analysis. Some commenters also suggested requiring the state to take follow-up actions on chemicals meeting specific criteria (e.g., phase-out of highly toxic and persistent chemicals).

From the extensive stakeholder comments, a green chemistry policy—which could be set forth in laws and regulations—could include the following elements:

- **Registration and data submittal requirements**. Chemical manufacturers, importers, and users would be required to:
  - Register chemicals (both existing and new) that they use;
  - Submit information on:
    - overall use and use in specific products and processes,
    - amounts imported and produced in California, and
    - any information (e.g., toxicity, use, volume, exposure potential) that they are required to submit to other jurisdictions (e.g., to the European Union pursuant to EU REACH, to Canadian authorities under CEPA);
  - Develop and submit a baseline set of data for chemicals prior to marketing and use in California (i.e., a "no data, no market" policy may be implemented).

    California would need to evaluate and determine the appropriate set of baseline data that would be required. Stakeholders recommended that traditional toxicology tests be considered along with alternative approaches such as quantitative structure activity relationships ("QSAR) and innovative short term assays that address "upstream" effects (i.e., early indications of toxic concerns). A number of stakeholders also raised the issue of animal welfare. They recommended that animal testing be used only as a last resort. Some commenters further suggested that a data audit system could be established and could evaluate the scientific validity of information gathered from external sources (e.g., industry submissions).

    Data submission requirements for existing chemicals, commenters suggested, could be triggered in a tiered fashion, based on level of concern or on usage, production or import volume, or other indicators of potential exposure. Some stakeholders advocated that California start with the high priority chemicals already identified by Canada. Several participants said the Hotspots Analysis and Reporting Program (HARP),[18/] currently used by many industrial facilities in California to report air emissions, could be adapted for this purpose.

- **Timelines**. Stakeholders suggested that clear and realistic timelines be set for submittal of information. Further, time-to-market was noted as a critical factor that must be considered in imposing regulatory controls. Any government delay increases uncertainty for businesses.

- **Public Access to Data**. A number of stakeholders indicated the need for toxicological and exposure data to be made publicly available. Some stakeholders emphasized that CBI will need to be respected; other stakeholders believed that health and environmental data could not be classified as confidential. Issues related to CBI could be addressed, for example, by requiring up-front justification for, and government review of, any CBI claims, and a requirement that business reassert CBI claims after a predetermined period of time.

- **Safety assessments.**

- **Life cycle assessments**. Many stakeholders indicated the importance of using life cycle analyses to evaluate chemicals, products, and processes. These analyses, they said, could consider the full range of recognized and emerging toxicological and environmental effects, chemical interaction and synergistic effects, social factors, environmental justice, chemical/product effectiveness, long and short term economics, and alternatives analysis. Several participants cautioned that life cycle analyses must be applied carefully, with the

awareness of possible pitfalls (e.g., one life cycle analysis using a regional scale and another using a global scale, so they cannot be compared.)

- **Risk, hazard, or alternatives assessments.** "Risk" versus "hazard" elicited lengthy debate during the Conversation with California. In addition to the "data gap," how chemicals are assessed is another key theme.[19/] Many participants proposed abandoning traditional risk assessment in favor of a new hazard focus. Equally strongly held, many other stakeholders advocated the continued use of risk assessments. Across the spectrum of approaches, some form of systematic assessment would be used to assess chemicals. Risk, hazard, and exposure assessment generally includes:

  - Characterizing exposure potential in the general population and sub-populations (e.g., children, the elderly, and workers);
  - Characterizing hazard potential of chemicals of concern;
  - Considering interactions between chemicals both in terms of toxicity and exposure (e.g., use of products containing multiple chemicals) and cumulative effects; and
  - Determining whether to reduce or eliminate exposures to the chemical based on specific criteria. For example, if the state obtains new information that an existing chemical is highly toxic and persistent, the state could be required to develop a plan to phase out or restrict that chemical.

  Several participants pointed out that alternatives assessment could be more effective. Alternatives assessment includes: identifying a full range of alternatives; considering the potential adverse effects of each alternative; and considering the potential benefits of each alternative. Throughout the comments, stakeholders exchanged numerous ideas and perspectives regarding methodologies to assess chemicals and alternative courses of action. Some stakeholders wanted the state to be responsible for carrying out safety assessments, while others advocated that the responsible parties (e.g., manufacturer of a chemical) do the assessments.

- **Follow-up actions.** Commenters suggested that government develop a list of priority chemicals targeted for use restrictions, reductions or phase-outs. (See option SR-2 below for suggested options on bans). Several stakeholders recommended that California could consider action on the high priority chemicals already identified by Canada. For chemicals of high concern, businesses could be required to develop toxics use reduction plans. A number of stakeholders emphasized the need for careful substitution planning to ensure that safer and greener alternatives (chemical, product, or process) are used in place of chemicals or processes that will be phased out, and that possible unintended consequences of the substitutions be evaluated and addressed. Additionally, stakeholders pointed out that a range of risk management options could be considered that could range from process controls all the way to substitution. Others noted that to call a chemical "safer" could require the same high standards that were applied in identifying a chemical as "toxic" and needing phase out. If a toxic chemical is targeted for phase out and no substitute is available, it was suggested that there be a requirement to develop such a substitute. Additionally, if a safer substitute did exist, its use could be mandated. Stakeholders emphasized that non-chemical alternatives could be considered in choosing substitutes. Stakeholders also recommended that in the absence of data that demonstrates the safety of a chemical, the use of that chemical could be restricted until safety is demonstrated.

- **Stakeholder involvement**. Throughout the comments, numerous commenters recommended that stakeholders be involved early in the process of developing new statutory and regulatory requirements.

- **Progress metrics and continual regulatory improvement**. Stakeholders also raised the issue of how to evaluate the success of regulatory measures on green chemistry and chemicals policy. They suggested that government could review regulatory approaches on an on-going basis and make improvements as needed. Stakeholders urged the state to seek continuous improvement to achieve the "greenest" or "safest" possible results, and to link regulatory standards could be linked to the best, safest available technology or chemical.

OPTION SR-2:	***Establish statutory/regulatory requirements for disclosure, labeling, and certification.***

Many stakeholders stated that significant strides could be made by requiring disclosure of already available information on toxicity, mandating labeling of product contents, and holding responsible parties liable for certifying the accuracy of information and the safety of their chemicals and products. They noted a lack of transparency in the supply chain from manufacturers to users of chemicals and, ultimately, to consumers of products. A regulatory system of disclosure and accountability could enable quick identification of the party responsible for a toxic product or intermediate, and assignment of liability. Stakeholders suggested that suppliers and manufacturers could be required to know and disclose—to all interested parties—the identity of the constituents in their products. Forcing disclosure of ingredients raises the issue of CBI. However, several commenters noted, disclosure of financial information was initially resisted in the past but is now a key factor in the operation of financial markets. They said these examples could be used as a model for evaluating the benefits of information disclosure related to toxic chemicals.

A number of stakeholders pointed out the importance of Material Safety Data Sheets (MSDS), which are widely used as a means to comply with hazard communication requirements under worker safety laws. They emphasized the need to ensure that MSDS documents are accurate, up-to-date, and informative.

One comment suggested making public the name of any manufacturer or supplier that has provided off-specification chemicals or products, which could deter illegal or negligent behavior and tap into the power of peer pressure. This negative publicity could result in lost business for these entities—a market-delivered penalty for unacceptable practices.

Stakeholders suggested that all products, including consumer products, carry mandatory labeling of their contents (ingredients). Mandatory labeling of products could harness the power of the market to force change. Many participants discussed problems and limitations regarding nomenclature. For instance, they gave dozens of examples of inaccurate, confusing, or meaningless “green” claims about products. Several comments recommended regulating the use of “green” labeling **t**o ensure accuracy of claims. Stakeholders also noted that government must consider enforcement issues, in order to deter false claims of “greenness.”

Participants suggested that manufacturers and suppliers could be required to certify the safety of the products they sell, both to retailers and other manufacturers. Another suggestion involved a requirement for chief executive officers of chemical manufacturers or importers to certify personally the veracity of information provided under any regulatory requirements.

OPTION SR-3:	***Adopt regulatory standards for industrial processes, products, and supply chain management and establish authority for monitoring, testing, and enforcement.***

A number of stakeholders advocated that businesses establish and voluntarily follow standards for industrial processes, products, supply chain management—including control of imported raw materials, testing for toxics in products, and rapid response to control and remove toxics in products. Although there are many responsible companies taking such measures, other stakeholders pointed out that regulatory requirements could ensure that standards are being followed, and adherence to these standards is verified by an objective third party.

Credible, rigorous regulatory standards provide certainty to business entities. Many commenters emphasized that these standards could be established for industrial processes and products, both domestic and imported. They said such standards could include manufacturing process controls, quality assurance programs, raw materials, and best practices for supply chain management. In developing these standards, participants recommended working with trade or marketing associations.

Several stakeholders noted many companies and organizations have implemented environmental management systems (e.g., using the International Organization for Standardization's model in its ISO 14001 standard), with third party certification of these systems. Stakeholders also pointed out that risk management measures, identified as part of environmental management, could address many green chemistry concerns. They listed green chemistry elements—such as substituting alternative input materials, making process changes during manufacturing, installing technological controls, and requiring use of personal protective equipment—frequently found in such systems.

Stakeholders pointed out the need for monitoring and testing of products to ascertain compliance with regulatory standards. They recommended expanding state programs to monitor and test food and other products for both contaminants and unsafe constituents. Other commenters suggested a product safety organization to review new products using clear criteria. A number of participants called for centralized laboratory testing where the public could request testing of suspicious products. Increased investment in new testing and monitoring methods was a common comment also. New test methods, which could be used as a basis for proactive enforcement of safety requirements for both manufacturers and retailers and as the basis for product recalls, were suggested. Several stakeholder said such new methods are needed so harmful chemicals in products are detected and recalled in a timely manner.

When violations are discovered, stakeholders pointed out the need to pursue appropriate enforcement actions, including penalties and product recalls. To effectively do this, the State could scrutinize who in the supply chain is liable for a toxic product and have a means for holding that party responsible. They said identifying responsible parties and holding them liable would facilitate the removal of toxics in products. Stakeholders suggested that liability laws be

strengthened to assist enforcement and to encourage greater responsibility for parties at various steps in the supply chain. Commenters also said accountability for out-sourcing could be better defined. A few participants suggested that chief executives could be held personally liable if toxic chemicals manufactured or imported by their companies harm people or the environment.

Others suggested that "safe harbor" or some legal indemnity be offered to companies that test for toxic chemicals in their products and replace them with safer substitutes.

In today's global economy, a number of stakeholders said that the state needs to address toxics in imported products as well as exports of toxics from the state. Government, they stated, could strengthen trade agreements with other nations and improve import/export requirements and testing. Well-defined standards would facilitate a level playing field for companies competing on a global basis.

To facilitate the removal of a chemical in a product discovered to be toxic, a state regulatory program to support industry in making such changes was suggested. This idea could ensure that requirements for chemical removal would be fair and reasonable, without compromising safety. Establishing subsidies or technical consultation by government to industry was suggested also, particularly to smaller manufacturers in situations that call for quick retooling of industrial processes.

New standards could create potential economic impacts for business. However, economic impacts could be weighed against the potential costs of not acting. Participants discussed the possibility that California could become a dumping ground for products prohibited in Europe, if California fails to regulate toxic chemicals in consumer products.

OPTION SR-4:	***Establish statutory/regulatory measures to create economic incentives to drive green chemistry.***

Incentives. As discussed in Chapter 2, economic incentives can play a significant role in advancing green chemistry. A mix of positive and negative incentives could influence trends in the market, consumer preferences, and product innovation. In some cases, however, these incentives cannot be established—or would not be effective—without a statutory or regulatory basis.

Government procurement. A number of stakeholders advocated imposing requirements on State agencies to consider green chemistry in its operations, particularly in procuring services or products. Stakeholders noted that such action by State agencies would reflect California's commitment to take a leadership role in green chemistry and would provide a model for other businesses and consumers to follow. In addition to government procurement, participants suggested that green chemistry requirements govern all aspects of state business, including green building, green manufacturing or production, recycling, composting, and other environmentally sustainable practices. Given the large volume of products purchased by the state, mandating green purchasing by the state could have the added benefit of influencing the market toward safer alternatives.

Fees and taxes. Stakeholders pointed out that the impositions of surcharges, taxes or fees, assessed according to clear criteria, on hazardous chemicals and products, could serve the dual

purpose of discouraging the use of these materials and generating funds for green chemistry programs. Stakeholders also advocated that taxes be assessed on the use of virgin materials and hard to dispose of products. Additional suggestions included volume or weight-based fees for waste disposal, depletion quotas on the extraction and import of virgin materials, elimination of any special tax treatment for the extraction of virgin materials, and modification of agricultural subsidies to foster sustainable practices.

Many stakeholders said positive incentives, such as tax credits for green products and technologies, could encourage movement toward safer alternatives. Rebates for energy efficient, safe, and other environmentally preferable products were also suggested to make these products more economically attractive to buyers.

Third-party certification. A number of comments proposed a state-run or third party (i.e., other than the manufacturer) program to certify green products (and issue a "green seal") based on specific criteria. This idea could include review of current approaches for green product certification. Some of the proposed criteria for green products were energy usage, waste generation, use of recyclable materials, and use of less toxic ingredients. Any certification program—several participants noted—may be hampered by significant data gaps on toxic substances and safer alternatives (as discussed under Option SR-1 above). [More options are summarized in Chapter 8.]

OPTION SR-5:	***Mandate extended producer responsibility and other measures to control the waste stream.***

The environmental and public health costs associated with a chemical or product during its life and at end-of-life are generally not accounted for by manufacturers when they evaluate the economics of a product, participants told us. Certain products are designed to be discarded at the end of their useful life. Stakeholders proposed that producers be required to conduct full life cycle analyses of their products and take responsibility for managing the full life cycle, including end-of-life. Life cycle analyses could incorporate specific standards and be third party certified. For example, a few stakeholders suggested the Green Dot program in Europe as a model for developing this type of program. By mandating extended producer responsibility, including take-back programs, the environmental costs of unsustainable and toxic products would be borne by those responsible for designing and producing them, rather than by society as a whole. Stakeholders cautioned, however, that mandatory take-back programs be structured so costs are passed on to the consumer or borne by local government.

Until extended producer responsibility programs are fully implemented, stakeholders suggested that government address known issues in the waste stream that are causing immediate harm. Regulatory provisions to minimize the adverse health and environmental impacts of the waste stream were suggested; these could, among other things, require product reuse, recyclability, or biodegradability. Some participants asked that separation of materials for recycling and composting be required as part of a program. Several commenters recommended that regulation of waste management at RCRA facilities be tightened. Conversely, one comment suggested more flexible regulations, which could allow waste generators to reclaim waste streams onsite.

Additional regulatory or statutory options included requirements for: lighting waste, electronic waste ("E-waste"), and other products known to contain hazardous substances; mandatory take-back programs for unused pharmaceuticals; ozonation for wastewater disinfection (sewage

treatment); and a grant program to allow upgrades of facilities and regular monitoring of sludge and effluent.

Stakeholders further advocated that the State manage the California waste stream responsibly, and ensure that hazardous waste not be exported to developing countries.

OPTION SR-6:	***Consider a broad range of sustainability, social, economic, and other factors associated with the life cycle of a product, in addition to human and environmental impacts, in chemical management decisions.***

Most environmental regulatory programs decide on a course of action on the basis of an assessment of human or ecological health impacts on the one hand, and a range of non-health-based considerations, including technical feasibility and costs, on the other.

Multi-media factors. Many commenters urged the State to seek solutions that recognize all of society's needs. They recommended approaches that also consider and weigh environmental, social, environmental justice, and economic factors in addition to risk or hazard. In particular, they noted, all relevant aspects of sustainability could be taken into account besides health and environmental effects. These could include: energy costs, greenhouse gas emissions, water use, natural resource consumption, extent of packaging, and recyclability, for example. A number of comments also recommended that these impacts be examined for all stages of the life cycle of the product, including trade-offs. Other suggestions called for risk-benefit analyses that incorporate "externalities." That is, costs associated with potential consequences of chemical use—such as lost wages from illness, health care, environmental degradation and cleanup, and the burden on the educational system due to behavioral and developmental problems—would be incorporated. In some cases, it might be useful to investigate the reason behind the use of certain chemicals; for example, long-established manufacturing processes, purchasing practices, or product specifications might specify the use of certain chemicals. Or, regulatory standards (such as flammability standards for furniture) can drive the use of a particular chemical.

Hazard versus risk. Another aspect of the decision-making process, participants stated, is "hazard" versus "risk." As above, hazard refers to the inherent toxicity of a chemical, while risk involves both toxicity and extent of exposure to the chemical. One view advocated that hazardous substances, if properly managed, do not produce adverse impacts. The opposing view maintained that the current risk-based approach has put people in harm's way and have only benefited chemical suppliers. Where exposures are considered, a number of stakeholders pointed to the need to reduce impacts on the most highly impacted or disproportionately exposed communities, on workplaces (where the highest exposures tend to occur), and on the most sensitive individuals (such as children), natural resources, and ecosystems or species.

Precautionary principle. Several stakeholders endorsed the use of the precautionary principle in order to ensure that the public and the environment are protected when data are incomplete or uncertain. A related suggestion, some commenters noted, would be shifting the burden of proving safety to the product manufacturers. A few comments argued that a product could be assumed unsafe unless the manufacturer can demonstrate otherwise. One comment recommended requiring take-backs, at no cost to the consumer, for those products that cannot be shown as safe, hence shifting the physical and financial burden to the manufacturer.

Sound science. Finally, many of the comments emphasized the need to ensure that decisions are based on sound scientific considerations. One comment recommended that chemical management decisions be carefully documented, conclusions be explicitly qualified, and the type of information assessed, including any uncertainties, be characterized. This could help prevent instances where analyses and conclusions on a specific set of information are applied inappropriately to other, often dissimilar, situations.

OPTION SR-7:	***Eliminate the use of hazardous chemicals by prohibiting their use, replacing them with alternatives found to be preferable, or establishing pre-market approval requirements.***

Many of the comments addressed considerations relating to eliminating or reducing the use of hazardous chemicals. Stakeholders' suggestions ranged from immediate prohibitions (bans) on the use of these chemicals, to phase-outs, and finally to admonitions against banning chemicals in the absence of alternatives that have been adequately evaluated.

Several stakeholders called for immediate action to eliminate known chemical hazards, although there were varying opinions on the degree of evidence needed to trigger action (i.e., how much evidence would be considered adequate), as well as the hazardous characteristics that would warrant action. Chemicals that are toxic, bioaccumulative and persistent were often identified as targets for immediate prohibitions, and specific mention was often made of chemicals that have been classified as carcinogens, mutagens, reproductive toxicants, developmental toxicants, neurotoxicants, or otherwise capable of serious or irreversible harm. Other comments referred more broadly to eliminating chemicals found to be harmful to people or wildlife, chemicals with adequate data demonstrating "serious harm" or "severe hazard," chemicals "suspected of toxicity," or chemicals known to be "unsafe." The State was urged to be protective, such that when impacts are unknown or safety data are inadequate, use of the chemical could be phased-out.

A number of comments proposed banning specific chemicals, groups of chemicals, or products. Various stakeholders recommended bans on: diacetyl, single-use polystyrene containers and other plastic/non-biodegradable polymer materials, incandescent lamps, toilet additives containing formaldehyde for recreational vehicles, commercial cleaning products, the most toxic "cosmetics and pesticides," brominated and chlorinated fire retardants, hazardous substances in electronic devices, and phthalates in children's products.

In contrast to the suggestions for immediate action, some comments recommended that chemicals be prohibited only when an unacceptable level of risk—not offset by the benefits of continued use—has been associated with the chemical and that risk cannot be adequately mitigated. Other comments proposed that if risk levels are judged too high, industry could have an opportunity to introduce appropriate measures to reduce risk within a given time span, or face phase-out of the material. Other viewpoints advocated that bans be avoided in the absence of safer alternatives. They said the State could consider options other than bans and required substitutions—including process changes and technological controls, the use of personal protective equipment, and requirements governing storage, transportation and disposal.

Various options relating to the use of substitutes were frequently discussed in conjunction with many of the options that discussed chemical bans. Several comments proposed a requirement for

substitution planning to ensure movement toward greener and safer alternatives -- that is, that hazardous chemicals be replaced with safer substitutes when the latter are available; when not available, businesses could be required to develop non-toxic and/or cost effective alternatives. One proposal is to prioritize toxic hazards in products for evaluation and mitigation based on use and availability of known safer substitutes (it was noted that commercial cleaning products would be a priority if this was implemented).

While substitution was viewed by many as a solution, some stakeholders warned about the potential for the creation of a different set of issues or unintended adverse consequences unless care was taken to ensure "informed substitution." For example, a series of chemicals have been used as refrigerants: ammonia (which is toxic), which was replaced by chlorofluorocarbons (which are non-toxic, but are ozone depleting), later replaced by hydrochlorofluorocarbons (which do not impact ozone, are nonflammable, have low toxicity, but can contribute to global warming). Several participants noted that since substitution must ultimately reduce risks to health and the environment, decisions could be based on a comparative evaluation of the cross-media life cycle impacts of a given chemical and its potential substitutes. Hence, the stakeholders emphasized that this evaluation consider: raw material sourcing, carbon footprint, performance, efficacy, costs, benefits, and technical feasibility, in addition to human health and environmental impacts. Some stakeholders stressed that data requirements could be the same for both existing chemicals and potential substitutes; thus, substitution with materials for which there are limited data could not be acceptable.

Lastly, several options proposed the adoption of measures involving safety evaluations addressing all phases of a product's life cycle, data submission requirements, and approvals prior to allowing chemicals or products into the market, or as conditions to continued use of these materials. One concept proposed a "no data, no market" policy, in which chemicals for which safety data are not available would be banned from sale or use; opposing viewpoints noted that this policy would be incredibly burdensome, too costly, and unworkable for California.

OPTION SR-8:	***Take immediate actions to prohibit or restrict the use of known hazardous substances.***

Many stakeholders pointed out that those toxic chemical hazards, which are already documented, could be quickly addressed by the state, under clearly set out timelines. Regulatory actions to prohibit or restrict known hazards—for example, highly toxic, bioaccumulative or persistent substances, environmentally damaging products or unsustainable practices that are known to be harmful to human health and/or the environment—could move the market toward safer alternatives. Several stakeholders identified immediate actions as recommended options. Some chemicals are considered to be of such great concern that an immediate phase-out could be considered, either entirely or for specific uses, especially where their use provides no significant overriding social benefit (e.g., lead in children's jewelry).

Options that were suggested for immediate action included:

- Ban or restrict the use of chemicals or chemical classes that are known hazards, or products with these chemical, including:

- very persistent or bioaccumulative chemicals;
- carcinogens, mutagens, and reproductive/ and developmental toxicants, or other very high hazard chemicals;
- certain substances in personal care products that are harmful to humans and ecological systems (the state could consider partnerships with European entities that have been working on this problem);
- brominated and chlorinated flame retardants;
- diacetyl;
- plastic packaging used for commercial purposes containing styrene, bisphenol A, perfluorooctanoic acid, vinyl chloride, nonylphenol or alkylphenol (to reduce the amount of these substances entering the waste stream, storm drains, coastal environment, and oceans);
- hazardous substances in electronic devices;
- phthalates in children's products;
- lead in drinking water pipes and fittings; and,
- formaldehyde in toilet additives.

- Implement bans with clear timelines.
- Require regulatory authorization from the state for continued use of substances of very high concern.
- Prohibit the export of toxic products and waste to developing countries.

Other product-specific actions that participants suggested include:

- Develop criteria for appropriate use of pesticides applied for cosmetic purposes only (e.g., used on crops for appearances) and ban inappropriate uses of pesticides.
- Prohibit the sale of incandescent light bulbs, and mandating toxics reduction in lighting.
- Establish emission limits for composition wood treated with formaldehyde.
- Mandate use of CO_2 systems in place of toxic chemicals.
- Ban non-refillable refrigerant cylinders to service air conditioning systems

OPTION SR-9:	***Reduce or restrict the use of hazardous substances through use reduction measures, standards setting, process or engineering changes, and product stewardship initiatives.***

As an alternative to banning the use of hazardous substances, several commenters recommended reducing the use of these chemicals. They suggested that both reductions and restrictions be guided by a prioritized list of chemicals. Use reductions could occur within specified timeframes. Businesses could be surveyed regarding their manufacturing, processing, or use of chemicals in order to establish a baseline against which progress would be measured. Businesses could also be required to annually report quantities of toxic chemicals used, and biennially

prepare toxics use reduction plans. A number of comments identified marine debris and toxic substances in lighting as specific targets for reduction.

Some of the comments recommended that California create a system based on the successful management of identified risks. Risk management can be accomplished through appropriate use restrictions, or through the adoption of standards. The appropriate State agency could be provided with the regulatory authority to establish restrictions for uses of priority chemicals, along with due process for doing so. To ensure adherence to use restrictions for consumer products, some participants pointed out the need to make consumers aware of the importance of reading and following label instructions for safe product use, storage, and disposal. Use restrictions could also be imposed on a chemical until its safety has been comprehensively demonstrated. In addition, limits could be established on the amounts of hazardous chemicals that can be released over the life of a product. Such limits could be linked to the best, safest available technology or chemical. One suggestion for addressing toxic chemicals present in products by accident involved working with the industries responsible for selected key product areas to promote existing standards or to develop new ones.

Reductions in the use and release of hazardous substances could also be achieved through "green engineering," that is, manufacturing and production process changes and cleaner technologies. Technological controls (e.g., pollution control equipment), requirements for the use of personal protective equipment, the use of enclosed systems, and instituting a range of pollution prevention options could effectively address health and safety concerns in the workplace and the community. Government could consider identifying industry sectors that generate the most toxic products, and identifying green engineering solutions specifically for these sectors.

Many stakeholders encouraged the State to rely on product stewardship and risk management programs that many businesses already have in place. Commenters urged government to expect and encourage manufacturers of products sold in California to employ comprehensive product safety management systems. Such systems could include, among other things: assessments to ensure the safety of products prior to marketing; rigorous control of production (from raw material specifications, to formulation management and process and quality control); safe operations that protect employees and the surrounding community; compliance with all applicable product safety, labeling and regulatory requirements; constant vigilance in post-market surveillance with rapid response to identified concerns; and innovation that improves product performance, value and environmental quality based on life cycle considerations. Companies could be required to post information on their safety assessment process on the Internet. Finally, government can work with scientific experts to examine best practices and develop a toolkit for safety assessment programs, participants noted.

OPTION SR-10: Expand the regulatory authority and funding for state programs.

Cal/EPA and its boards and departments, the Department of Public Health, and other agencies are already actively engaged in the area of green chemistry. Several options proposed by stakeholders suggested that the regulatory authority and funding of existing state agencies be expanded to meet the challenge of advancing green chemistry in California.

Stakeholders advocated that Cal/EPA be given the statutory authority to establish restrictions on uses of priority chemicals. They cited the State Air Resources Board's (ARB) authority to

regulate and adopt requirements for consumer products. In this regulatory program, ARB establishes regulations based on the characteristics of the best available alternatives and technologies. In this example, ARB has set limits on volatile organic compounds (VOCs) in aerosol deodorant and antiperspirant products based on the low or no VOC content of existing roll-on substitutes. That has effectively reduced the use of aerosol products when a roll-on alternative is available. Commenters said this program could be expanded to consider other chemicals, beyond air pollutants.

A few stakeholders advocated that funding for OEHHA be increased. Similarly, a few commenters proposed re-establishing funding for DTSC staff to review and validate the green chemistry and green engineering performance claims made by companies. Participants also touted economic incentives in the form of grants, low interest revolving loans, and preferred equity funding for pollution prevention and process changes.

Stakeholders suggested immediate efforts to expand state capabilities in analytical approaches such as life cycle analyses and quantitative structure activity relationships. Increased funding and more field inspectors for retail products and food was proposed.

If certain requirements were more flexible, several commenters stated, state agencies could act now to address many important issues that were raised in the Conversation with California. Many acknowledged that additional funding would be required to broaden the responsibilities of existing agencies or to support new activities and programs. Potential sources of funding that were suggested included a bond act (modeled after the stem cell research initiative, for example), and fees on businesses that manufacture or sell toxic chemicals.

OPTION SR-11:	***Coordinate and harmonize laws and regulatory requirements with those of the federal government, other states, and other countries.***

Another key theme in the Conversation with California is coordination and harmonization with others. Many stakeholders urged that California draw upon the wisdom and experience gained from existing green chemistry and chemicals policy initiatives at the federal level and internationally. They cautioned not “re-invent the wheel.” Stakeholders noted that a key component of developing any new statutory or regulatory requirements is an understanding of what is already being done. Several stakeholders recommended that the state conduct a comprehensive baseline assessment of existing laws and regulatory requirements at the state and local level relating green chemistry issues. This could involve a critical analysis of both the desirable features and deficiencies of those programs in order to help guide California.

In considering harmonization, varying levels of protections and requirements could be reviewed, with stakeholders suggesting that the most protective standards be considered the benchmark. There was wide agreement, to the extent possible, that the state coordinate and harmonize with other initiatives to avoid duplicative and possibly contradictory regulatory requirements. Comments urged avoiding unnecessary regulations, which may impede green chemistry discoveries.

A number of stakeholders advocated that California consider adopting and implementing the approach taken by Canada under CEPA. Others proposed that California take advantage of efforts under the Montebello Agreement between the U.S., Canada, and Mexico. Stakeholders suggested that the state negotiate data sharing agreements with other countries to take advantage

of the information already being collected. A recommendation to develop partnerships with other states in developing environmental health and safety data was made.

To immediately take advantage of work being done in other countries, it was suggested that the state evaluate whether the agencies that implement EU REACH and CEPA could be identified as authoritative bodies under Proposition 65. In this way, the information generated under those programs could be directly used by California to identify chemicals as known to cause cancer or reproductive/developmental toxicity.

During the Conversation with California, the State forged relationships with experts in other jurisdictions. Collaboration with these other experts was encouraged for the formulation of effective policies and strategies. Stakeholders also emphasized the need for the State to ensure that the process of constructing a regulatory framework for green chemistry would actively involve all stakeholders at all stages.

Finally, within the State, stakeholders observed that it is essential that collaborations occur across programs to ensure the development and implementation of a comprehensive, stream-lined and well-coordinated chemicals policy in California.

OPTION SR-12:	***Establish metrics to assess the effectiveness of chemical management strategies implemented.***

Performance metrics are valuable tools for evaluating the effectiveness of a program. A small number of comments recommended that the State use metrics to assess the performance of its Green Chemistry Initiative, and to measure the impacts of its reforms. According to these comments, the adoption of green chemistry performance indicators would reflect a commitment to transparency and proactive responses to new information, and would provide a signal when changes are needed. Suggested metrics include those that track chemical releases to the environment, human exposures, health impacts, long-term benefits, cost-effectiveness,

CHAPTER TEAM

The following Green Chemistry team staff members served as principal editors for this chapter, Statutory and Regulatory Requirements, Enforcement:

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The team compiled each of the comments relating to laws and regulations as well as compliance and enforcement options for green chemistry. They organized the comments that stakeholders made during the Conversation with California. The chapter team worked closely with the overall team, whose members are given in the Acknowledgements. The references for each of the twelve options summarized in this chapter are presented in the next section of this report.

Chapter 3—Statutory and Regulatory Requirements and Enforcement Options

REFERENCES

The tables below cross-reference each option to Appendix B. The figures shown in the first column represent the "challenge area" and the option number.

OPTION SR-1:	***Establish statutory/regulatory requirements for the development and reporting of toxicity and exposure data, safety assessments, and follow-up actions on chemicals, products, and processes.***
1-4	Develop and establish mandatory criteria that must be addressed for all substances used in commerce. Take into account toxicity, effectiveness, volume used, volume reduce, long and short-term health and environmental impacts (life cycle).
1-5	Develop and establish balancing criteria for all substances used in commerce. Consider short and long-term costs and economics, "alternative analysis," and public acceptance.
1-8	Factor environmental, societal, environmental justice, and economics into decisions.
1-15	Use "precautionary principle" to shift burden to industry.
1-20	Use EU REACH as a model.
1-24	Avoid focusing exclusively on chemicals in products and chemical inputs. Manufacturing and production processes using chemicals should also receive attention in order to address health and safety concerns of workers and to address community concerns for inherent safety of chemical facilities.
1-26	Support development of a chemical risk analysis process, such as that being implemented in Canada.
1-27	Support mandatory reporting and enforcement of chemical use by manufacturers and distributors.
1-30	Rethink the processes for allowing chemicals into the market.
1-36	Establish mandatory requirements needed to fill gaps about chemicals. In addition to CMR data, we need other endpoints: neurotoxicity, long-term toxicity, endocrine disruption, immunotoxicity, etc. Industry should be responsible for developing these data, with government as auditor or verifier.
1-39	Legislate something similar to the State of Massachusetts (S-1268 & H-2275), *The Act for a Healthy Massachusetts: Safer Alternatives to Toxic Chemicals.*
1-40	Change state MSDS document requirements to be similar to the State of Pennsylvania requirements, which are more informative than federal MSDS criteria.
1-78	Adopt laws and regulations that: (a) are science-based; (b) balance potential risks with benefits; (c) factor in existing scientific knowledge as well as reasonable uncertainties; and (d) consider the degree of risk to people and the environment.
1-79	Find a way to successfully manage both toxicity and exposure (i.e., risk) while providing the solutions California needs.
1-109	Lower the barrier to obtaining access to data and create incentives for the production of data, rather than maintaining the current framework which actually provides incentives to avoid producing data.

OPTION SR-1:	***Establish statutory/regulatory requirements for the development and reporting of toxicity and exposure data, safety assessments, and follow-up actions on chemicals, products, and processes.***
1-117	Reduce the differences in the ways that pharmaceuticals and environmental chemicals are regulated. The workshop identified several areas where information and methods developed in the pharmaceutical industry could be useful for environmental chemicals, and these should be addressed.
1-118	Implement the policy that "no data means no market," meaning that chemicals for which safety data are not available are banned from sale or use.
1-148	Recognize that substitution is not the only viable way to control risk.
1-152	Implement a "California Toxic Substances Control Act (CAL TSCA)." Require all new chemicals sold in California be tested for toxicity before they are marketed.
1-178	Develop and adopt green chemistry progress metrics with a commitment to transparency and proactive response to new information on any risk or benefit posed by chemicals.
1-184	Ensure the safety of consumer products by using sound science in the decision-making process.
1-189	Build on existing statutory and regulatory structures, voluntary initiatives, and data development efforts.
1-198	Require appropriate use-restrictions for chemical ingredients when scientific safety-based assessments indicate that they cannot be used safely in a consumer product or use application.
1-202	Put prohibitions in place only when an unacceptable level of risk is identified that cannot be adequately mitigated or that is not offset by the aggregate benefits of continued use. This approach is science-based, and relies on data generated through experimentation or by means of modeling (structure-activity relationships).
1-203	Base any chemical management system on risk.
1-204	Screen all chemicals (new and existing) to determine further information needs in a tiered, risk-based approach.
1-206	Recognize shared responsibilities of each party in the value chain.
1-211	Base decisions of preference and substitution on the comparative life cycle impacts of a chemical and its potential substitute. While a safety-based characterization scheme may focus on toxicity, persistence, and bioaccumulation, there are a number of other parameters, which are relevant to the sustainable use of a particular chemical in a formulation, such as raw material sourcing and carbon footprint. All relevant aspects of sustainability should be taken into consideration for a potential substitution decision. Similarly, any plan to consider substitution of chemicals should require that the efficacy and benefits of that compound be considered as any diminution of efficacy may negatively impact public health and well being through reduced hygiene and sanitation.
1-224	Recognize that criticisms of the TSCA to protect human health and the environment often overlook the real need for resources to properly administer the statute. Without the proper staffing and financial resources, any regulatory program will have limited effectiveness
1-225	Retain the pharmaceutical industry exemption from TSCA. The EU Reach program currently exempts pharmaceuticals, since they recognize that the pharmaceutical industry is heavily regulated by FDA-like government agencies and there may be product quality concerns if there are modifications to the registered formulations.
1-238	Hold substitute chemicals to the same standards as the chemical they are intended to replace.
2-4	Base environmental regulation on thorough scientific data that has clear evidence of harm to human health and environment.

OPTION SR-1:	***Establish statutory/regulatory requirements for the development and reporting of toxicity and exposure data, safety assessments, and follow-up actions on chemicals, products, and processes.***
2-7	Require chemical manufacturers to report information about the long-term health effects of chemicals in use by 2016.
2-12	Require real world information about how chemicals interact with each other.
2-27	Identify priority chemicals for toxics use reduction and create a list as targets for toxics use reduction.
2-29	Require businesses that use large quantities of toxic chemicals to report annually on the quantities of toxic chemicals used and to prepare and biennially update toxics use reduction plans.
2-42	Ensure that chemical producers generate, distribute, and communicate information on chemical toxicity, ecotoxicity, uses, and other key data.
2-43	Strengthen government tools for identifying, prioritizing, and mitigating chemical hazards.
2-45	Protect proprietary technology and intellectual property.
2-62	Require chemical producers, importers, and users to submit and update information on amounts, facility locations, and uses (including in products).
2-76	Fill data gaps and gain a better understanding [about chemicals].
2-89	Ensure that life cycle assessments have a key role.
2-109	Require new chemical registration, including information on fate, transport, and health effects.
2-119	Focus on upstream processes.
2-135	Enact a California Toxic Substances Control Act (CAL TSCA), which would require all new chemicals to be tested for toxicity before they are marketed, as would all existing chemicals sold in the state. DTSC with assistance from OEHHA would evaluate the results. OEHHA should be given more resources to speed up its current evaluation process and to implement CAL TSCA. ARB authority should be expanded to forbid the use of aerosol products where there are greener alternatives and ban certain toxics determined under CAL TSCA as a threat.
2-140	Leverage, not duplicate, the Security and Prosperity Agreement between US-Mexico-Canada.
2-141	Evaluate elements of EU REACH and CEPA; choose those most relevant to California.
2-143	Share data (from Canada's DSL to EU REACH) with other programs; avoid duplication; use equivalent testing systems.
2-144	Require “No data, no market idea.” Require a level playing field for all chemicals, both new and old.
2-146	Note that an available method for providing substitutions, as in EU REACH, will be important.
2-148	Adopt a phased approach for existing and new chemicals, as with CEPA.
2-150	Provide an effective stakeholder process, as Canada did.
2-151	Identify less hazardous chemicals, as Canada did.
2-180	Recognize that pre-market approval of chemicals or consumer products would be an incredibly burdensome and expensive process for the State of California and would unnecessarily slow the development of products.
2-193	Encourage company performed safety-based assessments of consumer products prior to the marketing of a product. Take into consideration the product’s life cycle.

OPTION SR-1:	***Establish statutory/regulatory requirements for the development and reporting of toxicity and exposure data, safety assessments, and follow-up actions on chemicals, products, and processes.***
2-195	Require appropriate use restrictions for chemical ingredients when scientific safety-based assessments indicate that they cannot be used safely in a consumer product or use application.
2-205	Develop requirements to obtain hazardous traits data to support a comprehensive assessment of chemical hazards for chemicals currently in use and those proposed for use.
2-207	Require companies to generate comprehensive safety and health data for all chemicals in their products by 2016. Require information for the following hazardous traits: mutagenicity and genetic toxicity; reproductive effects; developmental toxicity; cancer; immunological effects; neurological affects; organ effects, such as liver, kidney, eye, blood, and heart; respiratory effects; endocrine disruption; other disruptions of signaling and hormone systems; impacts on water and air quality and ecosystem health.
2-215	Require the use of safer substitutes for toxic chemicals when available. Require the development of non-toxic alternatives when safer substitutes are not available.
2-257	Develop an integrated program that features the following: (a) require all existing chemicals undergo a tiered process of scrutiny for their environmental, social, and health/toxicity impacts; (b) require that this information should be passed in a standard form along the supply chain; (c) require manufacturers to label consumer products with all the chemicals and materials (including nanotechnology) that these contain; (d) develop interactive consumer tools and technologies that assist consumers to interpret and use labeling data in their shopping; (e) require industry to conduct green chemistry assessments for chemical products sold or used within California; (f) expand greatly the investment of resources into green chemistry education and research at California State-supported universities, including the UC system (g) adopt a modest toxicity tax on all intermediates and chemical products used or sold within the State of California.
2-260	Place the burden of proof, when deciding if chemicals should be banned or not, on the chemical producing companies to fully disclose the chemicals in their products and to adequately demonstrate that the chemicals and products are safe. California should not fail to act in the face of uncertainty to ban chemicals suspected of toxicity. Chemical companies should be required to fund independent research of the impacts of their products, not just research conducted by their own scientists. The research should address the effects of multiple chemicals—only testing chemicals in isolation will fail to address the real world impacts. Chemicals found to be harmful to people or wildlife should be banned or phased out. Research efforts should also include the monitoring of various species, especially amphibians and upper trophic level predators, to better understand what chemicals are already present in the environment and what their impacts are. Incentives should be instituted that encourage the production and use of products that do not contain toxic chemicals.
2-285	Inform substitution decisions in terms of the characteristics and risks presented by potential alternatives.
2-291	Include measures that insure the development and incorporation of relevant, reliable, and predictive non-animal methods if toxicity testing policies or procedures are developed. These must not be limited to ICCVAM-validated methods.
2-293	Do not attempt pre-market approval of chemicals or consumer products because this would be an incredibly burdensome and unworkable process for California.

OPTION SR-1:	***Establish statutory/regulatory requirements for the development and reporting of toxicity and exposure data, safety assessments, and follow-up actions on chemicals, products, and processes.***
2-295	Base decisions affecting human health and the environment on the intrinsic hazards of a chemical and a new approach to toxicity testing.
2-296	Require that chemical manufacturers prove their products are safe.
2-298	Require that industry bear the costs associated with their chemical production or use.
2-299	Require safer alternatives to hazardous chemicals.
2-304	Create requirements to obtain scientifically defensible, full life cycle analysis data from producers to support complete chemical hazard assessment.
3-1	Develop science-based criteria for determining whether a particular product is greener or safer than alternatives.
3-7	(a) Prioritize chemicals used in commerce in California based on exposure potential and toxicity, and work to reduce exposure to the most hazardous substances. To do this, gather data regarding all chemicals manufactured in or used in commerce in California, including in what products, how and in what volumes they are used. Additional data regarding available toxicity characteristics should also be gathered for each of those chemicals. Identify gaps in toxicity and exposure data. (b) Use this data to prioritize or rank chemicals in terms of hazard as a function of toxicity and exposure. Tools for such ranking are available from other efforts such as Canada's CEPA program and USEPA. Evaluate these for use in California. Focus subsequent efforts on working with industry to find viable, safer alternatives for the highest ranked chemicals (i.e., those that pose the biggest threat in terms of toxicity and exposure). At the same time, engage industry and our university system to fill in important gaps regarding toxicity and exposure data. (c) Tap biomonitoring efforts to help fill exposure gaps. In evaluating and ranking chemicals, considerations should be given to the performance and feasibility of alternatives.
3-11	(a) Include human health and environmental considerations, performance, cost, and feasibility in evaluating alternatives materials and processes. (b) Provide positive incentives for green chemistry. (c) Use the Green Chemistry principles articulated by Anastas in evaluating alternatives.
3-34	Require responsible parties to identify the individual constituents of their products or, if that information was considered to be confidential business information, to provide the appropriate health information on their products. Require responsible parties to report new factual information regarding adverse health effects of their products or of the individual constituents of their products. Require that this information be reported to a centralized, publicly addressable database. Use the adverse effects reporting requirements for pesticides, as set forth in Section 6 (a) (2) of *the Federal Insecticide, Rodenticide, and Fungicide Act*, as a starting point.
3-35	Require chemical manufacturers, importers, and users to provide government with the structure of chemicals in use in California commerce, physicochemical properties, and all available toxicity and hazard data. Use Quantitative Structure Activity Models to evaluate exposure potential and predict toxicity where data are not yet available. Use this information in any prioritization scheme.

OPTION SR-1:	***Establish statutory/regulatory requirements for the development and reporting of toxicity and exposure data, safety assessments, and follow-up actions on chemicals, products, and processes.***
3-38	Use EU REACH program as a model and do the following: (a) Register all chemicals in commerce in California and require a summation of the chemical properties, toxicity and hazard of each in order to be registered for use. (b) Develop a list of chemicals of concern based on usage and toxicity or hazard information. (c) Register products containing these hazardous materials including imported products and publish this information. (d) Require tiered sets of toxicity information according to usage, amounts produced/imported, or other indicators of exposure. (e) Eliminate the use and/or require strict regulation of use of highly persistent or bioaccumulative chemicals, carcinogens, mutagens, reproductive toxins developmental toxins, neurotoxicants, and any other compound capable of causing serious or irreversible harm. (f) Develop models to simulate exposure scenarios for common chemicals in common products to inform decisions on chemical management.
3-39	Evaluate the best practices for chemical management schemes pointed out in the April 2007 report entitled "Not That Innocent: A comparative analysis of Canadian, European, and United States Policies on Industrial Chemicals" by Richard Denison for application to a California Green Chemicals Policy.
3-43	Develop clear criteria for prioritizing chemicals by toxicity, including aquatic toxicity. Evaluate Canada's criteria and those in EU REACH for applicability to California.
3-44	Develop clear criteria for identifying chemicals as persistent or bioaccumulative.
3-46	Evaluate what other states have done and use appropriate elements from those programs, including the Massachusetts Toxics Use Reduction Act, the Oregon Toxics Use and Hazardous Waste Reduction Act, and the Oregon Executive Order to reduce persistent and bioaccumulative toxicants.
3-52	Using data on toxicity and use, prioritize chemicals into low, medium, high, and very high concern categories. Develop clear criteria for manufacturers and users of chemicals prioritized into very high, high, medium, and low concern.
3-54	Use data from the Canadian CEPA program summaries of chemicals in their prioritization program, and any summaries that come from EU REACH program.
3-61	Consider environmental justice in setting green chemistry policy and initiatives for data requirements and analyses. Include consideration of communities bearing a disproportionate exposure to toxic chemicals in their communities and on the job.
3-66	Consider environmental justice in setting green chemistry policy and initiatives for data requirements and analyses. Include consideration of communities bearing a disproportionate exposure to toxic chemicals in their communities and on the job.
3-71	Require safer substitutes where available; use regulatory authority to require safer substitutes, including non-chemical solutions; and seek additional legal authority if necessary to do so.
3-73	Where no evidence exists for the safety of a chemical, restrict its use until safety can be comprehensively demonstrated.
3-78	Enact a California Toxic Substances Control Act, which would require all new chemicals to be tested for toxicity before they are marketed in California, and would established requirements for toxicity testing of existing chemicals.

OPTION SR-1:	***Establish statutory/regulatory requirements for the development and reporting of toxicity and exposure data, safety assessments, and follow-up actions on chemicals, products, and processes.***
3-83	Implement a modern, comprehensive chemicals policy in line with current scientific knowledge on human health, and which requires a full evaluation of the health impacts of both newly developed and existing industrial chemicals now in use.
3-95	Subject materials classified as persistent bioaccumulative toxicants, very persistent or bioaccumulative, carcinogens, mutagens, or reproductive toxicants to an environmental and human health risk assessment conducted by the producer or importer and reviewed by OEHHA.
3-99	In obtaining data to understand chemical risks, retain certain business information as confidential in order to protect intellectual capital. Health and environmental data should not be considered confidential. .
3-103	Focus assessment of chemicals on their intrinsic hazards and move away from reliance on time-consuming risk assessment methods that can be readily manipulated. Integrate the concepts of "cradle to cradle" and alternatives assessment to look for the least hazardous options in all cases. Furthermore, base these on the most sensitive criteria, such as the need to protect vulnerable human populations, endangered species, or water quality.
3-104	In weighing benefits and in analyses, consider the "externalities." These externalities include costs to communities in terms of lost wages from sick leave, health care costs, environmental degradation and the economic impacts that brings, expensive clean up actions, higher education costs due to higher rates of behavioral and developmental problems in highly exposed populations, etc.
3-129	Impose appropriate use restrictions for chemical ingredients when scientific safety-based assessments indicate they cannot be used safely in consumer product or use application..
3-138	Subject materials classified as PBT, vPvB, or CMR category 2 to risk analysis. If risk levels are judged too high, then industry should have the opportunity to introduce appropriate measures to reduce risk within a given time span, or face phase out of the material. Within a phase out strategy, the potential use of alternatives must address any risks associated with such substitution. It should not be acceptable to propose substitution by a material for which there is little data on its characteristics. Fundamentally, lack of data should not be rewarded.
3-152	Address the problem of chemicals being used in our daily lives that have not been tested for neurotoxicity in children. Include restrictions and bans on chemicals that demonstrate a hazard to our health and/or environment.
3-169	Require industry to conduct green chemistry assessments for chemical products sold or used within California. These assessments would consider whether there are green chemistry design options available and use options analysis to justify how products are designed. These assessments can be modeled on the Massachusetts TURA law but be updated greatly to reflect the combination of both products and processes. Companies currently do not generate enough decision-making information within their businesses. Registration of chemicals for marketing could be linked to the use of green chemistry design tools. If these tools have been used, then approval of the chemicals could be expedited.
3-171	Adopt a proactive approach to obtaining data needed to assess hazard traits. The current practice is for the state to consult various lists and data sources to try to track down whatever information is available to assess hazards of chemicals. The information available varies enormously, and little is available for many chemicals. The state needs to have the authority to obtain the information and test results needed to assess and characterize the hazards of chemicals.
3-181	Hold substitute chemicals to the same data requirements as the chemical(s) they are intended to replace.
3-182	Level the playing field in the green chemistry initiative and strive or consistency across-the-board.

OPTION SR-1:	***Establish statutory/regulatory requirements for the development and reporting of toxicity and exposure data, safety assessments, and follow-up actions on chemicals, products, and processes.***
3-184	Recognize, in a command and control regulatory environment, that private industry can only proceed as quickly as regulators can regulate. Time-to-market is critical in any new product launch. Delays and uncertainties increase the financial risks and reduce the initiative. California must ascertain its capability to manage whatever regulatory structure might be envisioned and begin making adjustments accordingly.
4-22	Build toxicological and exposure database on chemicals in use in California.
4-24	Ensure qualified experts develop data and identify toxics.
4-26	Prioritize chemicals of concern based both on risk and exposure.
4-27	Require testing, or submission of equivalent level of information, on materials prior to use.
4-28	Incorporate emerging toxicological issues such as endocrine disruption in the definition of toxic.
4-29	Evaluate the synergistic effects of chemicals in products.
4-44	Require responsible parties to report new factual information regarding adverse health effects of their products or of the individual constituents of their products to a centralized, publicly accessible database. The adverse effects reporting requirements for pesticides as set forth in Section 6 (a) (2) of the *Federal Insecticide, Rodenticide, and Fungicide Act*, could be used as a starting point.
4-45	Require responsible parties to identify the individual constituents of their products or, if that information is considered to be confidential business information, to provide the appropriate health information on their products.
4-49	Require multi-layered assessment of products including human and environmental impact, alternatives analysis, life cycle analysis, and multi-media impact.
4-54	Require EU REACH-like analysis, reporting, and removal of toxics in products.
4-63	Develop legislation that would require new chemicals to be tested for toxicity prior to marketing in California. Toxicity testing would also be required for existing chemicals already being used and marketed in California. The set of required toxicity tests would be developed by a group of scientists with input from California government agencies and the public. California government agencies would evaluate the results of the toxicity testing and decide whether the chemical would be marketed (new chemicals) or whether the chemical would have to be removed from the market (existing chemicals). The criteria for deciding on this "up or down" vote on a chemical would be predetermined by the group of scientists who designed the toxicity test battery, along with input from California government agencies and the public.
4-66	Develop clear criteria for prioritizing chemicals by level of concern based on a range of factors including chemical production volume and uses, exposure criteria such as persistence and bioaccumulation, and toxicological characteristics. Follow through with safety assessment and appropriate action.
4-67	Require the submission of safety data from chemical producers to address both hazard and use knowledge gaps. Start with lists already available to the state (e.g., Proposition 65 list) and set deadlines for data submission. Take action on substances of very high concern, including requiring permission for continued use of such chemicals. Include substitution planning to ensure movement toward safer and greener alternatives.
4-69	Create a map of chemical production and use in California. Show how chemicals flow into the state, who produces them, and how they are used.

OPTION SR-1:	***Establish statutory/regulatory requirements for the development and reporting of toxicity and exposure data, safety assessments, and follow-up actions on chemicals, products, and processes.***
4-75	Implement the policy that "no data means no market" meaning that chemicals for which safety data are not available are banned from sale or use.
4-78	Seek continuous improvement to achieve the "greenest" or "safest" possible results; link standards to the best, safest available technology/chemical.
4-79	Require companies operating in California to submit copies of the data and information that they submit to other jurisdictions, such as Canada pursuant to CEPA and the European Union pursuant to EU REACH.
4-80	Setup a third party (could be a government agency) that could facilitate the sharing of technologies and data among industries while guaranteeing the confidentiality of that information.
4-88	Require data requirements, analyses, and decision-making processes that: (a) Incorporate new science demonstrating the importance of low doses, as well as the significance of background exposures, synergistic effects, and the timing of exposures during the lifecycle; (b) Address the effects of cumulative exposures; (c) Provide comprehensive protection, including protecting the most vulnerable populations, endangered species, and water quality; (d) Consider environmental justice and worker impacts; and (e) Include a full cost accounting including costs to communities.
4-91	Incorporate a precautionary approach in decisions about chemical use to protect the public and environment when data are incomplete or uncertain, and therefore be based on the assumption that chemicals are unsafe unless reasonably demonstrated otherwise.
4-92	Where safer alternatives exist for hazardous chemicals, use of these alternatives should be mandated.
4-96	Carefully research and evaluate the possible unintended consequences of substituting one chemical for another.
4-102	Amend TSCA to correct the deficiencies that impede the timely and effective regulation of toxic chemicals.
4-105	When considering toxics in products, examine the entire environmental sustainability of the products, including health and environmental effects, transportation, use, disposal, efficacy, and potential benefits of use.
4-106	Focus initial regulatory efforts on the 500 high priority substances identified in Canada's program; require producers of these priority chemicals to provide hazard and exposure information. Chemicals of high concern should be allowed for targeted, low-exposure uses as determined in an open process. Include a means for adding and deleting priority chemicals based on unique California circumstances.
4-113	Avoid programs that require pre-market approval of chemicals or consumer products (i.e., modeled on programs used for pesticides and drugs) because these would be far too expensive.
4-134	If a significant risk is identified, consider a wide range of acceptable risk management options, including improving personal protective equipment and enhancing process technology controls to elimination of specific substances in favor of alternatives.

OPTION SR-1:	***Establish statutory/regulatory requirements for the development and reporting of toxicity and exposure data, safety assessments, and follow-up actions on chemicals, products, and processes.***
4-139	In pursuing the objective of the Green Chemistry Initiative to expand toxicology information on chemicals, encourage the use of alternatives to animal testing and require testing only as a last resort. Cal/EPA and the UC university system could work with other experts to provide assistance on alternative screening methodologies that can be utilized to provide adequate toxicology information for recommendations and decisions about priority chemical uses.
4-144	In assessing toxics in products, consider cumulative risks associated with multiple exposures (through using or being in proximity to multiple products).

OPTION SR-2: Establish statutory/regulatory requirements for disclosure, labeling, and certification.	
1-10	Mandate full disclosure of substances contained in products. "Green labeling" should be used with restraint.
1-38	Hold CEOs personally liable for adverse environmental and public health harm from toxic chemicals. They should also be held responsible for the veracity of information provided to the department under any new regulatory requirements.
1-40	Change state MSDS document requirements to be similar to the State of Pennsylvania MSDS requirements which are more informative than federal MSDS criteria.
1-167	The "emerging options" document contains several recommendations aimed at compliance and enforcement issues. In general, it will be difficult to enforce broad concepts of "green chemistry," largely because what constitutes "green chemistry" (or green engineering) will differ depending on the product, process, company, or industry involved. To the extent that regulatory actions are recommended by DTSC, appropriate enforcement measures will likely need to be considered. It is critical that those enforcement measures be capable of uniform application. In addition, California should address what steps might be necessary to deter false claims of "greenness" that mislead consumers and distort the market.
2-5	Require mandatory labeling and product disclosure indicating the presence and hazards of chemicals even if health data is unavailable.
2-6	Emphasize strict labeling of contents.
2-60	Develop and share production/use information (data on amounts, facility locations, and uses of chemicals; MSDS updated to include all data; consumer product contents disclosure, etc.).
2-63	Require updating of MSDS to reflect all available data (HPV, REACH, Canada).
2-64	Require disclosure of chemicals in consumer products, perhaps initially on priority chemicals.
2-70	Ensure that information is transmitted through all consumers in the supply chain.
2-212	Create labeling requirements to inform consumers of the potential health and environmental impacts of the chemicals contained in products.
2-223	Make information about chemicals to which the public and workers may be exposed more accessible, including mandatory labeling, indicating the presence of chemicals that may be hazardous.
3-5	(a) Create a labeling system that is accessible, and accurate. (b) Enable and streamline disposal of household hazardous waste (curbside pick-up or more local collection centers.), and improve the publicity of and accessibility to this disposal, and ensure safety of the collection sites. (c) Include—in education/outreach—manufacturers public disclosure of product selection and chemicals used in those products. Define and identify toxic and non-toxic chemicals in specific products, proper use, dangers of inappropriate use, and include information re; disposal. Include life cycle analysis, and impacts thereof.
3-34	Require responsible parties to identify the individual constituents of their products or, if that information was considered to be confidential business information, to provide the appropriate health information on their products. Require responsible parties to report new factual information regarding adverse health effects of their products or of the individual constituents of their products. Require that this information be reported to a centralized, publicly addressable database. Use the adverse effects reporting requirements for pesticides, as set forth in Section 6 (a) (2) of *the Federal Insecticide, Rodenticide, and Fungicide Act*, as a starting point.

OPTION SR-2: Establish statutory/regulatory requirements for disclosure, labeling, and certification.	
3-37	Generate environmental codes of practices and procedures in the development and design of products that encompass the manufacture, distribution, use, and end-disposal or recycling of the product that all manufacturers, importers, distributors, and users of products must follow. These practices could include bans of specific chemicals from consumer products.
3-69	Create labeling requirements that will inform consumers of potential health and environmental impacts of the chemicals contained in products.
4-5	Require full disclosure from suppliers.
4-7	Help establish a product safety/product liability organization to create a safety checklist and review products according to the checklist.
4-16	Develop mechanisms for improving the flow of information through the manufacturing process.
4-21	Require manufacturers/suppliers to certify the safety of the products they sell to retailers.
4-31	Scrutinize who is liable for a toxic product in the chain from manufacturing to sale and ensure there are consequences for the responsible party.
4-33	Require company accountability for out-sourcing.
4-44	Require responsible parties to report new factual information regarding adverse health effects of their products or of the individual constituents of their products to a centralized, publicly accessible database. The adverse effects reporting requirements for pesticides as set forth in Section 6 (a) (2) of the *Federal Insecticide, Rodenticide, and Fungicide Act*, could be used as a starting point.
4-45	Require responsible parties to identify the individual constituents of their products or, if that information is considered to be confidential business information, to provide the appropriate health information on their products.
4-47	Require a certificate of analysis to ensure purity.
4-48	Communicate information on suppliers providing off-specification chemicals.
4-49	Require multi-layered assessment of products including: human and environmental impact, alternatives analysis, lifecycle analysis, multimedia impact.
4-50	Require manufacturers to know what is going into products they produce.
4-101	In developing and implementing “eco-labeling,” ensure that: the analysis of the product is credible and based on scientific study; products meet agreed upon criteria and the eco-labels are not reliant on unsubstantiated claims by the producer; and an independent third party audits the eco-label.
4-111	Encourage or require manufacturers of products to communicate information about the ingredients in products, either on the package or on the Internet. Partner with the information technology sector (e.g., Internet search firms) to expand access to chemical information, support its local industry and raise awareness of chemical safety information currently available.

OPTION SR-3:	***Adopt regulatory standards for industrial processes, products, and supply chain management; establish authority for monitoring, testing, and enforcement.***
1-7	Develop and use "global approach." Work with other states, countries and multiple organizations to ensure restrictions applicable to products are applicable to imports.
1-14	Establish product safety organization or partnership with University of California to develop checklist and review new products.
1-77	Product stewardship and risk management programs that establish mechanisms to assure exposures remain in the safe region for typical uses and foreseeable misuses.
1-153	Require American Society for Testing and Materials (ASTM) Standards.
1-160	Consider whether there should be industry specific cradle to cradle standards?
1-195	Adhere to the ISO standards, so that no LCA results carried out by companies can be published unless critically reviewed by third party or published in a peer reviewed journal.
1-233	Provide safe harbors similar to medical profession for companies taking initiative in substituting ingredients.
2-20	Invest in new testing methods since many of the current testing methods are out of date or do not exist.
2-21	Provide technical expertise to organizations lacking internal resources.
2-75	Develop testing methods.
2-80	Offer R&D tax credits as an incentive for industry.
2-81	Offer tax credits for green chemistry capital investments as an incentive for industry.
2-120	Provide funding for re-tooling manufacturing.
2-156	Promote product stewardship and manufacturer responsibility, which will lead to greener products and production.
2-194	Require that companies have a chemicals management programs based on sound scientific risk assessment to protect human health and the environment.
2-269	Require that companies manufacturing in or importing chemicals to California have a management system that includes process and product safety elements and be subject to third party certification by representatives of a nationally recognized auditing board. They should affirm to the state that the management systems are in place and that third party certification has occurred.
3-102	In California's Green Chemistry Initiative, risk management efforts can involve a variety of approaches such as: substituting alternative input materials, making process changes during manufacturing, installing technological controls (e.g., pollution control equipment), requiring use of personal protective equipment, instituting a range of pollution prevention options, training, labeling, imposing various storage, transport and disposal requirements.
3-136	Require that the chemical industry or chemical importers take the responsibility to describe the environmental characteristics of their products. The financial burden of testing chemical products appropriately lies with the producer or importer. Such testing should be carried out at independent test facilities, and it may be beneficial to California to encourage the creation of such test centers within the state—either as independent entities or as part of the university system.
4-2	Improve import standards for products manufactured offshore.
4-3	Establish corporate and manufacturing codes of conduct.

OPTION SR-3:	***Adopt regulatory standards for industrial processes, products, and supply chain management; establish authority for monitoring, testing, and enforcement.***
4-4	Develop best practices for supply chain management.
4-6	Establish process and product benchmarks. Distinguish between process chemicals and product chemicals.
4-7	Help establish a product safety/product liability organization to create a safety checklist and review products according to the checklist.
4-10	Educate companies on greener alternatives and penalize companies for selling toxic items.
4-15	Government responsibility for international cooperation on imports and exports of products.
4-17	Expand and randomize government testing of food and products.
4-18	Improve enforcement for retailers and upstream.
4-19	Address the issue of how to find out what's in products from abroad.
4-20	Establish rigorous manufacturing process controls.
4-25	Review current and next generation technologies to help with product recalls.
4-30	Establish a quality assurance/quality control program for precursors and raw materials.
4-31	Scrutinize who is liable for a toxic product in the chain from manufacturing to sale and ensure there are consequences for the responsible party.
4-32	Provide assistance to small manufacturers and encourage pooling of resources to improve safeguards and quality control on inputs.
4-33	Require company accountability for out-sourcing.
4-34	Strengthen trade agreements between the state and other countries.
4-46	Strengthen relevant liability law to provide greater incentive for consumer protection from toxics in products.
4-55	Expand state testing of products to detect hidden toxics in all products and to produce a level playing field internationally—police your laws.
4-56	Develop a process for rapid removal of products found to be toxic by new studies that is fair to industry—State subsidized transformations.
4-57	Encourage the use of existing environmental management systems (e.g., ISO 14000) and work with international standards setting organizations (e.g., International Organization for Standardization) to develop green chemistry technical standards.
4-61	Establish a centralized testing laboratory for toxics in products that would accept testing requests from the public.
4-72	Increase the number of inspectors in the field for retail products and food.

OPTION SR-3:	***Adopt regulatory standards for industrial processes, products, and supply chain management; establish authority for monitoring, testing, and enforcement.***
4-110	California should expect and encourage manufacturers of consumer and commercial products sold in California to employ comprehensive product safety management systems that include: (a) Assessments to ensure the safety of products prior to marketing; (b) Rigorous control of production from raw material specifications, to formulation management, to process and quality control; (c) Safe operations that protect the health and environment of employees and the surrounding community; (d) Compliance with all applicable product safety, labeling and regulatory requirements including transportation, waste management and product disposal; (e) Constant vigilance in post market surveillance with rapid response to identified concerns; (f) Innovation that improves product performance, value and environmental quality based on life-cycle considerations; (g) Transparency in communicating information about safety management systems and products; and, (h) Ongoing evaluation and improvement of systems performance.
4-125	Establish an indemnity or hold harmless provision to enable responsible parties to test and recover products without the threat of punitive regulatory action.

OPTION SR-4: Establish statutory/regulatory measures to create economic incentives to drive green chemistry.	
1-11	Mandate a surcharge on chemicals and products to support fund to address long term environmental impacts.
1-45	Change policy to change materials flow (i.e. eliminate special tax treatment for extraction of virgin materials and subsidies for agriculture).
1-46	Tax the use of virgin materials.
1-47	Regulate mining, oil, and gas non-hazardous solid wastes under RCRA. Eliminate special tax treatment for extraction of virgin materials and subsidies.
1-48	Establish depletion quotas on extraction and import of virgin materials. Tax the production using virgin materials.
1-49	Establish requirements for product reuse, recyclability, or biodegradability.
1-50	Mandate consumer separation of materials for recycling. Establish weight or volume-based disposal fees.
1-51	Tax hard to dispose products. Establish deposit fund for packaging hazardous products.
1-52	Establish a fee rebate based on energy efficiency.
1-56	Change how we use taxes and charges. Make the individual actor pay for the full cost. For example, pro-rate based on emissions, pounds of waste disposed to encourage reuse and recycling. Include everyone, from household wastes all the way up to the big chemical companies and corporations. Establish a “Pay by the Bag" approach.
1-63	Overhaul environmental regulation to promote long-term innovation and pollution prevention. More effective economic incentives for investments in clean technologies are long overdue. Current measures of industrial productivity need to be re-conceptualized so they recognize environmental costs. And, altogether more attention needs to be paid to how clean technologies can be transferred successfully from country to country.
1-70	‘Feebate’ scheme to reward or penalize consumers of specified chemicals.
2-17	Establish regulatory framework that drives green chemistry through prohibitions, cost structures, etc. (i.e. disincentives for using practices that are not in agreement with green chemistry principles).
2-19	Lead the way with government driving demand for cleaner products through its own procurement processes.
2-54	Consider tax credits for developers and users developers of green technologies.
2-88	Develop a credible and effective third party labeling system for green products.
2-123	Include a regulatory component.
2-130	Consider tax incentives. Use a phased tax or penalty approach.
2-131	Establish a "green seal," reflecting a specified level of greenness, or certification of approval.
2-134	Use Green Buildings/LEED Certification as a model for green labeling/product certification; include the following as criteria—use of green energy during manufacturing, waste generation, use of recyclable materials, use of non-toxic ingredients.
2-139	Use environmental certification in Germany, "The Blue Angel," as a model for the certification of products and services.

OPTION SR-4: Establish statutory/regulatory measures to create economic incentives to drive green chemistry.	
3-3	Evaluate things that have worked in the past to reduce toxics in products and the environment, including gaps and opportunities; consider legislating toxic reduction efforts, such as: (a) Legislation has helped on numerous toxic reduction efforts. (b) Mandatory emissions standards for automobiles in California. This has had a tremendous impact by mandating a shift in demand allowing the auto manufactures to voluntarily comply if they want to participate in the California market. (c) Usage fees (taxes) can help to move a product's sales price closer to the total product life cycle costs (inclusive of decommissioning, disposal, clean up, associated human health care cost, and environmental rectification costs that are now born by tax payers). (d) Bottle tax gives an incentive to be environmental conscious to reduce the toxins in the waste we consumers create. (e) Cigarette tax provides a disincentive for consumption. (f) Rebates for use of preferred product purchases; for example, rebates for hybrid automobile purchases.
4-23	Develop a "green" rating system for products with agreed upon criteria.
4-94	Develop a robust framework for regulating chemicals to accompany incentives for the development of greener chemicals and technologies; voluntary programs alone are not sufficient.

OPTION SR-5: Mandate extended producer responsibility and other regulatory measures to control the waste stream.	
1-21	Foster "Reduce Energy/ Resource Consumption" through take back programs.
1-29	Need responsible producer management at end-of-life.
1-34	Design with intent of end-of-life: (a) Manufacturer take back (b) Producer responsibility with idea of economic change of design (c) Facilitate COUGE recycling (d) Design to be biodegradable (e) Design to last
1-53	Tighten regulation of waste management at RCRA facilities.
1-236	Make producers assume responsibility for the safe stewardship of their materials in order to promote environmental sustainability. Producers should be responsible for collection through processing/disposal, financially and operationally, with no cost to local government.
1-237	Shift the responsibility for the end-of-life management of discarded materials from local government to private industry producers, through extended producer responsibility (EPR). Incorporate the costs of product collection, recycling, and disposal into product price, and thereby encourage product design that has a reduced impact on the environment and human health. The results are products and product chains that have a reduced impact on the environment and that costs associated with a product's impact are paid by those manufacturing or using the product, rather than general taxpayers.
2-35	Donate reusable computers to reduce e-waste.
2-38	Collect mercury added thermostats.
2-40	Water quality: sewage sludge.
1-195	Adhere to ISO standards, so that no LCA results carried out by companies can be published unless critically reviewed by third party or published in a peer-reviewed journal.
2-211	Require chemical producers to complete a full life-cycle analysis of products to foster cradle to cradle management.
2-213	Make companies that make or sell products in the state containing hazardous chemicals take them back at the end of their life cycle and ensure their proper disposal.
2-298	Require that industry bear the costs associated with their chemical production or use.
2-308	Extend producer responsibility to placing the burden of end of life disposal, including sustainable practices such as recycling.
3-37	Generate environmental codes of practices and procedures in the development and design of products that encompass the manufacture, distribution, use, and end-disposal or recycling of the product that all manufacturers, importers, distributors, and users of products must follow. These practices could include bans of specific chemicals from consumer products.
3-17	Mandate toxics reduction in lighting waste.
3-22	E-waste: personal computers.
3-40	Work with industry to reduce toxics in products, and where that proves difficult because no safe alternative exists, California should require product take-back at no cost to the consumer. This shifts the physical and financial responsibility away from local governments and consumers back to the product manufacturer.

OPTION SR-5: Mandate extended producer responsibility and other regulatory measures to control the waste stream.	
3-41	Ban the export of toxic products and waste to developing countries as they lack the infrastructure to handle these materials.
3-47	Promote chemical reclamation and recycling technology to reduce chemical waste, which in turn reduces chemical manufacture.
3-48	Require mandatory take-back for unused pharmaceuticals.
3-49	Ban the export of hazardous waste to developing countries.
3-74	Develop regulations to require extended producer responsibility including take-back of hazardous materials, recycling of materials and use of less toxic materials. California can look at the Green Dot program in Europe as a model.
3-117	Do not allow exporting waste that is causing great harm overseas. Develop closed-loop, safe, and just ways of handling our waste, including recyclable plastics. The current model of exporting plastic to countries such as China needs to be stopped if California is serious about its Green Chemistry Initiative.
3-185	Note that there are numerous opportunities to reclaim process streams that may require refining (i.e. distillation, filtration, etc) prior to recycling the material back into the same process. The Chemical Industry Council of California and DTSC have embarked on a partnership to promote voluntary pollution prevention and reduce waste. CICC is eager to work with DTSC to implement regulations allowing more flexibility for generators to reclaim streams onsite without having to go through tiered permitting or Part B Permit. CICC recommends that we work collaboratively with DTSC to fix this problem and reduce waste generation.
4-140	Acknowledge that plastic is "downcyclable" not "recyclable." Plastic needs to be looked at with a cradle-to-cradle perspective, which requires a close look at what is happening overseas. California needs to develop closed-loop safe and just ways of handling our waste. The current model of exporting plastic to countries such as China needs to be stopped if California is serious about its Green Chemistry Initiative.

OPTION SR-6:	***Consider a broad range of sustainability, social, economic, and other factors associated with the life cycle of a product, in addition to human and environmental impacts, in chemical management decisions.***
1-8	Factor environmental, societal, environmental justice, and economics into decisions.
1-15	Use "precautionary principle" shift burden to industry.
1-17	Standardize terminology and definitions to promote the necessary and real change towards creating more sustainable, social and environmental solutions.
1-75	Recognize that the question is not just, "How do we control toxic substances?", but also how do we successfully manage both toxicity and exposure—risk—while providing the solutions society needs?
1-78	Ensure that laws and regulations: (a) Are science-based; (b) Balance potential risks with benefits; (c) Factor in existing scientific knowledge as well as reasonable uncertainties; and (d) Consider the degree of risk to people and the environment.
1-79	Find a way to successfully manage both toxicity and exposure (i.e., risk) while providing the solutions California needs.
1-88	Require that conclusions or recommendations in policies be carefully written and explicitly qualified to limit their perceived and actual applicability to those settings for which information has been provided and deemed sufficient to warrant the conclusion or recommendation. Furthermore, the degree of uncertainty associated with a conclusion or recommendation should be stated and should reflect the extent of exposure information available. Lastly, policies should ensure that in the absence of good exposure information, exposure should be assumed possible or likely.
1-111	Focus more on what people are exposed to in the real world.
1-112	Focus more on products and the chemicals in products, which get little attention.
1-165	Note that "Green Chemistry" is not just about substitution of one hazard for another; it is ultimately about the reduction of risks to health and the environment that are otherwise unmanaged. A risk reduction policy seems to be a much better approach to accounting for the economic, social, health, and environmental dimensions of green chemistry, particularly because by definition it will address not only inherent toxicity (hazard), but potential exposures as well. Perhaps most importantly, a risk reduction policy (one that addresses both hazard and exposure) correlates very well with the pollution prevention policies that have been at the heart of many existing DTSC programs, and can serve as a meaningful focal point in encouraging the development of sustainable chemistry, green engineering, and products that improve the lives of Californians and the State environment
1-166	Establish a process by which statewide priorities can be identified, where existing and new risk reduction measures—spanning the entire spectrum from research and financial incentives to regulation—can be appropriately assessed, and where the relative benefits and impacts of the approach can be evaluated. In short, a risk reduction policy provides an important and appropriate organizing principle for DTSC's "Green Chemistry" recommendations.
1-175	Prioritize toxic chemicals according to risk in a practical, objective, and transparent manner using sound science.

OPTION SR-6:	***Consider a broad range of sustainability, social, economic, and other factors associated with the life cycle of a product, in addition to human and environmental impacts, in chemical management decisions.***
1-201	Note that successful management of chemicals already in the marketplace according to their characteristics and actual uses, rather than simply banning substances. This focus recognizes the important difference between risk and hazard, i.e., that hazardous substances properly managed may not pose actual risks, and would create a system that is based on successful management of identified risks, as opposed to establishing prohibitions based on potential hazard.
1-202	Use prohibitions only when an unacceptable level of risk is identified that cannot be adequately mitigated or that is not offset by the aggregate benefits of continued use. This approach is science-based, and relies on data generated through experimentation or by means of modeling (structure-activity relationships).
1-203	Ensure that any chemicals management system is risk-based.
1-211	Base decisions of preference and substitution on the comparative life cycle impacts of a chemical and its potential substitute. While a safety-based characterization scheme may focus on toxicity, persistence, and bioaccumulation, there are a number of other parameters that are relevant to the sustainable use of a particular chemical in a formulation such as raw material sourcing and carbon footprint. All relevant aspects of sustainability should be taken into consideration for a potential substitution decision. Similarly, any plan to consider substitution of chemicals should require that the efficacy and benefits of that compound be considered as any diminution of efficacy may negatively impact public health and well being through reduced hygiene and sanitation.
1-212	Ensure that product efficacy, performance, and usability are not undermined, and that the ability to innovate is not compromised.
2-158	Note that all toxicity in chemicals cannot be eliminated. Trade-offs must be identified through life cycle analysis.
2-219	Reduce impacts of chemical exposure on the most highly impacted communities, e.g., developmentally vulnerable; communities bearing a disproportionate exposure to toxic chemicals; and workers exposed to toxic chemicals on the job
2-220	Use full cost accounting when making decisions regarding chemical use and management including not only research and development but also the cost to communities of a degraded environment, health care, economic decline, education for developmentally impacted children, environmental clean-up, disposal of toxic materials, worker exposures and lost work days, and even premature death
2-233	Shift the burden of proof of safety to the manufacturer, which overturns the presumption of innocence for any chemical.

OPTION SR-6:	***Consider a broad range of sustainability, social, economic, and other factors associated with the life cycle of a product, in addition to human and environmental impacts, in chemical management decisions.***
2-257	Develop an integrated program that features the following: (a) require all existing chemicals undergo a tiered process of scrutiny for their environmental, social, and health/toxicity impacts; (b) require that this information should be passed in a standard form along the supply chain; (c) require manufacturers to label consumer products with all the chemicals and materials (including nanotechnology) that these contain; (d) develop interactive consumer tools and technologies that assist consumers to interpret and use labeling data in their shopping; (e) require industry to conduct green chemistry assessments for chemical products sold or used within California; (f) expand greatly the investment of resources into green chemistry education and research at California State-supported universities, including the UC system (g) adopt a modest toxicity tax on all intermediates and chemical products used or sold within the State of California.
2-260	Place the burden of proof, when deciding if chemicals should be banned or not, on the chemical producing companies to fully disclose the chemicals in their products and to adequately demonstrate that the chemicals and products are safe. California should not fail to act in the face of uncertainty to ban chemicals suspected of toxicity. Chemical companies should be required to fund independent research of the impacts of their products, not just research conducted by their own scientists. The research should address the effects of multiple chemicals—only testing chemicals in isolation will fail to address the real world impacts. Chemicals found to be harmful to people or wildlife should be banned or phased out. Research efforts should also include the monitoring of various species, especially amphibians and upper trophic level predators, to better understand what chemicals are already present in the environment and what their impacts are. Incentives should be instituted that encourage the production and use of products that do not contain toxic chemicals.
2-266	When evaluating alternatives to existing flame retardant chemicals, address affordability issues also.
2-280	Weigh risk against benefit, not just hazard, in the decision making process on any chemical.
2-296	Require that chemical manufacturers prove their products are safe.
3-10	(e) Prioritize protection of most vulnerable people and resources. For example, get information on exposures of children to harmful substances through toxics in products, and seek changes to reduce or eliminate these toxics. Focus on consumer products with lots of exposure potential. This needs a regulatory action. (f) Look for initial easy fixes by integrating existing programs that have identified actual sources of pollutants. (g) Drive the demand for cleaner products through state procurement practices. (h) Designate the Occupational and Environmental Health at UC Berkeley and UCLA as lead entities within the UC system to address research relevant to green chemistry and chemicals policy in California.
3-40	Work with industry to reduce toxics in products, and where that proves difficult because no safe alternative exists, California should require product take-back at no cost to the consumer. This shifts the physical and financial responsibility away from local governments and consumers back to the product manufacturer.
3-70	Take early action on bad actor chemicals directed toward eliminating impacts to the most sensitive populations including vulnerable humans and ecosystems/species.

OPTION SR-6:	***Consider a broad range of sustainability, social, economic, and other factors associated with the life cycle of a product, in addition to human and environmental impacts, in chemical management decisions.***
3-73	Where no evidence exists for the safety of a chemical, restrict its use until safety can be comprehensively demonstrated.
3-104	Consider “externalities” when weighing benefits. Externalities include: costs to communities in terms of lost wages from sick leave, health care costs, environmental degradation and the economic impacts that brings, expensive clean up actions, higher education costs due to higher rates of behavioral and developmental problems in highly exposed populations, etc.
3-108	While a safety-based characterization scheme may focus on toxicity, persistence, and bioaccumulation, there are a number of other parameters that are relevant to the sustainable use of a particular chemical in a formulation such as raw material sourcing and carbon footprint. All relevant aspects of sustainability should be taken into consideration for a potential substitution decision.
3-112	Develop database of chemical alternatives that compares a number of sustainability parameters: performance, price, human health and environmental (e.g., toxicity, bioaccumulation, persistence) including carbon footprint and source sustainability.
3-140	Conduct studies of why specific chemistries are being used in terms of industrial structures and histories. Regulatory standards or established industry practices can actually exacerbate the creation of risks. Flammability standards have encouraged the use of brominated flame retardants; companies often simply use specific chemicals in manufacturing because they are accustomed to doing so and their technologies and ordering systems are built on the chemicals.
3-149	While the focus has been on chemical safety, incorporate an accounting of embedded energy, carbon dioxide impact, water usage, packaging, recyclability and so forth. Industry on the whole is already moving toward a greater consideration of these factors in our practices. The difficulty of quantifying and ascribing relative importance to these factors points to the need for commonly held practices or industry standards.
3-152	Address the problem of chemicals being used in our daily lives that have not been tested for neurotoxicity in children. Include restrictions and bans on chemicals that demonstrate a hazard to our health and/or environment.
3-157	Change our current, risk-based method of policy making, which limits the scope of chemical evaluation and puts people in harm’s way before allowing the government to make chemical regulations. The only groups who benefit from "risk management" are chemical suppliers—they don’t have to run toxicity tests or report their findings, they don’t have to report quantities or end uses of potentially toxic substances, and they have no incentive to update manufacturing methods or reformulate, as that always comes with some monetary cost. They need markets and incentives to design better products, but will not comply without preventative regulation in place.
3-179	Note that too much emphasis has been placed in prior year on reducing exposure (risk) and too little emphasis on reducing toxicity (hazard). The transition movement within the chemical in industry, however, has begun. Emphasis on a transition to hazard reduction (i.e. green chemistry)is and will continue to build. However, GCI needs to forthrightly acknowledge that elimination of all toxicity through chemical substitution is not possible. At best there will always be tradeoffs, which will need to be evaluated via life cycle analysis (LCA) methodologies.
4-91	Incorporate a precautionary approach in decisions about chemical use to protect the public and environment when data are incomplete or uncertain, and therefore be based on the assumption that chemicals are unsafe unless reasonably demonstrated otherwise.

OPTION SR-6:	***Consider a broad range of sustainability, social, economic, and other factors associated with the life cycle of a product, in addition to human and environmental impacts, in chemical management decisions.***
4-105	For toxics in products, examine the entire environmental sustainability of the products, including health and environmental effects, transportation, use, disposal, efficacy, and potential benefits of use.
4-126	Reconsider the proposed bedding standard (TB 604), which may result in a large increase in the use of toxic flame retardants, in light of green chemistry principles. Evaluate the public health and environmental impacts of the increased use of toxic flame retardants.
4-137	In implementing the green chemistry initiative, look at the chemical information that is already available. Make it clear that the Green Chemistry Initiative process will be governed by a risk-based science approach. Support an understanding of both the benefits and the burdens of new regulatory proposals. Consider process technology as part of a green chemistry program.

OPTION SR-7:	***Eliminate the use of hazardous chemicals by prohibiting their use, replacing them with alternatives found to be preferable, or establishing pre-market approval requirements.***
1-30	Rethink the processes for allowing chemicals into the market.
1-54	Rethink the processes for allowing chemicals into the market.
1-202	Use prohibitions only when an unacceptable level of risk is identified that cannot be adequately mitigated or that is not offset by the aggregate benefits of continued use. This approach is science-based, and relies on data generated through experimentation or by means of modeling (structure-activity relationships).
1-144	Recognize that substitutions may change the nature of the problem rather than solve it.
1-145	Mandatory bans and forced substitutions often are not a complete solution because, as one issue is addressed, another set of concerns may arise. This is the difference between "informed substitution" and "regrettable substitution," with the goal of "informed substitution" being to avoid "regrettable substitution." For example, the health and convenience of our lives has been greatly enhanced by modern refrigeration. Refrigerators originally used ammonia, a toxic chemical, as a coolant. As scientific discoveries were made, chlorofluorocarbons (CFCs) replaced ammonia. While CFCs are practically non-toxic, they were later implicated in depleting the ozone layer and eventually banned. CFCs were then replaced with hydrochlorofluorocarbons (HFCs), which have no impact on the ozone layer, are non-flammable, have low toxicity, and high energy efficiencies. Scientists have now learned that HFCs could contribute to global warming if released into the air. Alternative coolants such as hydrocarbons and carbon dioxide have been considered, but both need to be carefully examined because of the potential for emissions and the possible dangers from higher operating pressures.
1-147	Note that substitutions may result in unintended adverse consequences.
1-148	Recognize that substitution is not the only viable approach to control risk.
1-165	"Green Chemistry" is not just about substitution of one hazard for another; it is ultimately about the reduction of risks to health and the environment that are otherwise unmanaged. A risk reduction policy seems to be a much better approach to accounting for the economic, social, health, and environmental dimensions of green chemistry, particularly because by definition it will address not only inherent toxicity (hazard), but potential exposures as well. Perhaps most importantly, a risk reduction policy (one that addresses both hazard and exposure) correlates very well with the pollution prevention policies that have been at the heart of many existing DTSC programs, and can serve as a meaningful focal point in encouraging the development of sustainable chemistry, green engineering, and products that improve the lives of Californians and the State environment
1-211	Base decisions of preference and substitution on the comparative life cycle impacts of a chemical and its potential substitute. While a safety-based characterization scheme may focus on toxicity, persistence, and bioaccumulation, there are a number of other parameters that are relevant to the sustainable use of a particular chemical in a formulation such as raw material sourcing and carbon footprint. All relevant aspects of sustainability should be taken into consideration for a potential substitution decision. Similarly, any plan to consider substitution of chemicals should require that the efficacy and benefits of that compound be considered as any diminution of efficacy may negatively impact public health and well-being through reduced hygiene and sanitation.
1-213	Develop a database of chemical alternatives that compares a number of sustainability parameters: performance, price, human health and environmental (e.g., toxicity, bioaccumulation, persistence) including carbon footprint and source sustainability.
2-16	Remove known chemical hazards from the market immediately via Proposition 65, Silent Spring/Harvard study, tax incentives, etc.

OPTION SR-7:	***Eliminate the use of hazardous chemicals by prohibiting their use, replacing them with alternatives found to be preferable, or establishing pre-market approval requirements.***
2-32	Prohibit diacetyl.
2-34	Ban incandescent lamps.
2-36	Prohibit polystyrene containers.
2-117	Develop criteria for determining safe alternatives, including multi-media considerations; identify and publicize safe alternatives.
2-144	Adopt "No data, no market" idea, which will level the playing field for all chemicals, both new and old.
2-146	Find an available method for providing substitutions, as in EU REACH.
2-151	Identify less hazardous chemicals, as Canada did.
2-157	Note that data and the lack or unavailability of data is a major issue: (a) Data represents great value to the developer, in terms of resources, time, and opportunity for market advantage; (b) Data is intellectual property, confidential business property that must be protected; (c) Data gap will always exist; (d) Must prioritize chemicals for additional testing and must consider exposure, as well as hazard and how chemical will be used, in characterizing data needed; (e) Substitute chemicals must meet same data requirements as the chemicals that they are replacing.
2-158	Note that all toxicity in chemicals cannot be eliminated. Trade-offs must be identified through life cycle analysis.
2-193	Encourage company performed safety-based assessments of consumer products prior to the marketing of a product, that take into consideration all of the phases of a product's life-cycle.
2-214	Take immediate action to reduce or eliminate the use of chemicals that are toxic, bioaccumulative, and persistent.
2-215	Require the use of safer substitutes for toxic chemicals when available. Require the development of non-toxic alternatives when safer substitutes are not available.
2-216	Phase-out chemicals that harm the health of humans or the environment or whose impacts are unknown.
2-234	Require that, without data, you cannot market the product. This levels the playing field for all chemicals both new and old.
2-259	Prohibit the import, sale, or use of certain recreational vehicle toilet additives containing formaldehyde and derivatives of formaldehyde.

OPTION SR-7:	***Eliminate the use of hazardous chemicals by prohibiting their use, replacing them with alternatives found to be preferable, or establishing pre-market approval requirements.***
2-260	Place the burden of proof, when deciding if chemicals should be banned or not, on the chemical producing companies to fully disclose the chemicals in their products and to adequately demonstrate that the chemicals and products are safe. California should not fail to act in the face of uncertainty to ban chemicals suspected of toxicity. Chemical companies should be required to fund independent research of the impacts of their products, not just research conducted by their own scientists. The research should address the effects of multiple chemicals—only testing chemicals in isolation will fail to address the real world impacts. Chemicals found to be harmful to people or wildlife should be banned or phased out. Research efforts should also include the monitoring of various species, especially amphibians and upper trophic level predators, to better understand what chemicals are already present in the environment and what their impacts are. Incentives should be instituted that encourage the production and use of products that do not contain toxic chemicals.
2-266	Address affordability issues when evaluating alternatives to existing flame retardant chemicals.
2-285	Inform substitution decisions in terms of the characteristics and risks presented by potential alternatives.
2-293	Do not attempt pre-market approval of chemicals or consumer products because this would be an incredibly burdensome and unworkable process.
2-297	Phase-out or restrict hazardous chemicals and chemicals with inadequate safety data.
2-299	Require safer alternatives to hazardous chemicals.
2-302	Act quickly to eliminate or restrict known chemicals for which we already have adequate data demonstrating that they cause serious harm from use in California and require safer alternatives when available.
2-311	Implement protective regulations, including restrictions and bans on chemicals for which the weight of evidence demonstrates a severe hazard to human health and/or the environment.
2-313	Recognize that we are being exposed to far too many chemicals in our daily environment and many of us are getting sick. It is especially necessary to get them out of commercial cleaning products that are used everywhere, from stores to doctor's offices and even hospitals.
3-1	Develop science-based criteria for determining whether a particular product is greener or safer than alternatives.
3-2	(a) Develop criteria for appropriate use of cosmetic pesticides and consider banning inappropriate use and (b) Ban the most toxic cosmetic pesticides via legislation/regulation; possibly create monetary incentives for new homebuilders to substitute non-toxic chemicals in landscaping or create more sustainable landscaping designs (i.e., drought tolerant landscaping, water conservation, plants indigenous to the region, etc).
3-7	Tap biomonitoring efforts to help fill exposure gaps. In evaluating and ranking chemicals, considerations should be given to the performance, and feasibility of alternatives.
3-8	Ban the use of single-use polystyrene and other plastic/non-biodegradable polymer materials in order to protect the natural environment for present and future generations, exercise environmental stewardship by reducing the amount of polystyrene and other non-biodegradable polymeric substances that enters our waste stream, storm drains, watershed and coastal environment.

OPTION SR-7:	***Eliminate the use of hazardous chemicals by prohibiting their use, replacing them with alternatives found to be preferable, or establishing pre-market approval requirements.***
3-10	(a) Prioritize protection of most vulnerable people and resources. For example, get information on exposures of children to harmful substances through toxics in products, and seek changes to reduce or eliminate these toxics. Focus on consumer products with lots of exposure potential. This needs a regulatory action. (b) Look for initial easy fixes by integrating existing programs that have identified actual sources of pollutants. (c) Drive the demand for cleaner products through state procurement practices. (d) Designate the Occupational and Environmental Health at UC Berkeley and UCLA as lead entities within the UC system to address research relevant to green chemistry and chemicals policy in California.
3-11	(a) Include human health and environmental considerations, performance, cost, and feasibility in evaluating alternative materials and processes. (b) Provide positive incentives for green chemistry. (c) Use the Green Chemistry principles articulated by Anastas in evaluating alternatives.
3-13	Remove hazardous substances from electronic devices.
3-14	Adopt work standards for diacetyl.
3-15	Ban brominated and chlorinated fire retardants.
3-16	Prohibit the use of phthalates in children's products.
3-17	Reduce toxics in lighting waste.
3-18	Reduce lead content in drinking water pipes and fittings.
3-19	Reduce hazardous packaging.
3-20	Prohibit products containing diacetyl.
3-21	Prohibit PBDE chemicals.
3-53	Work with major users of chemicals of very high and high concern to reduce or eliminate their use of these chemicals in their products.
3-71	Require safer substitutes where available; use regulatory authority to require safer substitutes, including non-chemical solutions, and seek additional legal authority if necessary to do so.
3-72	Ban hazardous chemicals over time with a robust phase-out program including specific timelines by which users/producers must comply.
3-78	Enact a California Toxic Substances Control Act which would require all new chemicals to be tested for toxicity before they are marketed in California, and would established requirements for toxicity testing of existing chemicals.
3-79	Increase funding for OEHHA to evaluate alternative chemicals to determine whether alternatives pose an unacceptable risk.
3-93	If we are going to promote green chemistry, then let’s do it! A glass-bead product for highway markings from China is available and for a cheaper price, but you also could get significant levels of lead and arsenic in the product as a result. Another glass-bead product is domestically produced and does not contain dangerous levels of these heavy metals.

OPTION SR-7:	***Eliminate the use of hazardous chemicals by prohibiting their use, replacing them with alternatives found to be preferable, or establishing pre-market approval requirements.***
3-94	Use prohibitions of chemicals only when an unacceptable level of risk is identified that cannot be adequately mitigated or is not offset by benefits of the chemical..
3-102	In California's Green Chemistry Initiative, risk management efforts can involve a variety of approaches such as: substituting alternative input materials, making process changes during manufacturing, installing technological controls (e.g., pollution control equipment), requiring use of personal protective equipment, instituting a range of pollution prevention options, training, labeling, imposing various storage, transport and disposal requirements.
3-108	While a safety-based characterization scheme may focus on toxicity, persistence, and bioaccumulation, recognize that there are a number of other parameters which are relevant to the sustainable use of a particular chemical in a formulation such as raw material sourcing and carbon footprint. All relevant aspects of sustainability should be taken into consideration for a potential substitution decision.
3-112	Develop database of chemical alternatives that compares a number of sustainability parameters: performance, price, human health and environmental (e.g., toxicity, bioaccumulation, persistence) including carbon footprint and source sustainability.
3-138	Subject materials classified as PBT, vivo, or CMR category 2 to risk analysis. If risk levels are judged too high, then industry should have the opportunity to introduce appropriate measures to reduce risk within a given time span, or face phase out of the material. Within a phase out strategy, the potential use of alternatives must address any risks associated with such substitution. It should not be acceptable to propose substitution by a material for which there is little data on its characteristics. Fundamentally, lack of data should not be rewarded.
3-152	Address the problem of chemicals being used in our daily lives that have not been tested for neurotoxicity in children. Include restrictions and bans on chemicals that demonstrate a hazard to our health and/or environment.
3-176	Recognize that the industry itself will not focus on or develop alternatives unless there is a regulation. This results in a “chicken and egg” problem and the chemicals and products that pose problems continue to be used, exposing workers, people in the surrounding communities and consumers. An important feature of this model program should be the work on alternatives. It is important to use or establish independent entities with detailed technical knowledge and experience, to find, develop, test, and demonstrate viable and cost effective alternatives. The industries using the candidate chemicals or products must work with the independent entities to test potential alternatives. The health and environmental characteristics of the potential alternatives must be investigated and the alternatives must be safer than the original chemicals and products they will replaces
3-179	Note that too much emphasis has been placed in prior year on reducing exposure (risk) and too little emphasis on reducing toxicity (hazard). The transition movement within the chemical in industry, however, has begun. Emphasis on a transition to hazard reduction (i.e. green chemistry)is and will continue to build. However, GCI needs to forthrightly acknowledge that elimination of all toxicity through chemical substitution is not possible. At best, there will always be tradeoffs, which will need to be evaluated via life cycle analysis (LCA) methodologies.
3-181	Hold substitute chemicals to the same data requirements as the chemical(s) they are intended to replaces.

OPTION SR-7:	***Eliminate the use of hazardous chemicals by prohibiting their use, replacing them with alternatives found to be preferable, or establishing pre-market approval requirements.***
4-63	Develop legislation that would require new chemicals to be tested for toxicity prior to marketing in California. Toxicity testing would also be required for existing chemicals already being used and marketed in California. The set of required toxicity tests would be developed by a group of scientists with input from California government agencies and the public. California government agencies would evaluate the results of the toxicity testing and decide whether the chemical would be marketed (new chemicals) or whether the chemical would have to be removed from the market (existing chemicals). The criteria for deciding on this "up or down" vote on a chemical would be predetermined by the group of scientists who designed the toxicity test battery, along with input from California government agencies and the public.
4-67	Require the submission of safety data from chemical producers to address both hazard and use knowledge gaps. Start with lists already available to the state (e.g., Proposition 65 list) and set deadlines for data submission. Take action on substances of very high concern, including requiring permission for continued use of such chemicals. Include substitution planning to ensure movement toward safer and greener alternatives.
4-68	Develop criteria for low, medium, and high hazard chemicals. Publish lists of chemicals meeting these criteria to encourage movement away from high hazard chemicals and innovation toward low hazard chemicals.
4-75	Implement the policy that "no data means any market" meaning that chemicals for which safety data are not available are banned from sale or use.
4-85	Phase-out chemicals that harm human health or the environment or whose impacts are unknown.
4-92	Where safer alternatives exist for hazardous chemicals, mandate the use of these alternatives.
4-93	Do not wait to take immediate action while developing a sound, long-term chemicals policy. Chemicals currently in use that are known to be unsafe should be restricted or eliminated.
4-96	Carefully research and evaluate the possible unintended consequences of substituting one chemical for another.
4-113	Avoid programs that require pre-market approval of chemicals or consumer products (i.e., modeled on programs used for pesticides and drugs) because these would be far too expensive.
4-127	Ban the sale and use of certain products (e.g., toilet additives) that contain formaldehyde or other similar biocides and require the use of safer substitutes (e.g., bacterial or enzyme based additives).
4-130	Avoid banning in the absence of safer alternatives, which should be technically feasible, improve health/safety/environmental profile, be of comparable or superior performance, cost-effective, and be capable of persistence. If safer alternatives are not available, resources should be devoted to R&D or incentives should be provided to develop cost-effective alternatives.
4-132	Use the collaboration between industry, state government, and a third party expert in identifying solvent substitutes under SB 14 as a model. Take the following approach: 1) consider chemicals of top priority concern, 2) identify the specific applications or industry uses posing the greatest risk from those chemicals, and 3) apply a collaborative process of agency, industry and third-party experts to identify or develop viable alternatives that can maintain efficacy, but reduce risk in those targeted applications.
4-134	If a significant risk is identified, consider a wide range of acceptable risk management options, including improving personal protective equipment and enhancing process technology controls to elimination of specific substances in favor of alternatives.

OPTION SR-7:	***Eliminate the use of hazardous chemicals by prohibiting their use, replacing them with alternatives found to be preferable, or establishing pre-market approval requirements.***
4-135	Prioritize the evaluation and mitigation of toxic hazards in products that are widely used and already have known safer substitutes, such as commercial cleaning products.
4-141	Create a database on alternatives that compares a number of sustainability parameters: performance, price, human health and environmental (e.g., toxicity, bioaccumulation, persistence) including carbon footprint and source sustainability.

OPTION SR-8: Take immediate actions to prohibit or restrict the use of known hazardous substances	
1-19	Develop regulations to phase-out use of substances known to pose added risks and environmental harm.
1-144	Note that substitutions may change the nature of the problem rather than solve it.
1-145	Recognize mandatory bans and forced substitutions often are not a complete solution because, as one issue is addressed, another set of concerns may arise. This is the difference between "informed substitution" and "regrettable substitution," with the goal of "informed substitution" being to avoid "regrettable substitution." For example, the health and convenience of our lives has been greatly enhanced by modern refrigeration. Refrigerators originally used ammonia, a toxic chemical, as a coolant. As scientific discoveries were made, chlorofluorocarbons (CFCs) replaced ammonia. While CFCs are practically non-toxic, they were later implicated in depleting the ozone layer and eventually banned. CFCs were then replaced with hydrochlorofluorocarbons (HFCs), which have no impact on the ozone layer, are non-flammable, have low toxicity, and high energy efficiencies. Scientists have now learned that HFCs could contribute to global warming if released into the air. Alternative coolants such as hydrocarbons and carbon dioxide have been considered, but both need to be carefully examined because of the potential for emissions and the possible dangers from higher operating pressures.
1-146	Note that substituting one material for another is never as simple or straightforward as it might at first appear, i.e. mercury containing light bulbs.
1-147	Understand that substitutions may result in unintended adverse consequences.
2-16	Remove known chemical hazards from the market immediately, via Proposition 65, Silent Spring/Harvard study, tax incentives, etc.
2-32	Prohibit diacetyl.
2-34	Ban incandescent lamps.
2-36	Prohibit polystyrene containers.
2-37	Address marine debris via reduction and recycling.
2-87	Prioritize chemicals that should be restricted.
2-114	Until the Green Chemistry Initiative is operational, do not oppose legislative or other efforts to restrict exposures to toxic chemicals.
2-214	Take immediate action to reduce or eliminate the use of chemicals that are toxic, bioaccumulative, or persistent.
2-201	Ban non-refillable refrigerant cylinders to service air conditioning systems. This would eliminate the emission of greenhouse gases remaining in disposable containers when they are discarded. Also, it would save millions of pounds of steel and thousands of cubic yards of landfill space each year.
2-202	Require commercial dry cleaners to use carbon dioxide (CO_2) systems in place of perchlorethlyene ("perc") systems they now use.
2-203	Replace cutting oils and biocides in metal shops with CO_2, which is an excellent coolant and lubricant.
2-216	Phase-out chemicals that harm the health of humans or the environment or whose impacts are unknown.
2-259	Prohibit the import, sale, or use of certain recreational vehicle toilet additives containing formaldehyde and derivatives of formaldehyde.

OPTION SR-8: Take immediate actions to prohibit or restrict the use of known hazardous substances	
2-260	Place the burden of proof, when deciding if chemicals should be banned or not, on the chemical producing companies to fully disclose the chemicals in their products and to adequately demonstrate that the chemicals and products are safe. California should not fail to act in the face of uncertainty to ban chemicals suspected of toxicity. Chemical companies should be required to fund independent research of the impacts of their products, not just research conducted by their own scientists. The research should address the effects of multiple chemicals—only testing chemicals in isolation will fail to address the real world impacts. Chemicals found to be harmful to people or wildlife should be banned or phased out. Research efforts should also include the monitoring of various species, especially amphibians and upper trophic level predators, to better understand what chemicals are already present in the environment and what their impacts are. Incentives should be instituted that encourage the production and use of products that do not contain toxic chemicals.
2-297	Phase-out or restrict hazardous chemicals and chemicals with inadequate safety data.
2-302	Act quickly to eliminate or restrict known chemicals for which we already have adequate data demonstrating that they cause serious harm from use in California and require safer alternatives when available.
3-1	Develop science-based criteria for determining whether a particular product is greener or safer than alternatives.
3-2	(a) Develop criteria for appropriate use of cosmetic pesticides and consider banning inappropriate use and (b) Ban the most toxic cosmetic pesticides via legislation/regulation; possibly create monetary incentives for new homebuilders to substitute non-toxic chemicals in landscaping or create more sustainable landscaping designs (i.e., drought tolerant landscaping, water conservation, plants indigenous to the region, etc).
3-8	Ban the use of single-use polystyrene and other plastic and non-biodegradable polymer materials in order to protect the natural environment for present and future generations, exercise environmental stewardship by reducing the amount of polystyrene and other non-biodegradable polymeric substances that enters our waste stream, storm drains, watershed and coastal environment.
3-11	(a) Include human health and environmental considerations, performance, cost, and feasibility in evaluating alternative materials and processes. (b) Provide positive incentives for green chemistry. (c) Use the Green Chemistry principles articulated by Anastas in evaluating alternatives.
3-13	Remove hazardous substances from electronic devices.
3-14	Adopt work standards for diacetyl.
3-15	Ban brominated and chlorinated fire retardants.
3-16	Prohibit the use of phthalates in children's products.
3-17	Reduce toxics in lighting waste.
3-18	Reduce lead content in drinking water pipes and fittings.
3-19	Reduce hazardous packaging.
3-20	Prohibit products containing diacetyl.
3-21	Prohibit PBDE chemicals.
3-23	Establish emission limits for composition wood treated with formaldehyde.
3-25	Prohibit toxic packaging materials.

OPTION SR-8: Take immediate actions to prohibit or restrict the use of known hazardous substances	
3-36	Impose restrictions on amounts of hazardous chemicals in products that are released to the environment over the life of the product. California could require elimination of certain compounds known to be hazardous from products, such as carcinogens, mutagens, reproductive toxicants, developmental toxicants, and chemicals that are persistent and bioaccumulative.
3-52	Using data on toxicity and use, prioritize chemicals into low, medium, high, and very high concern categories. Develop clear criteria for manufacturers and users of chemicals prioritized into very high, high, medium, and low concern.
3-53	Work with major users of chemicals of very high and high concern to reduce or eliminate their use of these chemicals in their products.
3-70	Take early action on bad actor chemicals directed toward eliminating impacts to the most sensitive populations including vulnerable humans and ecosystems/species.
3-72	Ban hazardous chemicals over time with a robust phase-out program including specific timelines by which users/producers must comply.
3-94	Use prohibitions of chemicals only when an unacceptable level of risk is identified that cannot be adequately mitigated or is not offset by benefits of the chemical.
3-95	Subject materials classified as persistent bioaccumulative toxicants, very persistent or bioaccumulative, carcinogens, mutagens, or reproductive toxicants to an environmental and human health risk assessment conducted by the producer or importer and reviewed by OEHHA.
3-138	Subject materials classified as PBT, vPvB, or CMR category 2 to risk analysis. If risk levels are judged too high, then industry should have the opportunity to introduce appropriate measures to reduce risk within a given time span, or face phase out of the material. Within a phase out strategy, the potential use of alternatives must address any risks associated with such substitution. It should not be acceptable to propose substitution by a material for which there is little data on its characteristics. Fundamentally, lack of data should not be rewarded.
4-1	Assess chemicals within the context of alternatives. Criteria for better or worse green products should be clear.
4-56	Develop a process for rapid removal of products found to be toxic by new studies that is fair to industry—state subsidized transformations.
4-85	Phase-out chemicals that harm human health or the environment or whose impacts are unknown.
4-93	Do not wait to take immediate action while developing a sound, long-term chemicals policy. Chemicals currently in use that are known to be unsafe should be restricted or eliminated.
4-127	Ban the sale and use of certain products (e.g., toilet additives) that contain formaldehyde or other similar biocides and require the use of safer substitutes (e.g., bacterial or enzyme based additives).
4-130	Avoid bans in the absence of safer alternatives, which should be technically feasible, improve health/safety/environmental profile, be of comparable or superior performance, cost-effective, and be capable of persistence. If safer alternatives are not available, resources should be devoted to research and development. Or, incentives should be provided to develop cost-effective alternatives.
4-131	Exclude novel R&D chemicals, used in relatively tiny amounts in highly controlled settings, from any consideration of a restriction or mandate. Exemptions should also be allowed for select pilot demonstrations and testing.

OPTION SR-9:	***Reduce or restrict the use of hazardous substances through use reduction measures, standards setting, process or engineering changes, and product stewardship initiatives.***
1-24	Do not focus exclusively on chemicals in products and chemical inputs. Manufacturing and production processes using chemicals should also receive attention in order to address health and safety concerns of workers - and to address community concerns for inherent safety of chemical-using or producing facilities.
1-77	Ensure that product stewardship and risk management programs have mechanisms to assure exposures remain in the safe region for typical uses and foreseeable misuses.
1-169	Provide education regarding the broad scope of “green chemistry” includes “green engineering,” and that it is not limited to simplistic hazard substitution. Moreover, a concerted effort to disseminate appropriate information on the accomplishments, best practices, costs, and benefits of “green chemistry” would help assure that all interested stakeholders understand the concept and limitations of the approach. Health and safety information should never be considered proprietary or confidential information.
1-201	The successful management of chemicals already in the marketplace according to their characteristics and actual uses, rather than simply banning substances. This focus recognizes the important difference between risk and hazard, i.e., that hazardous substances properly managed may not pose actual risks, and would create a system that is based on successful management of identified risks, as opposed to establishing prohibitions based on potential hazard.
2-27	Identify priority chemicals for toxics use reduction and create a list as targets for toxics use reduction.
2-29	Require businesses that use large quantities of toxic chemicals to annually report on the quantities of toxic chemicals used, and prepare and biennially update toxics use reduction plans.
2-30	Survey California businesses to provide information regarding each facility it owns or operates in the state, the full-time equivalent number of employees at that facility, and whether a listed substance is manufactured, processed, or otherwise used in a facility. The total quantity used statewide should be established as a baseline against which toxics use reduction progress can be measured.
2-37	Reduce marine debris via reduction and recycling.
2-72	Adopt an expansive view of green chemistry that includes not only substitutes, but also processes, "designing" molecules, and addressing all potential exposures.
2-87	Prioritize chemicals that should be restricted.
2-194	Require that companies have a chemicals management programs based on sound scientific risk assessment to protect human health and the environment.
2-195	Require appropriate use-restrictions for chemical ingredients when scientific safety-based assessments indicate that they cannot be used safely in a consumer product or use application.
2-196	Promote consumer awareness of the importance of reading and following label instructions for safe product use, storage, and disposal.
2-214	Take immediate action to reduce or eliminate the use of chemicals that are toxic, bioaccumulative, and persistent.
2-269	Require that companies that manufacture chemicals in or import chemicals into California have a management system that includes process and product safety elements and be subject to third party certification by representatives of a nationally recognized auditing Board. They should affirm to the state that the management systems are in place and that third party certification has occurred.

OPTION SR-9:	***Reduce or restrict the use of hazardous substances through use reduction measures, standards setting, process or engineering changes, and product stewardship initiatives.***
2-311	Implement protective regulations, including restrictions and bans on chemicals for which the weight of evidence demonstrates a severe hazard to human health and/or the environment.
3-2	(a) Develop criteria for appropriate use of cosmetic pesticides and consider banning inappropriate use. (b) Ban the most toxic cosmetic pesticides via legislation/regulation; possibly create monetary incentives for new home builders to substitute non-toxic chemicals in landscaping or create more sustainable landscaping designs (i.e., drought tolerant landscaping, water conservation, plants indigenous to the region, etc).
3-14	Adopt work standards for diacetyl.
3-17	Reduce toxics in lighting waste.
3-23	Establish emission limits for composition wood treated with formaldehyde.
3-27	Utilize any useful information developed by USEPA Design for the Environment program and work with industry and businesses to implement elements. These include: (a) Evaluate the human health and environmental impacts of its processes and products. (b) Identify what information is needed to make human health and environmental decisions (e.g., hazard characteristics data and identification of "safer" alternatives). (c) Consider cross-media impacts and the benefits of substituting chemicals. (d) Reduce the use and release of toxic chemicals through the innovation of cleaner technologies that use safer chemicals. (e) Reduce the use and release of toxic chemicals through the innovation of cleaner technologies that use safer chemicals. (f) Make products that can be more readily reused, refurbished, remanufactured, or recycled. (g) Monitor the environmental impacts and costs associated with each product or process. (h) Recognize that although change can be rapid, in many cases a cycle of evaluation and continuous improvement is needed. Partnerships with UC and CSUS could help implement these objectives. Incentives for applying these as core business practices might also help.
3-36	Consider imposing restrictions on amounts of hazardous chemicals in products that are released to the environment over the life of the product. California could require elimination of certain compounds known to be hazardous from products, such as carcinogens, mutagens, reproductive toxicants, developmental toxicants, and chemicals that are persistent and bioaccumulative.
3-38	Use EU REACH program as a model and do the following: (a) Register all chemicals in commerce in California and require a summation of the chemical properties, toxicity and hazard of each in order to be registered for use. (b) Develop a list of chemicals of concern based on usage and toxicity or hazard information. (c) Register products containing these hazardous materials including imported products and publish this information. (d) Require tiered sets of toxicity information according to usage, amounts produced/imported, or other indicators of exposure. (e) Eliminate the use and/or require strict regulation of use of highly persistent or bioaccumulative chemicals, carcinogens, mutagens, reproductive toxins developmental toxins, neurotoxicants, and any other compound capable of causing serious or irreversible harm. (f) Develop models to simulate exposure scenarios for common chemicals in common products to inform decisions on chemical management.

OPTION SR-9:	***Reduce or restrict the use of hazardous substances through use reduction measures, standards setting, process or engineering changes, and product stewardship initiatives.***
3-40	Work with industry to reduce toxics in products, and where that proves difficult because no safe alternative exists, California should require product take-back at no cost to the consumer. This shifts the physical and financial responsibility away from local governments and consumers back to the product manufacturer.
3-53	Work with major users of chemicals of very high and high concern to reduce or eliminate their use of these chemicals in their products.
3-73	Where no evidence exists for the safety of a chemical, restrict its use until safety can be comprehensively demonstrated.
3-102	In California's Green Chemistry Initiative, risk management efforts can involve a variety of approaches such as: substituting alternative input materials, making process changes during manufacturing, installing technological controls (e.g., pollution control equipment), requiring use of personal protective equipment, instituting a range of pollution prevention options, training, labeling, imposing various storage, transport and disposal requirements.
3-118	Establish a program to identify, assess, and manage priority chemicals based on an evaluation of hazard and potential for exposure. Move quickly by leveraging priorities identified in the Canadian Chemical Management Plan. Create a collaborative effort between California and Canada to accelerate progress in both geographies. Include a means for adding and deleting priority chemicals based on unique California circumstances. Leverage the recently assembled U.S. Inventory Update report to provide initial volume, use and exposure information. Identify uses and user industries for the high priority chemicals that raise the greatest concern. Expect producers of priority chemicals and manufacturers with high concern uses to provide hazard and exposure information on those chemicals/uses to the program. Provide the agency with authority and a due process to establish restrictions for uses of priority chemicals that have unacceptable risks.
3-128	Include process technology considerations as alternative chemistry is being evaluated. This technology can have a significant impact on minimizing potential adverse health or environmental effects of a chemical substance. Process technology can reduce both human and environmental exposures to chemicals, for example, through enclosed systems, recycling of by-products, and controlling potential environmental releases. Use of these process technologies can eliminate the need for substitution of critical raw materials.
3-129	Impose appropriate use restrictions for chemical ingredients when scientific safety-based assessments indicate they cannot be used safely in consumer product or use application..
3-134	Work with scientific experts to examine best practices and to develop a toolkit for safety assessment programs and for safety assessments. Companies also could make a description of their safety assessment process available on the Internet. This could help provide context for product ingredient communication.
3-138	Subject materials classified as PBT, vPvB, or CMR category 2 to risk analysis. If risk levels are judged too high, then industry should have the opportunity to introduce appropriate measures to reduce risk within a given time span, or face phase out of the material. Within a phase out strategy, the potential use of alternatives must address any risks associated with such substitution. It should not be acceptable to propose substitution by a material for which there is little data on its characteristics. Fundamentally, lack of data should not be rewarded.
3-139	Provide incentives to develop products with improved characteristics, e.g. non-PBT or polymeric chemical additives. Similarly, improved stewardship, such as driven by the BFR industry's Voluntary Emission Control Action Program (VECAP) should be encouraged and rewarded.
4-12	Identify specific industry sectors that generate the most toxic products and identify green production and processing for those sectors.

OPTION SR-9:	***Reduce or restrict the use of hazardous substances through use reduction measures, standards setting, process or engineering changes, and product stewardship initiatives.***
4-78	Seek continuous improvement to achieve the "greenest" or "safest" possible results; link standards to the best, safest available technology/chemical.
4-93	Do not wait to take immediate action while developing a sound, long-term chemicals policy. Chemicals currently in use that are known to be unsafe should be restricted or eliminated.
4-108	Provide Cal/EPA with the statutory authority to establish restrictions on uses of priority chemicals.
4-110	California should expect and encourage manufacturers of consumer and commercial products sold in California to employ comprehensive product safety management systems that include: (a) Assessments to ensure the safety of products prior to marketing; (b) Rigorous control of production from raw material specifications, to formulation management, to process and quality control; (c) Safe operations that protect the health and environment of employees and the surrounding community; (d) Compliance with all applicable product safety, labeling and regulatory requirements including transportation, waste management and product disposal; (e) Constant vigilance in post market surveillance with rapid response to identified concerns; (f) Innovation that improves product performance, value and environmental quality based on life-cycle considerations; (g) Transparency in communicating information about safety management systems and products; and, (h) Ongoing evaluation and improvement of systems performance.
4-134	If a significant risk is identified, consider a wide range of acceptable risk management options, including improving personal protective equipment and enhancing process technology controls to elimination of specific substances in favor of alternatives.
4-137	In implementing the green chemistry initiative, look at the chemical information that is already available. Make it clear that the Green Chemistry Initiative process will be governed by a risk-based science approach. Support an understanding of both the benefits and the burdens of new regulatory proposals. Consider process technology as part of a green chemistry program.
4-142	In addressing toxics in products by accident, identify a few key product areas, and work with the affected industry sectors to either promote existing standards (and many such standards already exist) or develop new ones.

OPTION SR-10: Expand the regulatory authority and funding for state programs.	
1-35	Develop a database of ingredients used in consumer products similar to the Skin Deep database that is currently available for cosmetics. In order to ensure accuracy, California would need the regulatory authority to regulate consumer products and to require disclosure of ingredients in consumer products.
1-119	Increase the budget for state agencies responsible for evaluating human and ecological risk, i.e. OEHHA.
1-163	Adopt the output of the Canadian Chemical Management Plan (based on Canada's categorization and prioritization of the existing chemical inventory) as a solid, scientifically sound foundation.
1-164	Take advantage of the August 2007 Montebello Agreement between the US, Canada, and Mexico, which will result in significant chemical evaluation work being completed in a relatively short timeframe. Use the upcoming work to be conducted by the US, Canada, and Mexico. This would clearly allow DTSC to save time and resources, while advancing the protection of health and the environment. It would also allow DTSC to be viewed as a global leader in integrating the Montebello evaluation outcomes into its own process.
1-168	Do not wait for the conclusion of the CGCI to engage in discussions with USEPA and the Canadian government on how the State can coordinate with and leverage those programs in support of the CGCI.
1-227	As part of the agreement signed in Montebello, the three countries agreed to share data, information and safety assessments so that all North Americans would have continued access to safe and effective products with improved sustainability and environmental quality profiles. With California's expertise at the table, collaborating with the agencies involved could accelerate the benefits of this effort across the North American region.
1-244	Assure sufficient funding is available to conduct the necessary process steps that lie ahead.
2-31	Establish fees on businesses that use toxic chemicals. Such fees should be used to fund agency toxics use reduction activities, including data analysis, and the provision of technical assistance.
2-122	Consider a bond act to provide funding.
2-135	Enact a California Toxic Substances Control Act (CAL TSCA), which would require all new chemicals to be tested for toxicity before they are marketed, as would all existing chemicals sold in the State; DTSC with assistance from OEHHA would evaluate the results. OEHHA should be given more resources to speed up its current evaluation process and to implement CAL TSCA. ARB authority should be expanded to forbid the use of aerosol products where there are greener alternatives, and of certain toxics determined under CAL TSCA as a threat.
2-167	Re-establish funding for Technology Development staff to review and validate the green chemistry/ green engineering performance claims made by companies seeking economic incentives in the form of grants, low interest revolving loans, and preferred equity funding – without the certification component. Look at USEPA Design for the Environment program.
2-178	Avoid California-specific data development requirements and pre-market approval process for chemicals or consumer products. Rather, DTSC should collaborate with other government efforts, such as Canada's Chemicals Management Plan and the Montebello Agreement between Mexico, Canada, and the US.
2-182	Ensure that chemicals regulated by other agencies are not subject to duplicative reporting and/or contradictory regulation.
2-274	Adopt the output of the Canadian Chemical Management Plan (based on Canada's categorization and prioritization of the existing chemical inventory) as a solid, scientifically sound foundation for a California program.

OPTION SR-10: Expand the regulatory authority and funding for state programs.	
3-50	Create legislation that includes chemicals used in personal care products under DTSC authority. Partner with Europeans who have been working on this.
3-79	Provide more funding for OEHHA to evaluate alternative chemicals to determine whether alternatives pose an unacceptable risk.
3-80	Expand ARB authority to apply to other types of products, not just aerosolized products, which would increase the ability to forbid the use of certain toxic chemicals in consumer products.
3-97	Expand ARB authority to apply to other types of products, not just aerosolized products, which would increase the ability to forbid the use of certain toxic chemicals in consumer products.
3-188	Re-establish program funding for DTSC Science Pollution Prevention and Technology Development group to review and validate the green chemistry/ green engineering performance claims made by companies seeking economic incentives in the form of grants, low interest revolving loans, and preferred equity funding.
3-189	Begin an immediate effort to ramp-up state capability for life cycle analysis (LCA). Unquestionably, one cannot envision competency in cradle-to-cradle techniques without enhanced in-house LCA capability.
4-64	Expand the budget of OEHHA to speed the evaluation of toxicity test results and determination of whether particular chemicals pose an unacceptable risk.
4-65	Grant greater regulatory authority and flexibility to ARB to regulate whole consumer product types and establish regulations based on the characteristics of existing safer and greener alternatives (e.g., allow ARB to establish VOC limits for aerosol deodorant and antiperspirant products based on the low or no VOC content of existing roll-on substitutes, effectively forbidding the use of aerosol products when a roll-on alternative is available).
4-72	Increase the number of inspectors in the field for retail products and food.
4-74	Build technical capacity in state agencies such as OEHHA in the use of QSAR (quantitative structure activity relationship) models; review and consider how these methods can be applied in identifying chemicals of concern as well as safer alternatives.
4-108	Provide Cal/EPA with the statutory authority to establish restrictions on uses of priority chemicals.

OPTION SR-11: Coordinate and harmonize laws and regulatory requirements with the federal government, other states, and other countries.	
1-7	Develop and use a "global approach." Work with other states, countries, and multiple organizations to ensure restrictions applicable to products are applicable to imports.
1-13	Realign and leverage with existing federal, state, and local mandated reporting activities to avoid duplication and waste of resources.
2-1	Harmonize chemical policy worldwide; avoid creating its unique requirements.
2-2	Harmonize state law with other states and countries.
2-8	Perform a comprehensive gap analysis at the outset to avoid duplicative and possibly contradictory regulatory actions (e.g. laws, existing databases, inventories, etc.).
2-9	Compile a comprehensive list of all reports that must be filed with federal, state, and local agencies, including the information and data submission requirements for each; determine whether current reports provide sufficient baseline information, and if additional information should be obtained.
2-46	Do not impede discovery through unnecessary legislation and regulation.
2-90	Harmonize its program with other leaders.
2-104	Streamline regulations.
2-124	Do not reinvent the process, as a whole new process could have a negative effect; study the Canadian list, EU REACH, and others to determine their usefulness and validity.
2-140	Leverage the Security & Prosperity Agreement between US-Mexico-Canada, not duplicate.
2-141	Evaluate elements of EU REACH and CEPA and choose those most relevant to California.
2-147	Collaborate with different agencies; government agencies should work together, as with in Canadian system.
3-39	Evaluate best practices for chemical management schemes pointed out in the April 2007 report entitled "Not That Innocent: A comparative analysis of Canadian, European, and United States Policies on Industrial Chemicals" by Richard Denison for application to a California Green Chemicals Policy.
3-42	Coordinate across agencies for a comprehensive green chemistry program and smooth implementation.
3-46	Evaluate what other states have done and utilize appropriate elements from those programs, including the Massachusetts Toxics Use Reduction Act, the Oregon Toxics Use and Hazardous Waste Reduction Act, and the Oregon Executive Order to reduce persistent, bioaccumulative, and toxicants.
3-65	Establish partnerships with states to create an interstate clearing house of environmental health and safety data.
3-92	Note that the US, Canada, and Mexico have now agreed to a program to screen thousands of chemicals to see if further research is necessary to protect human health. Follow work already being done in Canada prioritizing chemicals based on whether they show strong evidence of persistence, bioaccumulation, and toxicity. USEPA has ongoing projects with the domestic chemical industry to gather data about large volume chemicals and fill in necessary information gaps. California should piggy-back any new chemical policy onto these programs rather than try to create its own testing agenda.

OPTION SR-11: Coordinate and harmonize laws and regulatory requirements with the federal government, other states, and other countries.	
3-119	Organize this overall effort in a collaborative approach involving chemical producers, targeted users/industries, the agency and appropriate academic and other 3rd party experts. Engage with USEPA and the recently announced Canada-US-Mexico Montebello Agreement to avoid duplication and expedite action on priority chemicals in California and throughout North America..
3-125	Incorporate the work that will be developed as a result of the Montebello Agreement between the United States, Canada, and Mexico. The environmental agencies of the three companies will coordinate efforts to advance chemical assessment and management in North America.
3-132	Join and share expertise are part of the Montebello agreement to share data and assessments so that all North Americans would have continued access to safe and effective products with improved sustainability and environmental quality profiles.
3-151	Evaluate what regulations and information are currently available and whether these tools are being appropriately implemented and applied prior to developing new programs. Indeed, we expect this analysis is already underway, pursuant to the mandate to conduct a "baseline assessment" of existing programs and information described in the April 20 memorandum from Secretary Linda Adams announcing the Green Chemistry Initiative.
3-153	Build chemical data development efforts on existing statutory and regulatory structures, voluntary initiatives, and data development efforts, and collaboration by California in ongoing work by other government agencies to assess chemicals and consumer products. Leverage efforts by Health and Environment Canada in addressing priority chemicals in the Chemicals Management Plan. California could also participate in the Security and Prosperity Partnership (SPP) under the Montebello Agreement involving trilateral cooperation among the governments of Canada, the United States and Mexico to share chemical information and safety assessments.
3-158	Conduct a detailed, comprehensive assessment of existing chemical toxicity reporting and data availability programs and ensure access to those data as applicable to California. Assurances of some measure of formulation confidentiality would encourage producers and manufacturers to make toxicity and use data available.
3-167	Establish a California-specific chemical evaluation process to identify uses of concern for priority chemicals that were not on the original CEPA categorization process or that will not be addressed under the Montebello Agreement in the timeframe required. The process should utilize a tiered approach, in which chemicals and their uses are prioritized for further evaluation. The process should also utilize risk-based screening and should focus on potential "data needs" versus "data gaps". Producers and users of identified priorities should be engaged in a collaborative process to bring hazard, use and exposure information to improve decision-making. As California proceeds with its process, it should leverage information already generated or that will be generated under regulatory or voluntary chemical evaluation programs. California must be transparent in the processes used to make risk evaluation and risk management decisions.
3-177	Consider all existing programs that regulate chemicals. As each of these specific program elements and specific data requirements is evaluated for purpose and benefit, a shorter list can be compiled of specific program elements that should be examined more closely. Additionally, gaps in programs that could lead to exposures that could give rise to unacceptable levels of risk should also be noted. The objective of this review is to focus further efforts on those topics where risks are not now managed at an acceptable level.
4-62	Make a baseline assessment of chemical information that is already available to the state.
4-81	Negotiate a data sharing agreement between the state (likely through Cal/EPA) and the European Union so that the state can access the data submitted under EU REACH.

OPTION SR-11:	***Coordinate and harmonize laws and regulatory requirements with the federal government, other states, and other countries.***
4-83	Evaluate whether the agencies that implement EU REACH and CEPA could be identified as authoritative bodies under Proposition 65 so that the information generated under these programs could be directly used by California to identify chemicals as known to cause cancer or reproductive/developmental toxicity.
4-103	Assess opportunities to enhance the level of cooperation and coordination between Cal/EPA and USEPA, and with international agencies.
4-136	Participate in the effort launched in August during the Security and Prosperity Partnership (SPP) with under the Montebello Agreement involving trilateral cooperation among the governments of Canada, the United States and Mexico to share chemical information and safety assessments.

OPTION SR-12: Establish metrics to assess the effectiveness of chemical management strategies implemented.	
1-214	In order to assess the performance of these programs and measure the impact of these reforms, monitor metrics that will assess releases of chemicals to the environment and exposure to humans.
1-123	Develop and adopt green chemistry performance indicators and metrics with a commitment to transparency and proactive responses to new information. This would provide a method for evaluating the success of green chemistry measures and whether changes are needed.
1-178	Develop and adopt green chemistry progress metrics with a commitment to transparency and proactive response to new information on any risk or benefit posed by chemicals.
1-234	Develop metrics and demonstrate cost-effectiveness, long-term benefits, health impacts, environmental impacts, etc.

Chapter 4—Voluntary Measures Options

Advancing green chemistry through non-regulatory approaches

SYNOPSIS

Given the complexity of many of today's environmental challenges, effective environmental policy often draws upon a variety of tools and approaches—from voluntary to the mandatory actions. A comprehensive green chemistry policy could be formulated using a combination of these tools, which include economic incentives, information, technical assistance, command-and-control approaches, and voluntary programs. At the same time, stakeholders questioned whether voluntary measures were sufficient, some offering criticism and others suggesting voluntary measures be balanced by mandated requirements.

Voluntary measures to develop chemical information, reduce chemical use, and find safer substitutes were mentioned often by stakeholders as part of the Conversation with California. They proposed 48 discrete options for non-regulatory approaches that could advance green chemistry. These are organized here into two main categories: (1) those that call for an evaluation of existing programs that could serve as models for California and (2) other options that were more specific, primarily involving public-private partnerships. Voluntary measures represented roughly 3% of the total number of comments submitted.

BACKGROUND

There are a number of voluntary programs in place, both in government and industry, which reduce chemical use or encourage the use of safer chemicals. Voluntary or non-regulatory approaches can:

- Help reduce program implementation costs for government;
- Allow a greater degree of flexibility and motivation for innovation; and,
- Accelerate achievement of desired outcomes.

An exhaustive review of existing voluntary programs for environmental protection was not conducted during the Conversation with California. Rather, participants highlighted those programs that they thought are relevant to a particular green chemistry topic in their detailed comments. Within Cal/EPA, several programs seek environmental improvement through cooperative, non-regulatory means; these include:

- Pollution prevention: DTSC works with selected industry sectors each year to develop and implement pollution prevention programs. These programs include best practices, waste reduction, self-monitoring, and other actions which businesses in a given sector can take. Similar programs administered by USEPA (Design for the Environment, High Production Volume Challenge, and other programs), the military, and others were also highlighted.

- Technology advancement: The California Energy Commission, ARB, CIWMB, and other state departments collaborate with research institutions, federal agencies, and industry—generally through joint funding arrangements—to develop, test, and use better technologies. These programs, while small, focus strategically on innovative processes

and equipment that is more energy and resource efficient and more effective in controlling pollution.

DISCUSSION OF OPTIONS

OPTION VM-1:	***Evaluate existing voluntary programs that can serve as models for the California Green Chemistry Initiative.***

Many businesses have put processes in place to screen chemicals prior to use in products and in manufacturing processes. Participants pointed out that businesses are interested in ensuring the safety of their products and their workplaces. During the "Conversation with California," a number of individuals and companies described some of the voluntary programs related to green chemistry.

Several stakeholders felt California should identify, evaluate, and encourage existing voluntary programs, both in the private and government sectors. They listed chemical and product stewardship, safety, and environmental programs in private industry. For example, several commenters noted the American Chemistry Council's Responsible Care program, which includes evaluations of chemical products and their uses to assure that they deliver their intended benefits while protecting public health and the environment, and a management system certified by third-party auditors. At the federal level, USEPA has promoted green chemistry and sustainability through its voluntary programs recently, as have industry groups. DTSC's Pollution Prevention program has operated for nearly a decade as a voluntary program aimed at reducing hazardous waste and offering safer chemical substitutes to large and small business sectors.

More specifically, stakeholders wrote that California should recognize the value and role of industry stewardship programs, and create incentives or otherwise encourage these and other entities to resume or adopt these programs. Participants suggested that California could identify voluntary programs, including the:

- American Chemical Council Responsible Care Program,[20/]
- joint USEPA-industry High Production Volume Challenge Program,
- American Chemical Society Green Chemistry Institute,
- Consumer Specialty Products Association's Product Care program, and
- BFR Voluntary Emission Control Action Program.

Participants recommended that the State review their effectiveness and determine whether one or more of these programs can serve as models green chemistry. As part of this evaluation, they said, the state could survey California businesses to determine what strategies they use to implement environmental management systems. An advisory panel of business and industry representatives could be convened to provide input to this assessment. Voluntary measures could be part of an overall strategy, along with other regulatory measures where necessary.

OPTION VM-2:	***Encourage Public-Private Partnerships among Government, Universities, and Industry, and between Industries and Manufacturers.***

Many stakeholders strongly urged California to promote and encourage partnerships and other forms of collaboration between government and industry, between manufacturers, and even between international concerns.

We received both general and specific advice on how to encourage collaboration. Some stakeholders urged working directly with major users of chemicals of high concern to eliminate or reduce the use of these chemicals in their products, while others suggested encouraging public and private partnerships across disciplines and institutions to develop greener products and ingredients. This was echoed by a suggestion that government, industry, and third party experts work together to identify or develop viable alternatives that will sustain efficacy but reduce risk in their targeted applications.

One stakeholder proposed tapping federal programs, such as the USEPA Design for the Environment program, for useful information to be shared with California's industries, possibly establishing partnerships with the University of California and the California State universities to help implement "design for the environment" principles. Several stakeholders advocated that California collaborate with Canada and their Chemicals Management Program as well as participate in the Security and Prosperity Partnership (SPP) under the Montebello Agreement.

Some stakeholders offered very specific advice on collaboration, such as:

- Work with scientific experts to develop a toolkit for safety and chemical assessment programs;
- Encourage companies to work together to identify "beyond MSDS" information needs along the supply chain, and establish processes to communicate those needs;
- Work with industries to provide consumers with ingredient information;
- Provide assistance to small manufacturers and encourage pooling of resources;
- Develop international technology exchanges;
- Work with other state agencies to develop and share information on green purchasing;
- Partner with the University of California to review new products;
- Expand education and training programs through partnerships with industry; and
- Partner with other states to create an interstate clearing house of environmental safety and health data.

Some voluntary measures that were mentioned included 'mentoring' ideas, where companies with established chemical use reduction or safer alternatives programs could share their experiences and assist smaller or other companies that are not so far along in implementation. Finally, one stakeholder proposed establishing a Green Chemistry Coordination Council to collect and promote the sharing of information, highlight businesses with green practices, provide assistance to businesses lacking resources, and educate consumers.

OPTION VM-3: The Debate—Voluntary, Regulatory, or Both?

Underlying much of the discussion in the Conversation with California was the question whether using safer chemicals and chemical manufacturing processes could be achieved by voluntary measures (including incentives such as recognition and economic incentives) or whether California should adopt a regulatory framework to attain green chemistry goals.

Some stakeholders adamantly argued against regulation, supporting rather innovation through incentives and partnerships. Others argued for a balance between the two approaches. The same stakeholder, for example, who proposed recognition for early adaptors and outstanding achievements in green chemistry, also recommended this be complemented with regulatory measures to meet public expectations for safe chemical management. Similarly, another stakeholder called for voluntary collaboration with regulatory clout to eliminate or minimize hazards while simultaneously promoting innovation and substitution.

Direct criticism of voluntary measures was also stated. Using the USEPA High Production Volume challenge as an example, commenters maintained that, because the program is voluntary, USEPA and others have very limited ability to gain high quality or complete data from industry—even after identifying deficiencies in what industry has submitted. Some stakeholders noted that voluntary measures may only affect a small fraction of all consumer products or businesses. They pointed out that consumers will still be able to buy many unsafe products, or products for which little health or environmental information is available, and that non-participating businesses will still be able to use and release highly toxic chemicals.

CHAPTER TEAM

The following Green Chemistry team staff members served as principal editors for this chapter:

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The team compiled each of the comments relating to voluntary measures for green chemistry. They organized the comments that stakeholders made during the Conversation with California. The chapter team worked closely with the overall team, whose members are given in the Acknowledgements. The references for each of the three major options summarized in this chapter are presented in the next section of this report.

REFERENCES

The tables below cross-reference each option to Appendix B. The figures shown in the first column represent the "challenge area" and the option number.

OPTION VM-1: Evaluate existing voluntary programs that can serve as models for the California Green Chemistry Initiative.	
1-21	Foster "Reduce Energy/ Resource Consumption" through take back programs.
2-13	Identify voluntary programs (USEPA Industry HPV Challenge Program, etc.), program requirements, number of participants, sectors represented and effectiveness.
2-14	Survey a statistically significant sample of California businesses to determine if they have adopted strategies or programs to implement environmental management systems; convene a chemical business and industry stakeholder or advisory panel.
2-98	Recognize the value and role of industry stewardship programs (e.g., American Chemistry Council's Responsible Care, which includes evaluations of chemical products and their uses to assure that they deliver their intended benefits while protecting public health and the environment, and a management system certified by third-party auditors). Create incentives for others to take similar steps.
3-27	Utilize any useful information developed by USEPA Design for the Environment program and work with industry and businesses to implement elements. These include: (a) Evaluate the human health and environmental impacts of its processes and products. (b) Identify what information is needed to make human health and environmental decisions (e.g., hazard characteristics data and identification of "safer" alternatives). (c) Consider cross-media impacts and the benefits of substituting chemicals. (d) Reduce the use and release of toxic chemicals through the innovation of cleaner technologies that use safer chemicals. (e) Reduce the use and release of toxic chemicals through the innovation of cleaner technologies that use safer chemicals. (f) Make products that can be more readily reused, refurbished, remanufactured, or recycled. (g) Monitor the environmental impacts and costs associated with each product or process. (h) Recognize that although change can be rapid, in many cases a cycle of evaluation and continuous improvement is needed. Partnerships with UC and CSUS could help implement these objectives. Incentives for applying these as core business practices might also help.
3-139	Provide incentives to develop products with improved characteristics, e.g. non-PBT or polymeric chemical additives. Similarly, improved stewardship, such as driven by the BFR industry's Voluntary Emission Control Action Program (VECAP), should be encouraged and rewarded.
3-165	Recognize and encourage product stewardship programs, which are designed for better management of the supply chain and continually minimize a chemical's impact.
4-95	Review the Consumer Specialty Products Association's Product Care program as a model stewardship program in which consumer and institutional specialty product companies have agreed to go beyond government regulations in emphasizing health.
4-97	Review the ACC Responsible Care program as a model for reducing potential hazards which includes a rigorous EHS&S management system that is certified by third-party auditors.

OPTION VM-2:	***Encourage public/private partnerships among government, universities, and industry, and between industries and manufacturers.***
1-2	Develop a partnership with academia and establish a research program.
1-9	Foster outreach and education through partnerships to stakeholders.
1-14	Establish a product safety organization or partnership with the University of California to develop a checklist for review new products.
1-82	Look at other industries and partnership (e.g. the military "green munitions" program) in order to make information and tools available for green chemistry.
1-116	Encourage greater collaboration and partnership across disciplines and institutions to increase overall knowledge. For example, consider the model of how pharmaceutical companies make decisions on which chemicals are too hazardous to pursue.
2-41	Look at the Pollution Prevention (P2): Design for the Environment Program.
2-55	Examine ways to expand education and training programs for students and chemists through partnerships with industry.
2-67	Collaborate with the University of California, state agencies, and industry.
2-111	Create a partnership between state government, industry, the public, etc.
2-147	Collaborate with different agencies, i.e. government agencies should work together, as in the Canadian system.
2-184	Develop pilot applications in close collaboration with key stakeholders to test various green chemistry policy options.
2-197	Support collaborative efforts to encourage public and private partnerships to develop "greener" products and "environmentally responsible" ingredients.
2-208	Establish partnerships with other states to create an interstate clearing house of environmental safety and health data
2-258	Include the following policy elements to further Green Chemistry in California: (a) Strengthen the recognition and pursuit of green chemistry processes and products by establishing clear criteria and voluntary certification based on comprehensive lifecycle considerations. (b) Explore models to provide needed chemical hazard data throughout the supply chain. (c) Establish a Green Chemistry Coordination Council to collect and promote the sharing of information, highlight businesses with green practices, provide assistance to businesses lacking resources, and educate consumers. (d) Prioritize chemicals for screening, testing and appropriate restrictions. (e) Invest in pollution prevention in the short term as well as extension of the current state pollution prevention model to downstream chemical users. (f) Continue the Conversation with California to sustain progress in Green Chemistry.

OPTION VM-2:	***Encourage public/private partnerships among government, universities, and industry, and between industries and manufacturers.***
3-27	Utilize any useful information developed by USEPA Design for the Environment program and work with industry and businesses to implement elements. These include: (a) Evaluate the human health and environmental impacts of its processes and products. (b) Identify what information is needed to make human health and environmental decisions (e.g., hazard characteristics data and identification of "safer" alternatives). (c) Consider cross-media impacts and the benefits of substituting chemicals. (d) Reduce the use and release of toxic chemicals through the innovation of cleaner technologies that use safer chemicals. (e) Reduce the use and release of toxic chemicals through the innovation of cleaner technologies that use safer chemicals. (f) Make products that can be more readily reused, refurbished, remanufactured, or recycled. (g) Monitor the environmental impacts and costs associated with each product or process. (h) Recognize that although change can be rapid, in many cases a cycle of evaluation and continuous improvement is needed. Partnerships with UC and CSUS could help implement these objectives. Incentives for applying these as core business practices might also help.
3-53	Work with major users of chemicals of very high and high concern to reduce or eliminate their use of these chemicals in their products.
3-60	Advance the science by developing, road-testing and sharing new toxicology testing methods and strategies that account for endocrine disruption, developmental neurotoxicology, timing of exposure, toxicogenomics, etc, including high throughput screening methods. Collaboration with the federal government and universities is important.
3-121	(e) Expect and encourage manufacturers of consumer products to communicate information about the ingredients in products, either on the package or on the internet at the manufacturer's discretion and with appropriate provisions for protection of Confidential Business Information. (f) Expect and encourage chemical and product manufacturers to update their MSDS document to the new 16-section ANSI standard and to reflect the latest hazard information from voluntary (e.g. HPV) and regulatory (e.g. Canada CMP) programs. (g) Encourage companies in important value chain sectors to work together to identify "beyond MSDS" information needs both upstream and downstream and to establish processes for communication to meet those needs. (h) Leverage California's capability and interest to assemble a chemical information system on hazard, use, and exposure from global sources.
3-127	Rather than imposing regulatory burdens, promote innovation through green chemistry with positive incentives and partnerships. Green Chemistry should be encouraged through the sharing of expertise, financial support for research, information exchange, and public education. Incentives could be offered for companies to pursue and foster Green Chemistry and Green Engineering.
3-130	Push collaborative efforts to encourage public and private partnerships, with a goal of developing greener products and environmentally responsible ingredients based on life-cycle considerations, rather than mandatory and voluntary state labeling programs that endorse green products or programs that stipulate a single third-party certification of green products or numerical ranking.
3-131	Collaborate with the Canadian government not only on the priority list of chemicals but the program in general. In our opinion, this collaboration would avoid needless duplication, inefficiencies, and burdens, as well as take advantage of credible, high-quality scientific work already completed.
3-133	Work with affected industries to implement a means of ingredient communication that would provide consumers with the information they can use to make even better informed decisions regarding the products they use in their homes.

OPTION VM-2: Encourage public/private partnerships among government, universities, and industry, and between industries and manufacturers.	
3-134	Work with scientific experts to examine best practices and to develop a toolkit for safety assessment programs and for safety assessments. Companies also could make a description of their safety assessment process available on the Internet. This could help provide context for product ingredient communication.
3-153	Build chemical data development efforts on existing statutory and regulatory structures, voluntary initiatives, and data development efforts, and collaboration by California in ongoing work by other government agencies to assess chemicals and consumer products. Leverage efforts by Health and Environment Canada in addressing priority chemicals in the Chemicals Management Plan. California could also participate in the Security and Prosperity Partnership (SPP) under the Montebello Agreement involving trilateral cooperation among the governments of Canada, the United States and Mexico to share chemical information and safety assessments.
3-155	Engage in collaborative efforts to encourage public and private partnerships with the goal of developing "greener" products and "environmentally responsible" ingredients rather than mandatory and voluntary state labeling programs that endorse green products or programs that stipulate a single third-party certification of green products.
3-185	Note that numerous opportunities exist to reclaim process streams that may require refining (i.e. distillation, filtration, etc) prior to recycling the material back into the same process. The Chemical Industry Council of California and DTSC have embarked on a partnership to promote voluntary pollution prevention and reduce waste. CICC is eager to work with DTSC to implement regulations allowing more flexibility for generators to reclaim streams onsite without having to go through tiered permitting or Part B Permit. CICC recommends that we work collaboratively with DTSC to fix this problem and reduce waste generation.
4-32	Provide assistance to small manufacturers and encourage pooling of resources to improve safeguards and quality control on inputs.
4-35	Develop international technology exchanges between companies to capture knowledge on how to successfully mass-produce products using less toxic alternatives.
4-43	Work with other state agencies, including DGS, to develop information on green purchasing and disseminate this information to other government agencies, including county and city level, as well as private businesses.
4-98	Consider a wide range of incentives to motivate changes in the behavior of industry and/or consumers: Production tax credits; Rebates to consumers or business; Investment tax credits; R&D tax credits; R&D grants; Equipment grants; Loans or loan guarantees; Public infrastructure development; Government support to deploy environmentally preferred products or technologies; Public/Private partnerships; Employee training and workforce development; CEQA exemption on qualified projects or other regulatory relief and special status once qualified (Fast track permits; Environmental Leaders programs) or other expedited permitting programs; Government preferred purchasing or government sponsored preferences; Government specified product standards; Use of consensus standards; Use of third party standards and certification; Product labeling programs; Web based consumer information
4-132	Use the collaboration between industry, state government, and a third party expert in identifying solvent substitutes under SB 14 as a model. Take the following approach: 1) consider chemicals of top priority concern, 2) identify the specific applications or industry uses posing the greatest risk from those chemicals, and 3) apply a collaborative process of agency, industry and third-party experts to identify or develop viable alternatives that can maintain efficacy, but reduce risk in those targeted applications.
4-136	Participate in the effort launched in August during the Security and Prosperity Partnership (SPP) with under the Montebello Agreement involving trilateral cooperation among the governments of Canada, the United States and Mexico to share chemical information and safety assessments.

OPTION VM-3: The Debate: Voluntary, Regulatory, or Both?	
1-3	Foster participation in development of innovative alternatives through incentives for stakeholders. Do not regulate.
1-100	Because the HPV Challenge is voluntary, USEPA has very limited ability to ensure that the data submitted by sponsors are of high quality and complete. While USEPA and other commenters have often identified deficiencies in initial submissions, there is no legal or binding obligation on the part of sponsors to heed those comments.
1-177	Voluntary collaboration with regulatory clout will support a green chemistry infrastructure to eliminate or mitigate hazard while promoting innovation and substitution.
1-179	Pursue enforcement efforts in two directions: voluntary with incentives and regulatory to dictate changes. The California Green Chemistry Initiative should leverage voluntary industry efforts to create better alternatives to high hazard substances, to mitigate risk and to make full use of market-based incentives. Recognition should be given for early adaptors and/or outstanding achievements in green chemistry. These would then be complemented by regulatory compliance to meet public expectations for safe chemical management.
1-181	Develop a technical center of excellence in green chemistry as a key element of the California Green Chemistry Initiative. The center would be available to provide technical assistance, lead development of a green chemistry curriculum for undergraduate and graduate programs, and conduct state- of- the-art research on green chemistry innovations.
1-189	Build on existing statutory and regulatory structures, voluntary initiatives, and data development efforts.
2-185	Encourage voluntary industry efforts to create better alternatives to high hazard substances, to mitigate risk and to make full use of market- based incentives. Recognition should be given for early adaptors and/or outstanding achievements in green chemistry. These would then be complemented by regulatory compliance to meet public expectations for safe chemical management.
3-127	Rather than imposing regulatory burdens, promote innovation with positive incentives and partnerships. Green Chemistry should be encouraged through the sharing of expertise, financial support for research, information exchange, and public education. Incentives could be offered for companies to pursue and foster green chemistry and green engineering..
3-153	Build chemical data development efforts on existing statutory and regulatory structures, voluntary initiatives, and data development efforts, and collaboration by California in ongoing work by other government agencies to assess chemicals and consumer products. Leverage efforts by Health and Environment Canada in addressing priority chemicals in the Chemicals Management Plan. California could also participate in the Security and Prosperity Partnership (SPP) under the Montebello Agreement involving trilateral cooperation among the governments of Canada, the United States and Mexico to share chemical information and safety assessments.
4-94	Develop a robust framework for regulating chemicals to accompany incentives for the development of greener chemicals and technologies; voluntary programs alone are not sufficient.

Chapter 5—Education and Outreach Options

Increasing public awareness and enhancing academic programs to advance green chemistry

SYNOPSIS

Numerous comments were submitted by stakeholders expressing the need for education and outreach on green chemistry. This chapter summarizes the 164 options that could increase the knowledge base and enable chemical users and consumers (i.e., the public) to be active participants in advancing green chemistry in California. The three options summarized in this chapter focus on:

- Augmenting science curriculum for kindergarten through grade 12;
- Expanding academic programs in institutions of higher education; and,
- Providing clear and meaningful information to consumers and the public.

Options regarding education and outreach include those designed to reach school-age children, university students, consumers, and the public. The options summarized in subsequent sections further detail stakeholders' recommendations to:

- Cultivate, through education, an understanding of basic principles of chemistry, toxicology, environmental sciences, and sustainability;
- Foster an interest in careers in science, engineering, and other relevant disciplines;
- Build, through academic training at institutions of higher learning, a workforce equipped with the scope and breadth of knowledge and skills to advance green chemistry, and an intellectual environment that catalyzes the development of new ideas and technological innovations; and,
- Develop a well-informed citizenry capable of actively engaging in demanding and supporting green products and processes, and avoiding unsafe chemical use and disposal practices.

Education and outreach represented roughly 11% of the total number of comments received throughout the Conversation with California.

BACKGROUND

In the last few years, under various statutes, California has initiated a program to incorporate environmental principles and concepts into the State's curriculum and standards for K-12 public schools. This program, known as the Education and the Environment Initiative (EEI), promotes unified, comprehensive curriculum that includes multiple environmental themes—such as water, air, waste, energy, etc. An Office of Education and the Environment (which is housed within the California Integrated Waste Management Board [CIWMB]) coordinates the EEI program, develops curriculum units for K-12 grades in science, mathematics, language arts, etc. Several stakeholders suggested that the State include green chemistry concepts in the EEI units for science education.

Existing law (Health and Safety Code section 25170) requires DTSC to maintain a toll-free "Toxic Substances Hotline," to provide information on toxic substances to the regulated community and the public. Existing law also requires that DTSC develop and implement training and education for generators of hazardous wastes. That includes the general public. The program is designed to increase awareness of and compliance with hazardous waste management requirements. As part of outreach efforts, DTSC prepares fact sheets which are available to consumers as well as businesses.

In addition, DTSC—along with other regulatory entities in state and local government—proactively solicit stakeholder input and participation by providing free information to and from the community, as well as identifying and considering community concerns related to projects and the management of hazardous wastes.

Other participants also noted existing "right to know" programs, such as the federal Toxics Release Inventory and the California Proposition 65 program. They said these programs are aimed at providing consumers and citizens some information about hazardous chemicals.

DISCUSSION OF OPTIONS

OPTION EO-1: Augment the science curricula for kindergarten through grade 12 with age-appropriate content related to green chemistry.

Numerous stakeholders indicated that cultivating a basic understanding of concepts in chemistry, toxicology, environmental sciences, and sustainability is essential to transform how the next generation, their parents, teachers, and school administrators view and use science in making everyday decisions that reflect environmentally preferable choices. Additionally, incorporating these principles into the science curricula would foster interest and inspire students to pursue higher education and careers in these areas.

Stakeholders recommended curriculum augmentation with close collaboration between the Department of Education, other educational professionals, and technical experts. So as not to compromise academic advancement, stakeholders suggested compliance with existing Academic Performance Index requirements (and other legal requirements imposed on schools) for annual improvements in reading fluency and mathematical computations. Further, programs for K-12 should focus on scientific literacy to better prepare young consumers and leaders for the future. Depending upon the complexity and extent of the content, specific modules or teacher training may be necessary.

Stakeholders suggested a directive from the governor or specified funding for augmenting the K-12 curriculum to ensure uniformity throughout the state. Some stakeholders suggested expanding the existing outreach and education programs within Cal/EPA and its BDOs to explicitly include Green Chemistry. The Education and the Environment Initiative[21] (EEI), which is aimed at developing a unified strategy on education about the environment in California's primary and secondary schools was specifically cited. The program is administered by the CIWMB, the State Board of Education, the Office of the Secretary for Education, the Curriculum and Supplemental Materials Commission, the State Department of Education, and the California Resources Agency.

Additional recommendations to reduce associated costs to state and local government included collaborative efforts with nonprofit organizations, foundations and businesses that invest in K-12 education as part of their public outreach or corporate communications mandate. These entities could provide access to expertise, resources, promotional opportunities, or endorsements. Junior Achievement for example is an organization whose mission is to inspire and prepare young people to succeed in a global economy. Businesses that develop, market, or sell educational materials could also defray costs; hence, opportunities that enable them to promote and sell products that have been deemed credible and effective by the State (or other designated authority) could be explored.

OPTION EO-2:	***Establish or enhance academic programs at colleges and universities to supply the technical expertise and advanced designs needed to promote an environmentally sustainable economy.***

Stakeholders agreed that higher education is essential to advancing the State's environmental, economic, social and cultural well-being. They said the role of higher education is two-fold: (a) educating and training graduates with the necessary expertise and skills to enter the workforce and (b) stimulating discovery, new ideas, and inventions through its research programs. Numerous recommendations were made to re-evaluate accreditation requirements to ensure that degrees in chemistry, environmental sciences, and relevant engineering fields require coursework relevant to green chemistry. Participants also suggested that degrees in other fields of study cover green chemistry topics at the appropriate level of detail. Stakeholders further agreed that to advance a green economy a diverse workforce consisting of professionals who have the rigorous academic training in their respective areas of expertise, and an understanding of chemistry, toxicology, public health, environmental sciences, and policy in necessary.

Numerous recommendations to stimulate innovation through product and technology development through the colleges and universities were made. Such strategies could include international exchange programs for students and professionals, scholarships, and funding for technology development.

Stakeholders recommended collaboration between academia, government, and industry to effectively exchange new ideas and emerging technologies, offset research and development costs, and train personnel. These partnerships could expedite the development and commercialization of new, environmentally preferable technologies, help create, attract, and fill jobs, as well as boost California's economy.

OPTION EO-3:	***Facilitate public access to clear and objective information to enable informed choices.***

Many stakeholders noted that consumers, through their purchasing power, play a vital role in driving the demand for products and consumer goods that are manufactured and placed in the market. Further, an increase in consumer awareness and understanding of their role is essential in creating a more sustainable future. (See also Chapter 2, Economic Incentives.)

Commenters made numerous recommendations about alternatives that government and industry can collectively undertake to ensure that consumers are well informed about the products that they consume. They said education and outreach for consumers and the public must:

- Provide clear and unbiased information and
- Increase the consumer understanding of the relevance and connection between the products they use and their impact on their own health, and the local and global environment.

Recommendations for consumer education ranged from simple pamphlets to the more sophisticated educational television programs through partnerships with Hollywood and Public Television. Other forms of consumer education and outreach included: brochures and materials distributed through local forums; public relations messages through news releases; web-based information; and commercials on mass media such as television, radio or billboard messages; and product labels with specific mandated information.

Some participants suggested that funding for consumer outreach programs could be appropriated by the Legislature or incorporated into existing efforts (such as "Flex Your Power"). Alternatively, others suggested that direct raw material taxes or taxes on consumer goods and product manufacturing could support outreach efforts.

CHAPTER TEAM

The following Green Chemistry team staff members served as principal editors for this chapter, Data Collection and Use:

Peggy Harris, DTSC
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The team compiled each of the comments relating to education and outreach. They organized those comments from the Conversation with California. The chapter team worked closely with the overall team, whose members are given in the Acknowledgements. The references for each of the three major options summarized in this chapter are presented in the next section of this report.

REFERENCES

The tables below cross-reference each option to Appendix B. The figures shown in the first column represent the "challenge area" and the option number.

OPTION EO-1:	***Augment the science curricula for kindergarten through grade 12 with age-appropriate content related to green chemistry***
1-2	Develop a partnership with academia and establish a program.
1-9	Foster outreach and education through partnerships to stakeholders.
1-14	Establish a product safety organization or partner with the University of California to develop a checklist for review new products.
1-32	Teach green chemistry and green design at schools.
1-156	Encourage C2C curriculum (K-12 and post-secondary).
1-182	Promote public education and awareness of chemicals used in commerce and the principles of green chemistry. Programs addressed to consumers or primary (K-12) education should focus on scientific literacy to create a broader understanding of the costs and benefits of both chemicals policy and product innovation. These programs should provide the foundation for effective communication using product labels, hazard warnings, etc., and other policy options.
1-190	Recognize education plays a key role in effective decision-making, uncovering innovations, and training the next generation of society's leaders in science, business, health, and public policy. With a topic like green chemistry, where effective decisions will require collaborative approaches and solutions not yet imagined, education needs to play a key role. Green chemistry requires integrated, systems approaches and knowledge on a broad range of topics. For example, chemists need an understanding of toxicology, while policy makers need to understand business processes and markets to develop efficient and effective policies. Successful implementation of green chemistry requires a level of collaboration not often taught or practiced today.
1-191	Use the National Science Resources Center and its Science and Technology for Children® (STC®) program, which is a comprehensive, researched-based K-6 science curriculum consisting of 24 instructional units that explore the life, earth, and physical sciences and technological design.
2-25	Expand green chemistry curriculums from middle school through post-secondary education.
2-59	Recognize that education and training—at various levels including, but not limited to, K-12 programs—is critical to advancing green chemistry.
2-121	Incorporate into K-12 education and the Education and the Environment Initiative (EEI).
2-188	Promote public (including K-12) education and awareness of chemicals used in commerce and the principles of green chemistry. Programs should focus on scientific literacy and effective communication on using product labels, hazard warnings, etc.
2-249	Provide universal training in green chemistry starting in K-12 education and development of a curriculum to train our future scientists. Data gaps should be identified and filled and we should create a usable info depot/clearing house to make the system consumer friendly
2-312	Make educational programs a key component of its Green Chemistry Initiative, considering the full range of educational opportunities: sponsored research, collaborative grants, modules for courses K-12 and at the university level, programs to educate consumers, media and policy makers.

OPTION EO-1: Augment the science curricula for kindergarten through grade 12 with age-appropriate content related to green chemistry	
3-60	Advance the science by developing, road-testing and sharing new toxicology testing methods and strategies that account for endocrine disruption, developmental neurotoxicology, timing of exposure, toxicogenomics, etc, including high throughput screening methods. Collaboration with the federal government and Universities is important.
3-96	Schools (primary, secondary, and colleges and universities) as the trainers of tomorrow's leaders and the institutions conducting foundational research, should play a critical role in the Green Chemistry Initiative. California should engage educators to develop curricula, sponsor research, and educate consumers, the media, and policymakers.
3-190	At the Lawrence Hall of Science, UC Berkeley began a program some 20 years ago known then as the Chemical Education Public Understand Project (CEPUP), now the Science Education Public Understanding Project. W e recommend California consider how this program might accelerate outreach and conversely how green chemistry concepts might be incorporated into the teaching modules.
4-13	Develop educational programs for children.
4-51	Expand education in building a sustainable technology base.
4-104	Promote private business sector sponsorship of training and education programs at all levels (including elementary, high school and university). Conflict of interest concerns could be avoided by using an independent third party to manage the funding.
4-124	Make use of the Education and the Environment Initiative (EEI) to incorporate green chemistry concepts into education.

OPTION EO-2:	***Establish or enhance academic programs at colleges and universities to supply the technical expertise and advanced designs needed to promote an environmentally sustainable economy.***
1-14	Establish a product safety organization or partnership with University of California to develop a checklist for review new products.
1-32	Teach green chemistry and green design at schools.
1-74	Chemistry has enabled the development of countless products that consumers use every day, and consumers want to understand what impact these products may have on the environment and on their health. Industry shares this desire, and continues to strive to develop, produce, and market products that are both beneficial and safe for people and the environment.
1-107	Talk to chemistry departments at universities so that they understand the importance of the hazard traits of toxicity, persistence, and bioaccumulation. Encourage the development of new curriculum and requirements for chemistry undergraduate and graduate students.
1-113	Overcome gaps in education related to new methods. Some of these may include computational toxicology and bioinformatics, as well as other things that we have discussed. Building such capacity (e.g., more training, resources, and scientists) may lead to better models and approaches.
1-116	Encourage greater collaboration and partnership across disciplines and institutions to increase overall knowledge. For example, consider the model of how pharmaceutical companies make decisions on which chemicals are too hazardous to pursue.
1-156	Encourage C2C curriculum (K-12 and post-secondary).
1-162	Establish research and development centers focused on sustainable chemistry and/or sustainable engineering within its University of California system, such as Centers for Excellence in Sustainable Chemistry at leading University of California campuses that are networked to address major sustainability opportunities and issues.
1-169	Recognize the need for education in the broad scope of “green chemistry” includes “green engineering,” and that it is not limited to simplistic hazard substitution. Moreover, a concerted effort to disseminate appropriate information on the accomplishments, best practices, costs, and benefits of “green chemistry” would help assure that all interested stakeholders understand the concept and limitations of the approach. Health and safety information should never be considered proprietary or confidential information.
1-181	Develop a technical center of excellence in green chemistry as a key element of the California Green Chemistry Initiative. The center would be available to provide technical assistance, lead development of a green chemistry curriculum for undergraduate and graduate programs, and conduct state- of- the- art research on green chemistry innovations.
1-190	Education plays a key role in effective decision-making, uncovering innovations, and training the next generation of society’s leaders in science, business, health, and public policy. With a topic like green chemistry, where effective decisions will require collaborative approaches and solutions not yet imagined, education needs to play a key role. Green chemistry requires integrated, systems approaches and knowledge on a broad range of topics. For example, chemists need an understanding of toxicology, while policy makers need to understand business processes and markets to develop efficient and effective policies. Successful implementation of green chemistry requires a level of collaboration not often taught or practiced today.
2-24	Create a green chemistry program at the University of California.
2-25	Expand green chemistry curriculums from middle school through post-secondary education.

OPTION EO-2:	***Establish or enhance academic programs at colleges and universities to supply the technical expertise and advanced designs needed to promote an environmentally sustainable economy.***
2-44	Support research, development, technical assistance, entrepreneurial activity, and education in green chemistry science and technology
2-55	Examine ways to expand education and training programs for students and chemists through partnerships with industry.
2-57	Collaborate with universities to further the study and application of green chemistry.
2-58	Support research and development through various initiatives (e.g. university-based center, government funding, cooperative state research, etc
2-59	Recognize that education and training—at various levels including, but not limited to, K-12 programs—is critical to advancing green chemistry.
2-61	Advance the science (improve toxicological methodology; use biomonitoring data; press industry and federal government to move forward, collaborate with universities).
2-67	Collaborate between UC, state agencies, and industry.
2-68	Promote the exchange of information about best management practices, incentives and barriers among industries/corporations, and between industry and customers; one way to do this is through a mentoring program (e.g., large corporations mentoring small ones, or via the "ACC" (American Chemical Council)) is suggested.
2-91	Develop a more involved relationship between the industry and academia to develop and exchange toxicology information.
2-95	Promote academic programs in green chemistry. Enhance current programs, including training in ecotoxicity and green chemistry for chemistry students.
2-110	Create a Green Chemistry Department. [Note: this is unclear whether this means an academic department or a state agency.]
2-132	Provide more education for business groups; involve UC Extension.
2-133	Invest in green chemistry research and development, develop leading university centers; invest in EDC (endocrine disrupting chemicals) research, encourage collaborative work between green chemists and EDC researchers to foster strategies for avoiding EDCs in new products; promote public education into the dangers of EDCs and the need for alternatives
2-162	Encourage public private arrangements between universities and private industry, particularly as they relate to green chemistry solutions.
2-166	Host a Green Chemistry Symposium IV dedicated entirely to technology transfer, start-up funds, equity funding, and possible CalPERS investment in California companies with homegrown technology that solve California environmental problems.
2-171	Ensure that GCI has a strong science foundation.
2-186	Create a clearinghouse of best green chemistry practices.
2-187	Develop a technical center of excellence in green chemistry. The center would provide technical assistance, lead development of a green chemistry curriculum for undergraduate and graduate programs, and conduct state-of-the-art research on green chemistry innovations.
2-192	Foster innovation and encourage universities, educational institutions, and industry to partner in developing effective “greener” ingredients that reduce environmental impact

OPTION EO-2:	***Establish or enhance academic programs at colleges and universities to supply the technical expertise and advanced designs needed to promote an environmentally sustainable economy.***
2-205	Develop requirements to obtain hazardous traits data to support a comprehensive assessment of chemical hazards for chemicals currently in use and those proposed for use.
2-208	Establish partnerships with other states to create an interstate clearinghouse of environmental safety and health data.
2-262	Incorporate toxicology into the formal training of chemists.
2-271	Make risk assessment, including toxicology and life cycle thinking, part of the required curriculum for chemistry and/or chemistry related degrees conferred by state institutions.
3-32	Work with the UC system to develop a green chemistry curriculum for all chemistry and engineering majors.
3-96	Schools (primary, secondary, and colleges and universities) as the trainers of tomorrow's leaders and the institutions conducting foundational research, should play a critical role in the Green Chemistry Initiative. California should engage educators to develop curricula, sponsor research, and educate consumers, the media, and policymakers.
3-123	Develop a registry in which all stakeholders can document Green Chemistry successes. Develop an extension service through the UC system to expand reapplication of successes across the potential user community.
3-135	Close the “technology gap” through market-based incentives to support green chemistry. This could include funding for university research grants, scholarships, and similar programs, as well as awards for innovation, tax credits, low-interest loans, and other incentives. These positive incentives should be open to all companies that are innovators and sell products in California—not simply limited to companies located in California.
3-183	Conduct a base-line review of physical and intellectual capabilities to support and nurture the green chemistry R&D initiative. Additionally, CICC recommends that public private arrangements between universities and private industry be encouraged, particularly as it relates to green chemistry solutions.
3-190	At the Lawrence Hall of Science, UC Berkeley began a program some 20 years ago known then as the Chemical Education Public Understand Project (CEPUP), now the Science Education Public Understanding Project. W e recommend California consider how this program might accelerate outreach and conversely how green chemistry concepts might be incorporated into the teaching modules.
4-37	Establish academic programs in product stewardship; develop and implement cradle-to-cradle design curriculum into multiple disciplines.
4-42	Work with the UC system to develop a green chemistry curriculum for all chemistry and engineering majors.
4-51	Expand education in building a sustainable technology base.
4-52	Encourage that chemists should have university courses in green chemistry emphasizing toxicity and ecotoxicity.
4-53	Encourage universities to develop green business and law courses, etc.
4-57	Encourage the use of existing environmental management systems (e.g., ISO 14000) and work with international standards setting organizations (e.g., International Organization for Standardization) to develop green chemistry technical standards.

OPTION EO-2:	***Establish or enhance academic programs at colleges and universities to supply the technical expertise and advanced designs needed to promote an environmentally sustainable economy.***
4-60	Establish green chemistry scholarships and international exchange programs for students and scientists (sponsored by California government and/or industry).
4-99	Construct incentives that: foster innovation in the private sector and academia; create markets; facilitate increasing demand for the desired products and solutions; periodically are reviewed to assess the ongoing need of the incentives change; are as comprehensive and equitable as possible; provide transparent and user friendly information to consumers.
4-104	Promote private business sector sponsorship of training/education programs at all levels (including elementary, high school and university). Conflict of interest concerns could be avoided by using an independent third party to manage the funding.
4-112	Develop an extension service through the UC system to promote successful green chemistry methods and processes.
4-124	Use the Education and the Environment Initiative (EEI) to incorporate green chemistry concepts into education.
4-128	Develop a technical center of excellence in green chemistry to provide technical assistance, lead development of a green chemistry curriculum for undergraduate and graduate programs and conduct state-of-the-art research on green chemistry innovations.
1-74	Chemistry has enabled the development of countless products that consumers use every day, and consumers want to understand what impact these products may have on the environment and on their health. Industry shares this desire, and continues to strive to develop, produce, and market products that are both beneficial and safe for people and the environment.
1-114	Educate the public and consumers and other users of products about how to select and use “safer” products. We need to address their information needs in ways that are understandable to make it possible for them to do so.
1-120	Create a unified database that includes data from sources around the world. This database would have to be designed to be accessible to different users (chemical products, users, consumers, etc) and should be made public. The “E-Chem” unified data portal newly introduced by OECD might be considered a “baby step” toward this.
1-121	Ensure that data are available to the public and address limitations related to confidential business information.
1-130	Recognize concerns about the growing tide of consumer deceptive trade practices and litigation, some of it based on product labels. The State of California is a significant jurisdiction for such claims, including class action lawsuits. Any eco-labeling program developed and overseen by the state should exempt eco-labeling from forming the basis for such liability, relying instead on state regulatory controls to enforce eco-labeling standards. It would defeat the public policy goals of having an eco-labeling program, if the very program that the State designs to inform consumer decision-making becomes the basis for private parties to claim money damages for purported misinformation. Additionally, any eco-labeling program must be harmonized with existing state and federal regulations.
1-131	Provide consumers with accurate information upon which they can make informed decisions could be a very useful tool in driving changes. Many programs are predicated on consumer choice. Cars are labeled with expected fuel efficiency ratings. Major home appliances have energy labels, which can be used for comparisons. Plumbing fixtures show the water use. The clear intent is that consumers will use these labels to make more informed purchasing decisions.

OPTION EO-2:	***Establish or enhance academic programs at colleges and universities to supply the technical expertise and advanced designs needed to promote an environmentally sustainable economy.***
1-133	While most of the initial consumer labels focused on single attributes (water, energy, or fuel efficiency), most purchasing decisions are not that simple. Typically, in green chemistry, a number of attributes must be evaluated. A food nutrition label is perhaps a more analogous situation where consumers need to consider a variety of factors (sugar, protein, fat), various desirable nutrients (vitamins, minerals) and some to be avoided or minimized (sodium, saturated fat).
1-135	Note that Environmentally Preferred Purchasing (EPP) can be an effective approach to drive change by assigning an advantage in the purchasing process for products and services that meet a pre-determined set of "green" or “sustainable” attributes. Using this approach, brand owners, retailers, and government regulations set the marketplace expectations and develop market demand for new technologies. It is up to manufacturers – and their suppliers to deliver products and services that meet the market demand, or risk being left behind.
1-136	Develop and market materials to meet rising consumer demand for “green” or sustainable products.

OPTION EO-3: Facilitate public access to clear and objective information to the public to enable informed choices.	
1-8	Factor environmental, societal, environmental justice, and economics into decisions.
1-10	Mandate full disclosure of substances contained in products. "Green labeling" should be used with restraint.
1-17	Standardize terminology and definitions to promote the necessary and real change towards creating more sustainable, social and environmental solutions.
1-21	Foster "Reduce Energy/ Resource Consumption" through take back programs.
1-23	Advertise green businesses.
1-31	Educate the companies and consumers worldwide.
1-35	Develop a database of ingredients used in consumer products similar to the Skin Deep database that is currently available for cosmetics. In order to ensure accuracy, California would need the regulatory authority to regulate consumer products and to require disclosure of ingredients in consumer products.
1-37	Develop an information clearinghouse. This information would include hazard and use data as well as information about safe alternatives.
1-137	As a key material solutions partner, work with our customers and their customers to better understand the impact of the product throughout its life cycle so they can make better informed decisions.
1-138	Apply science-based EPP definitions so that measurable environmental improvements can be delivered.
1-139	Use government preferred purchasing or government sponsored preferences.
1-140	Build the appropriate infrastructure to take and recycle emerging waste streams before government specified product standards (e.g., CAFE standards, energy efficiency standards for buildings, bans on incandescent lighting bulbs, etc.). For example, mercury-containing bulbs are routinely disposed of with residential wastes. More energy efficient but equally harmful in the environment if not handled properly.
1-141	Think about the “signals” that are being sent to markets to avoid unintended consequences. For example, specifying increased recycle content will significantly raise barriers to entry and delay introduction of new, innovative materials since recycling infrastructure and markets take time to develop. A flexible, performance based approach avoids the government picking technological winners and losers, but it must be done using a holistic, long-term view.
1-149	Involve people at the business and community level.
1-154	Provide consumer education so consumers know what questions to ask.
1-155	Provide consumer education on what will be hazardous when product is thrown away; wake up consumers that there is no “away.”
1-161	Require that a company that manufactures chemicals in or imports chemicals into California have a publicly available overview of the approach it uses for chemical evaluation and assessment. Companies should affirm to the state that the chemical evaluation and assessment approach is publicly available.

OPTION EO-3: Facilitate public access to clear and objective information to the public to enable informed choices.	
1-169	Recognize the need for education in the broad scope of “green chemistry” includes “green engineering,” and that it is not limited to simplistic hazard substitution. Moreover, a concerted effort to disseminate appropriate information on the accomplishments, best practices, costs, and benefits of “green chemistry” would help assure that all interested stakeholders understand the concept and limitations of the approach. Health and safety information should never be considered proprietary or confidential information.
1-174	Describe and communicate effectively chemical hazards and risks with extensive and accessible data management.
1-190	Education plays a key role in effective decision-making, uncovering innovations, and training the next generation of society’s leaders in science, business, health, and public policy. With a topic like green chemistry, where effective decisions will require collaborative approaches and solutions not yet imagined, education needs to play a key role. Green chemistry requires integrated, systems approaches and knowledge on a broad range of topics. For example, chemists need an understanding of toxicology, while policy makers need to understand business processes and markets to develop efficient and effective policies. Successful implementation of green chemistry requires a level of collaboration not often taught or practiced today.
1-199	Recognize that education of consumers and other organizations will be critical to driving change and fostering innovation within other groups. We challenge DTSC to develop educational components as a part of the overall approach to California’s Green Chemistry Initiative.
1-200	Include organizations, which put accurate, unbiased information into the hands of consumers. They are also an important component.
1-209	Retain certain business information as confidential in order to protect intellectual capital. Health and environmental information should not be considered confidential.
1-213	Develop a database of chemical alternatives that compares a number of sustainability parameters: performance, price, human health and environmental (e.g., toxicity, bioaccumulation, persistence) including carbon footprint and source sustainability.
1-215	Increased transparency and access to information on chemicals in commerce.
1-228	Focus resources and attention on a limited number of chemicals that are important to evaluate. The process should be collaborative and should include scientific experts in toxicity and exposure from academia, chemical manufacturers, product formulators, and non-governmental organizations. The manufacturers of the chemicals and consumer products could provide toxicity and exposure/use data to determine whether the uses of “priority chemicals” are safe or should be restricted.
2-26	Develop a "Safe Home Environment" place for children to visit and learn.
2-37	Address marine debris via reduction and recycling.
2-94	Educate consumers. Provide green information to consumers to change the marketplace and consumer attitudes, enable informed choices, and drive green chemistry. Create a database for the public to get green information.
2-108	Classify or rank existing chemicals (green, light green, yellow, and red).
2-117	Develop criteria for determining safe alternatives, including multi-media considerations; identify and publicize safe alternatives.
2-131	Establish a "green seal," reflecting a specified level of greenness, or certification of approval.
2-136	Recognize and award green products, which would be a strong motivator because they can lead to greater sales and preferential purchase by environmentally conscious consumers. Recognition with the use of a logo would be most effective. See German Blue Angel award.

OPTION EO-3: Facilitate public access to clear and objective information to the public to enable informed choices.	
2-138	Include information geared towards the general public, particularly related to the purchase and use of certain products, on websites. Include: lists of manufacturers and products that have received “green" awards to motivate submission of information to DTSC for review, information on the environmental impacts of plastics, greener alternatives to household chemicals, disposal options for universal waste, information on green chemistry, a page called "What can I do to help the environment?" Increase awareness and enable the general public to put greater pressure on manufacturers and legislatures to make green chemistry and environmental protection a priority.
2-139	Use environmental certification (German "The Blue Angel" program) as a model for the certification of products and services.
2-155	Bring social science into the picture to help stimulate behavior change in consumers and businesses.
2-174	Establish a Green Chemistry Coordination Council to collect and promote the sharing of information, highlight businesses with green practices, provide assistance to businesses lacking resources, and educate consumers.
2-196	Promote consumer awareness of the importance of reading and following label instructions for safe product use, storage, and disposal
2-197	Support collaborative efforts to encourage public and private partnerships to develop “greener” products and “environmentally responsible” ingredients.
2-221	Support workshops and education forums that are accessible to communities so they can hear about the green chemistry issues.
2-222	Provide grants funded from revenue from fees imposed on companies using toxic chemicals to groups engaged in grassroots outreach and education on green chemistry issues.
2-223	Make information about chemicals to which the public and workers may be exposed more accessible, including mandatory labeling, indicating the presence of chemicals that may be hazardous.
2-253	Foster a social attitude adjustment that includes a ratcheting down of solid waste acceptance both by government and consumers. Current waste streams must be turned into resource streams and the cost can be internalized.
2-257	Develop an integrated program that features the following: (a) require all existing chemicals undergo a tiered process of scrutiny for their environmental, social, and health/toxicity impacts; (b) require that this information should be passed in a standard form along the supply chain; (c) require manufacturers to label consumer products with all the chemicals and materials (including nanotechnology) that these contain; (d) develop interactive consumer tools and technologies that assist consumers to interpret and use labeling data in their shopping; (e) require industry to conduct green chemistry assessments for chemical products sold or used within California; (f) expand greatly the investment of resources into green chemistry education and research at California State-supported universities, including the UC system (g) adopt a modest toxicity tax on all intermediates and chemical products used or sold within the State of California.
2-261	Make educational programs a key component of its Green Chemistry Initiative.
2-309	Continue to broaden the tent of stakeholders as the Green Chemistry Initiative moves forward.

OPTION EO-3: Facilitate public access to clear and objective information to the public to enable informed choices.	
3-4	Expand consumer education regarding product life cycle costs and impacts (e.g. appropriate selection, use, disposal, and alternative materials or practices) since well-informed consumers will not only handle and dispose of chemicals more safely, and will demand safer products with closed loop lifecycles. Disseminate information through traditional media as well as outreach through community partners as well as the private sector. Educate people how chemicals are created, screened for use, and managed through a process. Show people "a day in the life of a chemical." Provide complete transparent chemical risk information in a way the public can access, understand, and absorb. Create convenient, credible chemical evaluation tools that businesses, schools or individuals can easily use when selecting chemical products. These could use prior art such as the Green Screen or Pfizer's Solvent Alternatives Chart. These tools could show examples of the risk as well as hazard, and define hazard/risk as high, medium and low and compare to products and services used by consumers everyday. If something is a hazard, show the alternatives or how the risk relates to the pathways for exposure. (Is it in a product, or solely for use in a process? If it is in a product, what entails safe use? etc.)
3-5	Create a labeling system that is accessible, and accurate. Enable and streamline disposal of household hazardous waste (curbside pick-up or more local collection centers.), and improve the publicity of and accessibility to this disposal, and ensure safety of the collection sites. Include, as part the education and outreach, manufacturers public disclosure of product selection and chemicals used in those products. Define and identify toxic and non-toxic chemicals in specific products, proper use, dangers of inappropriate use, and include information about disposal. Include life cycle analysis and impacts thereof.
3-6	Create a task force by collaborating with regulatory agencies, UC, Chemical Abstract Service, industry manufacturers, and the public to create a web portal to identify chemicals (toxic and non-toxic), how each is created/screened for use/managed through a process, and disseminate/access information.
3-7	(a) Prioritize chemicals used in commerce in California based on exposure potential and toxicity, and work to reduce exposure to the most hazardous substances. To do this, gather data regarding all chemicals manufactured in or used in commerce in California, including in what products, how and in what volumes they are used. Additional data regarding available toxicity characteristics should also be gathered for each of those chemicals. Identify gaps in toxicity and exposure data. (b) Use this data to prioritize or rank chemicals in terms of hazard as a function of toxicity and exposure. Tools for such ranking are available from other efforts such as Canada's CEPA program and USEPA. Evaluate these for use in California. Focus subsequent efforts on working with industry to find viable, safer alternatives for the highest ranked chemicals (i.e., those that pose the biggest threat in terms of toxicity and exposure). At the same time, engage industry and our university system to fill in important gaps regarding toxicity and exposure data. (c) Tap biomonitoring efforts to help fill exposure gaps. In evaluating and ranking chemicals, considerations should be given to the performance and feasibility of alternatives.
3-9	Work with the military and aerospace industry as well as the plating industry, to evaluate and revise outdated mill specifications to allow for more "environmentally friendly" plating chemistries. Technological advances have generated more environmentally friendly electroplating technologies (e.g., cyanide-free plating solutions). However, a widespread switch to more "green" plating practices has been hampered by outdated "milspecs" (i.e., the military specifications for most plating done for military and aerospace applications).

OPTION EO-3: Facilitate public access to clear and objective information to the public to enable informed choices.	
3-27	Utilize any useful information developed by USEPA Design for the Environment program and work with industry and businesses to implement elements. These include: (a) Evaluate the human health and environmental impacts of its processes and products. (b) Identify what information is needed to make human health and environmental decisions (e.g., hazard characteristics data and identification of "safer" alternatives). (c) Consider cross-media impacts and the benefits of substituting chemicals. (d) Reduce the use and release of toxic chemicals through the innovation of cleaner technologies that use safer chemicals. (e) Reduce the use and release of toxic chemicals through the innovation of cleaner technologies that use safer chemicals. (f) Make products that can be more readily reused, refurbished, remanufactured, or recycled. (g) Monitor the environmental impacts and costs associated with each product or process. (h) Recognize that although change can be rapid, in many cases a cycle of evaluation and continuous improvement is needed. Partnerships with UC and CSUS could help implement these objectives. Incentives for applying these as core business practices might also help.
3-28	Develop layperson information on common chemicals in common commercial products for educating the public.
3-29	Develop a fact sheet on chemicals policy in the US and post it on their GCI website to educate the general public.
3-30	Engage in culturally appropriate outreach to consumers to help them make informed choices and move purchasing towards greener products. Media such as television commercials (featuring Arnold Schwarzenegger, perhaps), comic books, radio, could be utilized. Partnering with Hollywood would go a long way.
3-31	Develop guidance on what its citizens as individuals could do to move towards greener, sustainable living.
3-33	Work with other state agencies including DGS to develop information on green purchasing, and disseminate this information to counties and cities and to private sector businesses for their use.
3-58	Require updates of MSDS to reflect all available data.
3-59	Require disclosure of chemicals in consumer products, focusing initially on high concern chemicals.
3-77	If California considers an eco-label program, base labeling on science and life cycle analysis, and involve a multi-stakeholder working group to generate the standards for eco-labeling.
3-82	Develop model life cycle analysis paradigm, starting with a single widely used product with environmentally detrimental properties, and analyze every aspect of that product's lifecycle, from the harvesting and processing of raw materials, to that product's ultimate disposal or "end of life" management.
3-87	Consider a marketing program (perhaps akin to the "California cows" and dairy ads currently on television) whereby the state would promote companies that are actively engaged in Green Chemistry and Green Engineering, and products that are the result of Green Chemistry and Green Engineering.
3-124	Continue the Conversation with California via ongoing workshops, symposia, and other communication approaches to maintain and build on the momentum established in the program to date.

OPTION EO-3: Facilitate public access to clear and objective information to the public to enable informed choices.	
3-134	Work with scientific experts to examine best practices and to develop a toolkit for safety assessment programs and for safety assessments. Companies also could make a description of their safety assessment process available on the Internet. This could help provide context for product ingredient communication.
3-145	Establish a Green Chemistry Coordination Council to collect and promote the sharing of information, highlight businesses with green practices, provide assistance to businesses lacking resources, and educate consumers. Catalog and make easily available information regarding best practice screening processes, green chemical design, collaborative efforts such as the ACS Green Chemistry Institute, and international efforts such as the Global Harmonization System. All stakeholders still have a lot to learn in this dynamic area, and everyone stands to gain from continued information sharing. DTSC leadership in this area should be continued by establishing it as a central clearinghouse of information for the state and beyond. We further suggest building upon and making readily available the information provided by existing efforts: ACS Green Chemistry Institute, Cleangredients, USEPA Design for Environment Program, Performance Track, the chemical industry's HPV testing program, eChemPortal, EPEAT, and DTSC Technical Resource Center.
3-148	Continue the Conversation with California to sustain progress in Green Chemistry. The dialogue between DTSC and stakeholders has been very helpful and will result in more well-developed, effective policy.
3-154	Work with industry to implement a means of ingredient communication that would provide consumers with the information they can use to make informed decisions regarding the products they use in their homes.
3-162	Seek input from animal protection stakeholders, who have a unique set of qualifications and can specifically address the reduction and replacement of in vivo animal tests, before recommending testing strategies or regulations. The National Academy of Science's recent report addressing the future of toxicity testing should be embraced as part of a GC initiative, not only in the interest of animal welfare, but in the interest of a healthy environment
3-168	Require manufacturers to label consumer products with all the chemicals and materials (including nanotechnology) that these contain. Consumers currently lack the information required to discriminate between products based on their toxicity impacts, so industry has few incentives to develop new green chemistry products. In parallel, develop interactive consumer tools and technologies that assist consumers to interpret and use labeling data in their shopping. The Toxics Release Inventory succeeded because information tools made its data highly accessible.
3-173	Provide clear and transparent characterization of chemical hazards to the public. Many entities can and are making decisions and take action that contribute to adoption of safer or lower hazard chemicals and products. To support such efforts, businesses, agencies, and the public need comprehensive, current, accurate, and reliable information about the relative hazard of different chemicals. California should develop a matrix of information about the hazard traits of chemicals in use or considered for use, presented in ways that are useful and understandable to various audiences. This matrix should also make clear when gaps in data exist, so that businesses and individuals can choose to avoid chemicals with unknown hazards as well as those that are higher hazard.
4-1	Assess chemicals within the context of alternatives. Criteria for better or worse green products should be clear.
4-9	Educate the public on what items they use that are toxic and natural alternatives that could be used instead
4-11	Use sound scientific information to define what is "toxic" and "non-toxic."

OPTION EO-3: Facilitate public access to clear and objective information to the public to enable informed choices.	
4-12	Identify specific industry sectors that generate the most toxic products and identify green production and processing for those sectors.
4-23	Develop a "green" rating system for products with agreed upon criteria.
4-38	Develop a fact sheet on chemicals policy in the US and post it on the Green Chemistry Initiative website to educate the general public.
4-39	Develop layperson information on common chemicals in common commercial products.
4-40	Engage in culturally appropriate outreach to consumers to help them make informed choices and move toward greener products. Use television commercials (could feature Arnold Schwarzenegger), comic books, radio, and the Internet. Partner with Hollywood.
4-41	Develop guidance on what citizens of California could do to move toward greener, sustainable living.
4-43	Work with other state agencies, including DGS, to develop information on green purchasing and disseminate this information to other government agencies, including county and city level, as well as private businesses.
4-45	Require responsible parties to identify the individual constituents of their products or, if that information is considered to be confidential business information, to provide the appropriate health information on their products.
4-70	Develop educational programs for consumers on the consequences of excessive consumption.
4-71	Create a list to be posted on the Internet of "bad actor" chemicals that have been found in products and the associated suppliers/manufacturers.
4-73	Create "feeder" lists of chemicals to provide an early indication of potential chemicals of concern; such feeder lists would require a lower threshold of data than a list such as Proposition 65. Publish the lists on the Internet.
4-77	Review a case study to examine the factors that are useful and appropriate in determining what is "safer." For example, use flame retardants to evaluate how best to identify a safer alternative (e.g., safer chemical, alternative non-chemical technology, change in performance standards etc.). Develop a technical and a layperson document describing the results of the case study, and use this information for developing policy and doing education and outreach.
4-84	Create a unified database to capture toxicity and exposure data sources from around the world. Make the database public (on the Internet) and accessible to various types of users (chemical products users, consumers etc.) Review the OECD "E-Chem" portal as an example of this.
4-87	Support activities that increase the capacity of individuals and communities to act in their own interest to reduce exposure to toxic chemicals.
4-95	Review the Consumer Specialty Products Association's Product Care program as a model stewardship program in which consumer and institutional specialty product companies have agreed to go beyond government regulations in emphasizing health.
4-97	Review the ACC Responsible Care program as a model for reducing potential hazards which includes a rigorous EHS&S management system that is certified by third-party auditors.
4-101	In developing and implementing “eco-labeling,” ensure that: the analysis of the product is credible and based on scientific study; the products meet agreed upon criteria and the eco-labels are not reliant on unsubstantiated claims by the producer; an independent third party audits the eco-label.

OPTION EO-3: Facilitate public access to clear and objective information to the public to enable informed choices.	
4-109	Facilitate informed substitution in moving to alternatives for restricted uses of priority chemicals. Although "toxics use reduction" is an admirable goal, failure to adequately assess the multimedia and lifecycle implications of forcing a shift to alternatives can result in significant unintended consequences.
4-116	Promote consumer education and responsibility. For example, how consumers collectively handle chemical products has an enormous effect (for example, nail polish remover can be easily poured down a household sink, which would not be allowed in the workplace). Further, consumers should read and follow label directions.

Chapter 6—Research and Technology Options

Providing the research needed to support green chemistry

SYNOPSIS

Research and closely related topics comprised approximately 2% of the total number of comments received throughout the Conversation with California. Participants proposed 25 options involving research and technology for green chemistry. These include:

- Researching alternative starting materials for use in chemical synthetic processes;
- Conducting research to develop analytical screening methods for toxics in commercial products; and
- Developing new, safer technologies and industrial processes.

The industrial revolution in the 20th century was driven by strong research in basic chemistry and physics. Today's green chemistry efforts will be heralded by the latest scientific methods. Research could be performed in several areas. Research could help identify safer alternative starting materials and substitutes for the hazardous chemicals which are currently used. This can make processes safer for businesses and workers as well as make products safer for the consumer and the environment.

Engineering design can reframe older processes to make them produce less waste and ensure that new processes contain environmentally friendly design factors from the beginning through the final phases of production. Research in this area—and in new technologies—can generate a considerable amount of scientific information.

The Green Chemistry vision includes research as a key driver in changing practices in chemistry and engineering. The wastes created during processes leading to commercial end-products can be significantly reduced or possibly eliminated altogether. Products could become raw materials for the next generation of products or biodegrade at the end of their useful life. New research and technology can promote reformulation of molecules by identifying alternative feed stocks and new catalysts that accomplish desired results using new pathways. All of the changes—driven by research—can sustain economic growth while at the same time greatly reducing the quantities of waste generated in the creation, use, and disposal of commercial goods and products.

BACKGROUND

Stakeholders noted that industry conducts extensive chemicals research as part of their business. Several commenters mentioned substantial investment and resources devoted to industry-based research, which supports not only new products but also less hazardous approaches. A few state programs cosponsor focused research and development work in particular areas—such as less polluting combustion, more energy efficient technologies, water conservation, etc. Federal agencies partner with universities and industry for major research initiatives. In California, the University of California operates national laboratories (i.e., Lawrence Livermore National Laboratory, Lawrence Los Alamos National Laboratory, and the Ernest O. Lawrence Berkeley

National Laboratory) for advanced research. Many of these programs, stakeholders said, have green chemistry-related elements.

DISCUSSION OF OPTIONS

OPTION RT-1:	***Conduct research to identify safer alternative starting materials for products that are now known to employ hazardous substances at the beginning of the process.***

Participants in the Conversation with California called for research in safer alternatives, feed stocks, and raw chemicals processes. They said such work could be conducted by public and private sector laboratories, including:

- **State of California laboratories.** DTSC, ARB, and DPH each operate state laboratories, which are capable of conducting green chemistry research in their respective areas (hazardous materials, air quality, and public health).

- **Private sector laboratories.** Stakeholders said private laboratories could be used or contracted with for research in clearly defined specified areas.

- **University of California laboratories.** The University of California's Center for Occupational and Environmental Health on the Berkeley and Los Angeles campuses was mentioned as a resource for research projects.

Option RT-2:	***Conduct research to develop analytical chemistry screening methods for commercial products.***

The frequency and wide variety of recent product recalls, participants commented, demonstrates a need to screen for chemicals of concern in products manufactured both domestically and overseas. Before products can be screened for the presence of chemicals of concern, analytical chemistry screening technologies are needed. New research could identify and help develop analytical methods that work both in laboratory and field conditions. They said research can provide detailed information about what these chemical screening tools will be, how they will work chemically, and what their limitations are. Research can result in the creation of new methodologies to identify the chemical contents of products. Finally, research can aid in the development of new screening technologies for detecting toxic substances in consumer goods.

Option RT-3:	***Use green engineering research to develop and assess green designs and production processes.***

Stakeholders mentioned that green engineering process improvements are as much a part of green chemistry as starting material substitutions. Chemical processes often can be made greener and more efficient by designing processes differently. They called for basic research in this area; they noted that this would benefit a wide variety of industries by addressing issues common to many (e.g., solvent recycling). Research into the engineering side of processes can produce

decisive changes to save not only energy but also starting materials and solvents in the production of green chemical product.

CHAPTER TEAM

The principal editors for this chapter were:

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The team compiled each of the comments relating to chemical and engineering research and technology. They organized the comments that stakeholders made during the Conversation with California. The references for each of the three major options summarized in this chapter are presented in the next section of this report.

REFERENCES

The tables below cross-reference each option to Appendix B. The figures shown in the first column represent the "challenge area" and the option number.

OPTION RT-1:	***Conduct research to identify safer alternative starting materials for products that are now known to employ hazardous substances at the beginning of the process.***
1-2	Develop a partnership with academia and establish a research program.
1-12	Research and develop new testing methods on relative toxicity and synergistic effects of substances.
2-12	Require real world information about how chemicals interact with each other.
2-22	Designate the Center for Occupational and Environmental Health at UC Berkeley and UCLA as the lead entities within the University of California system to address matters pertaining to chemicals policy and green chemistry in California.
2-23	Partner with the University of California to create an institute for sustainable manufacturing and green chemistry research.
2-24	Create a green chemistry program at the University of California.
2-44	Support research, development, technical assistance, entrepreneurial activity, and education in green chemistry science and technology.
2-57	Collaborate with universities to further the study and application of green chemistry.
2-58	Support research and development through various initiatives; for example, university-based center, government funding, cooperative state research, etc.
2-61	Advance the science (improve toxicological methodology; use biomonitoring data; press industry and federal government to move forward; collaborate with universities).
2-67	Collaborate between the University of California, state agencies, and industry.
2-91	Develop a more involved relationship between the industry and academia to develop and exchange toxicology information.
2-105	More research and development (R&D) for private sector and government, including R&D prior to using chemicals in products.
2-133	Invest in green chemistry research and development. Develop leading university centers. Invest in endocrine disrupting chemicals (EDC) research. Encourage collaborative work between green chemists and EDC researchers to foster strategies for avoiding EDCs in new products. Promote public education into the dangers of EDCs and the need for alternatives.

OPTION RT-1:	***Conduct research to identify safer alternative starting materials for products that are now known to employ hazardous substances at the beginning of the process.***
3-10	(a) Prioritize protection of most vulnerable people and resources. For example, get information on exposures of children to harmful substances through toxics in products, and seek changes to reduce or eliminate these toxics. Focus on consumer products with lots of exposure potential. This needs a regulatory action. (b) Look for initial easy fixes by integrating existing programs that have identified actual sources of pollutants. (c) Drive the demand for cleaner products through state procurement practices. (d) Designate the Occupational and Environmental Health at UC Berkeley and UCLA as lead entities within the UC system to address research relevant to green chemistry and chemicals policy in California.
4-61	Establish a centralized testing laboratory for toxics in products that would accept testing requests from the public.
4-128	Develop a technical center of excellence in green chemistry to provide technical assistance; lead development of a green chemistry curriculum for undergraduate and graduate programs; and conduct state-of-the-art research on green chemistry innovations.
4-130	Avoid bans in the absence of safer alternatives, which should be technically feasible, improve health, safety, and environmental profile; provide comparable or superior performance; and be cost-effective and sustainable. If safer alternatives are not available, devote resources to research and development or provide incentives for developing alternatives.

OPTION RT-2: Conduct research to develop analytical chemistry screening methods for commercial products.	
2-20	Invest in new testing methods since many of the current testing methods are out of date or do not exist.
2-28	Identify accurate and effective methods to test for and evaluate the potential hazard traits of chemical substances.
2-61	Advance the science (improve toxicological methodology; use biomonitoring data; press industry and federal government to move forward; collaborate with universities).
2-75	Develop testing methods.
4-58	Develop fast, effective screening technologies for toxics in products (e.g., x-ray fluorescence [XRF]).
4-143	To identify and eliminate impurities in chemicals, improve and fund research in new analytical methods for detection and quantification. Support for key process-related research could yield important new means to reduce the presence of unwanted toxics due to synthesis.

OPTION RT-3: Use green engineering research to develop and assess green designs and production processes.	
1-24	Do not focus exclusively on chemicals in products and chemical inputs. Manufacturing and production processes using chemicals should also receive attention in order to address health and safety concerns of workers. Address community concerns for inherent safety of chemical using or producing facilities.
2-102	Ensure that green chemistry will be governed by science. Examine the basis for assumptions about the adequacy of current protective measures in the process of identifying policy options. Understand both the burdens and benefits of new regulatory approaches. Acknowledge that engineering and process improvements are as much a part of "green chemistry" as product improvements or substitutions.

Chapter 7—Technical Assistance Options

Facilitating business transition toward green chemistry

SYNOPSIS

Stakeholders stated that technical assistance enables businesses, especially those that lack the necessary expertise or resources, to explore environmentally preferable alternatives for their processes and products. Even large and sophisticated companies can benefit an outside perspective, they said. Many business entities are willing to initiate such changes, particularly when presented with the potential to realize environmental and economic benefits. However, the time, expertise, and costs associated with identifying and evaluating alternatives can be high.

Technical assistance can take several forms: fact sheets, brochures, and checklists; hotline or duty officers to answer questions; regulatory and compliance information; electronic databases of information; software or programs that can be used to sort options or analyze alternatives; seminars, workshops, and symposia; on-site assessments and evaluations; and approved third party auditors and evaluations.

The three options presented in this chapter summarize the 98 options submitted during the Conversation with California. Roughly 12% of all comments referenced technical assistance. The options include:

- Providing technical assistance to businesses in evaluating alternatives;
- Establishing partnership networks to promote information sharing among state agencies, industry, academia, and the pubic; and,
- Publicizing guidelines, chemical databases, and evaluation tools.

This chapter addresses options for assisting industry in making sound environmental choices in designing and producing their products. A key element is access to information. Many of the stakeholders talked about information needs of “consumers” or “customers”. Comments related to these are primarily address under the Education and Outreach chapter. However, we acknowledge that businesses are also “consumers” or “customers” of other businesses that provide the goods or materials essential to their manufacturing processes. The information that is produced and made available to the general public may need to be displayed and accessed though different means than a technical assistance program designed for business and industry use.

BACKGROUND

Presented below is a list of some of the programs that were either specifically mentioned in the Green Chemistry discussions or exist within Cal/EPA:

- **DTSC**—The department provides technical assistance on green chemistry, pollution prevention, technology evaluation, and, to a lesser degree, life cycle assessment. Staff have worked with a number of California’s industry sectors, including: auto body and paint; vehicle service and repair industry; hospitals (mercury removal); chemical manufacturers; petroleum; semiconductor; pharmaceutical; and metal finishing industries. In addition to targeting industry sectors DTSC has done work on identifying

and promoting alternatives to specific waste stream such as solvents or products such as engine oil filters. DTSC often works in conjunction with local partners who assist with the outreach to small businesses.

- **DPR**—The department works closely with County Agricultural Commissioners to provide technical assistance to farmers, formulators and pesticide applicators. This assistance is broader than just answering compliance questions. DPR produces and distributes information on best management practices and safer alternatives such as Integrated Pest Management (IPM). DPR technical assistance efforts are not just limited to farmers. They also conduct focused outreach, education and assistance targeting schools and day care facilities.

- **CIWMB**—The board promotes and operates the Recycling Market Development Zone (RMDZ) Program with local zone managers and provides generic business assistance to companies not currently located within an RMDZ. Local resources combine with State-level incentives to create a tandem package of recycling business assistance services. State and local government join in a three-way partnership with business to boost the availability of recycled-content products. Typical technical assistance offered locally include help with siting; referrals to grants and financing; and a as help finding feedstock, marketing recycled products, networking, and advocacy.

- **ARB**—The board administers a Small Business Assistance Program through the Office of the Ombudsman. One of the goals is to ensure that everyone has access to the regulatory process and the information needed to operate within the rules. ARB also develops practical, rule-specific publications which describe source processes and emission control equipment, clarify rule requirements, identify compliance issues, and promote self-regulation for better compliance. Short self-inspection handbooks and longer, more detailed technical technical manuals for inspectors are available. ARB also periodically publishes Compliance Advisories. Information on pollution prevention practices can be found through ARB Business Assistance Program publications. For example, Pollution Prevention Primer, and Pollution Prevention Guide contain information that can help a business implement pollution prevention practices that will reduce waste, environmental impact, and operating costs.

- **SWRCB**—The board and regional boards conduct an outreach program, which has assembled specific education materials, activities, and contacts to help stakeholders achieve their water quality objectives. Specific industry and business links exist for agriculture, industrial and commercial operations, forestry, and manufacturing (which are now being developed).

- **USEPA**—The agency formed a partnership with a broad range of stakeholders for the Design for the Environment (DfE) Program. This program focuses on industries that combine the potential for chemical risk reduction and improvements in energy efficiency with a strong motivation to make lasting, positive changes. DfE convenes partners, including industry representatives and environmental groups, to develop goals and guide the work of the partnership. Partnership projects evaluate the human health and environmental considerations, performance, and cost of traditional and alternative technologies, materials, and processes. As incentives for participation and driving change, DfE offers unique technical tools, methodologies, and expertise. The USEPA DfE program has reached more than 200,000 business facilities and approximately 2 million workers.

- **University of California Cooperative Extension**—The service has farm, nutrition, family and consumer science advisors based in more than 50 county offices. In addition, Cooperative Extension specialists are headquartered at UC Berkeley, UC Davis, and UC Riverside, where they conduct research and coordinate advisors' activities. As a land-grant institution, the Cooperative Extension mandate is tied to the welfare, development, and protection of California agriculture, natural resources, and people. The county farm advisors' work is aimed at enhancing California agricultural productivity and competitiveness. Together with farmers, pest control advisors, and industry representatives, they identify current and emerging agricultural opportunities and problems.

DISCUSSION OF OPTIONS

OPTION TA-1:	***Provide technical assistance to businesses in evaluating alternative products and processes.***

Numerous stakeholders suggested that businesses need for technical assistance and inferred that technical assistance would facilitate implementation of green chemistry. For the most part, stakeholders did not give detailed comments on how to organize a technical assistance program. Instead, they highlighted several existing programs or features of those programs.

Participants told us that many programs exist and could be used as a model for a California program. Some commenters suggested expanding certain programs to include California. Several stakeholders point to the following programs in other jurisdictions:

- **Massachusetts Toxics Use Reduction Institute** (TURI) was established in 1990 through the passage of the Massachusetts Toxics Use Reduction Act. This far-reaching law was enacted to promote a new "preventive approach" to environmental protection, requiring over 600 firms in Massachusetts to inventory the toxic chemicals that they manufacture, process, or otherwise use; report annually on use of the chemicals; and create a plan for reducing or eliminating their use. The Institute was established to provide the education, research, and technical support services that promote the mission of the law. The Institute, which is often referred to simply as "TURI", was set up at the University of Massachusetts Lowell Campus to take advantage of the faculty and student resources of this long-recognized technical college. TURI is part of the state's toxics use reduction program, which is supported primarily by fees paid by Massachusetts companies that participate in the program.

- **Oregon Department of Environmental Quality Sustainability Program** involves using, developing, and protecting resources at a rate and in a manner that enables people to meet their current needs and also provides that future generations can meet their own needs. DEQ has a number of projects and programs that support sustainability. Its clients include: educational Institutions, industrial organizations, non-profit organizations, small business, administrative agencies, consumers, sustainableoregon.net communicates developments in Oregon state government and connects you with local agencies, organizations and businesses taking leadership roles in sustainable development.

Stakeholders remarked that the size, scope, and focus of a technical assistance program could be linked with other aspects of green chemistry. They said technical assistance programs do not happen in the abstract. Such programs need to be connected to research, information, databases, and the business community they are striving to serve.

Participants also told us that the scope of the services that could be provided range from preparing and distributing simple fact sheets to formal on-site technical assistance. Service providers can range from State and local staff, to university based advisory to private consultants who are in some way registered or approved by the state. The availability of funding will influence any decisions on technical assistance options. One stakeholder suggested that program funding could come from fees paid by businesses using toxic chemicals.

OPTION TA-2: Establish a partnership network for information sharing and dissemination.

Many comments discussed the need for technical assistance. In this option, they talked about who or how this assistance should be provided. Several commenters suggested some kind of technical center of excellence in green chemistry to research alternatives and provide technical assistance. Such a center could be sponsored by government, the University of California, or other universities. Most commonly it was suggested that it be operated in partnership with private industry. One stakeholder suggested a Green Chemistry Coordinating Council to collect and promote the sharing of information that highlights businesses with green practices and provide assistance to businesses lacking resources. Another stakeholder specifically suggested the use of third party experts to identify or develop viable alternatives.

Some existing partnerships were mentioned as possible models or starting points. These include: the UC Cooperative Extension Program, the USEPA Design for the Environment effort, the Department of Defense "green munitions" program, the DTSC partnership with California Chemical Industry Council, and the UC Berkeley Science Education Public Understanding Project.

One of the possible functions for a partnership or center could be to serve as a clearinghouse for information on safe or safer alternative. Others suggested that a web portal that provided access to chemical health and safety information that could be used by businesses to compare or rank alternatives. The Data Collection and Use chapter of this report expands on the need to acquire health and environmental impact information. A technical assistance program could be involved in sharing the results with businesses that need the information. Another stakeholder suggested partnering with the Department of General Services to develop information on green purchasing and to distribute this information to both local government and private businesses. A theme mentioned in several comments was the concept of stewardship programs as something that could help with greening the supply chain and addressing the cradle to cradle concerns. The American Chemical Council "Responsible Care" program, an industry lead program, was mentioned as an example.

Some other different kinds of technical assistance partnership were also offered as possibilities. One suggested a "mentoring" effort where large businesses could assist smaller businesses who make lack resources to evaluate alternatives. Another suggested partnering should be broader than just California and that we should look internationally for solutions to share or possibly work with the International Standards Organization to develop green technology standards that could be shared.

Interestingly, none of the comments on partnerships or centers specifically mentioned local programs. Yet, most of the existing technical assistance programs (see above) work closely with local agencies who serve as liaison or conduits in delivering information. Some pointed out that DTSC has a long history working with a network of local pollution prevention "champions".

OPTION TA-3: Publicize guidelines, chemical databases, evaluation tools, and other information to simplify the selection of preferable alternatives.

This option addresses content; what kinds of information businesses want or need, according to participants. This list of options in closely related to and intertwined with the research options. Stakeholders have said what they want some of this information may already exist other suggested needs will have to be developed first before it can be provided as a guideline or put into a readily available data base. The point of this option is to highlight where assistance is most needed or desired.

A re-occurring theme is that businesses need help in understanding what specifically constitutes "green chemistry". To this end, stakeholders identified the need for more information on what characteristics or attributes make for "green products". Businesses are looking for convenient, credible chemical evaluations or evaluation tools that they can use in making their choices. More specifically, some individuals suggested the need for automated web-based assessments to assist in product design and procurement. An example of this is the US Army Defense Ammunition Center work with Chemical Compliance Systems, Inc to web based modules that are used to analyze options. In the pharmaceutical industry, they have a more simplified approach which leads to certain chemicals being identified as ones that are too hazardous to pursue. A third example is some of the guidance distributed by DTSC to evaluate and compare solvent alternatives. One commenter was so specific as to suggest that a green chemistry symposium dedicated entirely to technology transfer be held.

Stakeholders encouraged that evaluations or evaluation tools should have the capability for use up and down the supply chain and that we should look internationally for sources that could be pulled into a database. Another common theme was the suggestion that "life cycle" (LCA) be brought in and applied to the evaluations. Several stakeholders also identified the need for some standardization in life cycle analysis so results are more comparable and transparent.

The recommendations went from simple lists of "safe chemicals" to recommending specific proprietary evaluation systems developed by private for profit companies. Some Stakeholders suggests, grading, ranking or scorecard with a wide range of latitude from the very simple (green-OK, yellow-caution, red-restricted or low-medium-high-very high) to very formal multimedia independently third party certified.

If a decision is made to include and pursue technical assistance, stakeholder said that attention must to be given to the types of information that will be developed and how it should be delivered to address the needs in the most cost effective fashion. For example, government sometimes think businesses are looking for information on cost effectiveness, fiscal impacts or financing options, yet relatively few of the comments identified this need. Again, the delivery of information through technical assistance is linked closely what information is needed and with the research to collect, compile and/or develop the material.

CHAPTER TEAM

The principal editors for this chapter were:

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The chapter team worked closely with the overall team, whose members are given in the Acknowledgements. They compiled each of the technical assistance comments and organized those into the three major options in this chapter. The references are presented in the next section of this report.

Chapter 7—Technical Assistance Options

REFERENCES

The tables below cross-reference each option to Appendix B. The figures shown in the first column represent the "challenge area" and the option number.

OPTION TA-1: Provide technical assistance to businesses in evaluating alternative products and processes.	
1-181	Develop a technical center of excellence in green chemistry as a key element of the California Green Chemistry Initiative. The center would be available to provide technical assistance, lead development of a green chemistry curriculum for undergraduate and graduate programs, and conduct state-of-the-art research on green chemistry innovations.
2-21	Provide technical expertise to organizations lacking internal resources.
2-31	Establish fees on businesses that use toxic chemicals. Such fees should be used to fund agency toxics use reduction activities, including data analysis, and the provision of technical assistance.
2-41	P2: Design for the Environment Program
2-44	Support research, development, technical assistance, entrepreneurial activity, and education in green chemistry science and technology.
2-56	Disseminate information on accomplishments, best practices, costs, and benefits.
2-68	Promote the exchange of information about best management practices, incentives, and barriers among industries and corporations, and between industry and customers. One way to do this is through a mentoring program (e.g., large corporations mentoring small ones or via the American Chemical Council).
2-70	Ensure that information is transmitted through all consumers in the supply chain.
2-77	Provide technical assistance to industry.
2-96	Create a green business program to educate and encourage companies and recognize companies incorporating green chemistry practices.
2-132	Educate business groups; involve UC Extension.
2-176	Increase investment in pollution prevention in the short term as well as extension of the current CA Pollution Prevention model to downstream chemical users as an element of the long-term green chemistry strategy.
2-187	Develop a technical center of excellence in green chemistry. The center would provide technical assistance, lead development of a green chemistry curriculum for undergraduate and graduate programs, and conduct state-of-the-art research on green chemistry innovations.
2-208	Establish partnerships with other states to create an interstate clearing house of environmental safety and health data
2-261	Make educational programs a key component of its Green Chemistry Initiative.

OPTION TA-1: Provide technical assistance to businesses in evaluating alternative products and processes.	
3-27	Utilize any useful information developed by USEPA Design for the Environment program and work with industry and businesses to implement elements. These include: (a) Evaluate the human health and environmental impacts of its processes and products. (b) Identify what information is needed to make human health and environmental decisions (e.g., hazard characteristics data and identification of "safer" alternatives). (c) Consider cross-media impacts and the benefits of substituting chemicals. (d) Reduce the use and release of toxic chemicals through the innovation of cleaner technologies that use safer chemicals. (e) Reduce the use and release of toxic chemicals through the innovation of cleaner technologies that use safer chemicals. (f) Make products that can be more readily reused, refurbished, remanufactured, or recycled. (g) Monitor the environmental impacts and costs associated with each product or process. (h) Recognize that although change can be rapid, in many cases a cycle of evaluation and continuous improvement is needed. Partnerships with UC and CSUS could help implement these objectives. Incentives for applying these as core business practices might also help.
3-40	Work with industry to reduce toxics in products, and where that proves difficult because no safe alternative exists, California should require product take-back at no cost to the consumer. This shifts the physical and financial responsibility away from local governments and consumers back to the product manufacturer.
3-47	Promote chemical reclamation and recycling technology to reduce chemical waste, which in turn reduces chemical manufacture.
3-53	Work with major users of chemicals of very high and high concern to reduce or eliminate their use of these chemicals in their products.
3-114	Expand access to information on chemicals for consumers, businesses and regulators by leveraging its preeminence in data management and mining in order to organize the world's chemical data. For example, the dossiers for the USEPA High Production Volume (HPV) Chemical Challenge program, and the related European program are often difficult to find and the data difficult to extract. By partnering with the information technology sector (e.g., Internet search firms), the State could expand access to chemical information, support its local industry and raise awareness of chemical safety information currently available.
3-127	Rather than imposing regulatory burdens, promote innovation in green chemistry positive incentives and partnerships. Green chemistry should be encouraged through the sharing of expertise, financial support for research, information exchange, and public education. Incentives could be offered for companies to pursue and foster green chemistry and green engineering.
3-143	Strengthen the recognition and pursuit of green chemistry processes and products by establishing clear criteria and voluntary certification based on comprehensive lifecycle considerations. Equally important, consumers need to be educated about responsible choices and practices.
3-147	Increase investment in pollution prevention in the short term as well as extension of the current CA Pollution Prevention model to downstream chemical users as an element of the long-term green chemistry strategy. Pollution prevention programs and policies such as SB 14 have been promoted for quite some time, yet they never receive anywhere near adequate funding and attention. This suggests the possibility of 1) taking chemicals of top priority concern, 2) identifying the specific applications or industry uses posing the greatest risk from those chemicals, and 3) applying a collaborative process of agency, industry and third-party experts to identify or develop viable alternatives that can maintain efficacy, but reduce risk in those targeted applications
4-10	Educate companies on greener alternatives and penalize companies for selling toxic items
4-32	Provide assistance to small manufacturers and encourage pooling of resources to improve safeguards and quality control on inputs.

OPTION TA-1: Provide technical assistance to businesses in evaluating alternative products and processes.	
4-35	Develop international technology exchanges between companies to capture knowledge on how to successfully mass produce products using less toxic alternatives.
4-57	Encourage the use of existing environmental management systems (e.g., ISO 14000) and work with international standards setting organizations (e.g., International Organization for Standardization) to develop green chemistry technical standards.
4-59	Develop "demonstration projects" and workshops to address common green chemistry problems.
4-77	Review a case study to examine the factors that are useful and appropriate in determining what is "safer." For example, use flame-retardants to evaluate how best to identify a safer alternative (e.g., safer chemical, alternative non-chemical technology, change in performance standards etc.). Develop a technical and a layperson document describing the results of the case study, and use this information for developing policy and doing education and outreach.
4-98	Consider a wide range of incentives to motivate changes in the behavior of industry and consumers, including: production tax credits; rebates to consumers or business; investment tax credits; R&D tax credits; R&D grants; equipment grants; loans or loan guarantees; public infrastructure development; government support to deploy environmentally preferred products or technologies; public/private partnerships; employee training and workforce development; CEQA exemption on qualified projects or other regulatory relief and special status once qualified (fast track permits; environmental leaders programs) or other expedited permitting programs; government preferred purchasing or government sponsored preferences; government specified product standards; use of consensus standards; use of third party standards and certification; product labeling programs; web based consumer information.
4-120	Catalog, and make easily available, information regarding best practice screening processes, green chemical design, collaborative efforts, international efforts, and examples of product development decisions and substitutions that have resulted in reduced waste produced and energy inputs.
4-132	Based on the model collaboration between industry, state government, and a third party expert in identifying solvent substitutes under SB 14, take the following approach: 1) consider chemicals of top priority concern, 2) identify the specific applications or industry uses posing the greatest risk from those chemicals, and 3) apply a collaborative process of agency, industry and third-party experts to identify or develop viable alternatives that can maintain efficacy, but reduce risk in those targeted applications.

OPTION TA-2: Establish a partnership network for information sharing and dissemination.	
1-82	Look at other industries and partnership (e.g. the military's "green munitions" program) in order to make information (CCS tools) available.
1-115	Understand the information needed by businesses using chemicals to make informed choices and evaluate how to address these information needs throughout the supply chain (i.e., information transfer up and down the supply chain between manufacturers to chemical users).
1-180	Create a clearinghouse of best green chemistry practices. There are numerous initiatives being conducted around the world with an existing and developing body of knowledge that can be leveraged to speed implementation.
2-56	Disseminate information on accomplishments, best practices, costs, and benefits.
2-60	Develop and share production/use information (data on amounts, facility locations, and uses of chemicals; MSDS updated to include all data; consumer product contents disclosure)
2-67	Increase collaboration between UC, state agencies, and industry.
2-68	Promote the exchange of information about best management practices, incentives, and barriers among industries and corporations, and between industry and customers. One way to do this is through a mentoring program (e.g., large corporations mentoring small ones or the American Chemical Council).
2-91	Develop a more involved relationship between the industry and academia to develop and exchange toxicology information.
2-92	Look to universities to work on alternatives.
2-93	Recognize that companies are innovators. Companies and industry associations should be encouraged to share best practices in regards to green chemistry and sustainability including incentives and barriers. Large companies can mentor small companies.
2-97	Use large associations and organizations, such as the American Chemistry Council, to facilitate interactions between suppliers and customers, including mentoring.
2-98	Recognize the value and role of industry stewardship programs (e.g., American Chemistry Council's Responsible Care, which includes evaluations of chemical products and their uses to assure that they deliver their intended benefits while protecting public health and the environment, and a management system certified by third-party auditors) and create incentives for others to take similar steps.
2-111	Create a partnership between state, industry, the public, etc.
2-132	Educate business groups; involve UC Extension.
2-147	Increase collaboration of different agencies (i.e. government agencies should work together) as with in Canadian system.
2-156	Promote product stewardship and manufacturer responsibility, which will lead to greener products and production.
2-162	Encourage public private arrangements between universities and private industry, particularly as they relate to green chemistry solutions.
2-169	Consider how UC Berkeley's Science Education Public Understanding Project (SEPUP), and educational outreach program, might accelerate outreach and conversely how green chemistry concepts might be incorporated into the teaching modules.
2-172	Establish clear criteria and voluntary certification for green chemistry based on comprehensive lifecycle considerations (including energy, C02 impact, water usage, packaging, recyclability, etc.)

OPTION TA-2: Establish a partnership network for information sharing and dissemination.	
2-187	Develop a technical center of excellence in green chemistry. The center would provide technical assistance, lead development of a green chemistry curriculum for undergraduate and graduate programs, and conduct state- of- the- art research on green chemistry innovations.
2-192	Foster innovation and encourage universities, educational institutions, and industry to partner in developing effective “greener” ingredients that reduce environmental impact.
2-197	Support collaborative efforts to encourage public and private partnerships to develop “greener” products and “environmentally responsible” ingredients.
2-208	Establish partnerships with other states to create an interstate clearing house of environmental safety and health data.
2-258	Include the following policy elements to further green chemistry in California: 1) strengthen the recognition and pursuit of green chemistry processes and products by establishing clear criteria and voluntary certification based on comprehensive lifecycle considerations; 2) explore models to provide needed chemical hazard data throughout the supply chain; 3) establish a green chemistry coordination council to collect and promote the sharing of information, highlight businesses with green practices, provide assistance to businesses lacking resources, and educate consumers; 4) prioritize chemicals for screening, testing and appropriate restrictions; 5) greater investment in pollution prevention in the short term as well as extension of the current ca pollution prevention model to downstream chemical users; and 6) continue the Conversation with California to sustain progress in green chemistry.
3-8	Ban the use of single-use polystyrene and other plastic/non-biodegradable polymer materials in order to protect the natural environment for present and future generations, exercise environmental stewardship by reducing the amount of polystyrene and other non-biodegradable polymeric substances that enters our waste stream, storm drains, watershed and coastal environment.
3-9	Work with the military and aerospace industry as well as the plating industry, to evaluate and revise outdated mill specifications to allow for more "environmentally friendly" plating chemistries. Technological advances have generated more environmentally friendly electroplating technologies (e.g., cyanide-free plating solutions). However, a widespread switch to more "green" plating practices has been hampered by outdated "milspecs" (i.e., the military specifications for most plating done for military and aerospace applications).
3-27	Utilize any useful information developed by USEPA Design for the Environment program and work with industry and businesses to implement elements. These include: (a) Evaluate the human health and environmental impacts of its processes and products. (b) Identify what information is needed to make human health and environmental decisions (e.g., hazard characteristics data and identification of “safer” alternatives). (c) Consider cross-media impacts and the benefits of substituting chemicals. (d) Reduce the use and release of toxic chemicals through the innovation of cleaner technologies that use safer chemicals. (e) Reduce the use and release of toxic chemicals through the innovation of cleaner technologies that use safer chemicals. (f) Make products that can be more readily reused, refurbished, remanufactured, or recycled. (g) Monitor the environmental impacts and costs associated with each product or process. (h) Recognize that although change can be rapid, in many cases a cycle of evaluation and continuous improvement is needed. Partnerships with UC and CSUS could help implement these objectives. Incentives for applying these as core business practices might also help.
3-33	Work with other state agencies including DGS to develop information on green purchasing, and disseminate this information to counties and cities and to private sector businesses for their use.

OPTION TA-2: Establish a partnership network for information sharing and dissemination.	
3-65	Establish partnerships with states to create an interstate clearing house of environmental health and safety data.
3-111	For alternatives identified, require a separate life cycle assessment by an outside party, or state-funded Center for Excellence in order to confirm that there is no loss in performance with the alternative, to avoid unintended consequences, and to assist in commercialization. The state also could develop a cooperative extension-type program to assist companies in cradle-to-cradle product design/formulation and assist in adoption of new alternative chemistries and processes. .
3-120	In pursuing the objective of the Green Chemistry Initiative to expand toxicology information on chemicals, encourage the use of alternatives to animal testing and require testing only as a last resort. Work with other experts to provide assistance on alternative screening methodologies that can be utilized to provide adequate toxicology information for recommendations and decisions about priority chemical uses.
3-130	Push collaborative efforts to encourage public and private partnerships, with a goal of developing greener products and environmentally responsible ingredients based on life cycle considerations, rather than mandatory and voluntary state labeling programs that endorse green products or programs that stipulate a single third-party certification of green products or numerical ranking.
3-145	Establish a Green Chemistry Coordination Council to collect and promote the sharing of information, highlight businesses with green practices, provide assistance to businesses lacking resources, and educate consumers. Catalog and make easily available information regarding best practice screening processes, green chemical design, collaborative efforts such as the ACS Green Chemistry Institute, and international efforts such as the Global Harmonization System. All stakeholders still have a lot to learn in this dynamic area, and everyone stands to gain from continued information sharing. DTSC's leadership in this area should be continued by establishing it as a central clearinghouse of information for the state and beyond. We further suggest building upon and making readily available the information provided by existing efforts: ACS Green Chemistry Institute, Cleangredients, USEPA Design for Environment Program, Performance Track, the chemical industry's HPV testing program, eChemPortal, EPEAT, and DTSC Technical Resource Center.
3-147	Increase investment in pollution prevention in the short term as well as extension of the current CA Pollution Prevention model to downstream chemical users as an element of the long term green chemistry strategy. Pollution prevention programs and policies such as SB 14 have been promoted for quite some time, yet they never receive anywhere near adequate funding and attention. This suggests the possibility of 1) taking chemicals of top priority concern, 2) identifying the specific applications or industry uses posing the greatest risk from those chemicals, and 3) applying a collaborative process of agency, industry and third-party experts to identify or develop viable alternatives that can maintain efficacy, but reduce risk in those targeted applications.
3-155	Engage in collaborative efforts to encourage public and private partnerships with the goal of developing "greener" products and "environmentally responsible" ingredients rather than mandatory and voluntary state labeling programs that endorse green products or programs that stipulate a single third-party certification of green products.
3-165	Product stewardship programs, designed to better management throughout the supply chain of the substance, & continued minimization of the impact of the substance, should be recognized & encouraged.
4-10	Educate companies on greener alternatives and penalize companies for selling toxic items
4-32	Provide assistance to small manufacturers and encourage pooling of resources to improve safeguards and quality control on inputs.
4-35	Develop international technology exchanges between companies to capture knowledge on how to successfully mass produce products using less toxic alternatives

OPTION TA-2: Establish a partnership network for information sharing and dissemination.	
4-57	Encourage the use of existing environmental management systems (e.g., ISO 14000) and work with international standards setting organizations (e.g., International Organization for Standardization) to develop green chemistry technical standards
4-112	Develop an extension service through the UC system to promote successful green chemistry methods/processes.
4-119	Establish a Green Chemistry Coordination Council to collect and promote the sharing of information and successful programs and to provide assistance to businesses lacking resources.
4-128	Develop a technical center of excellence in green chemistry to provide technical assistance, lead development of a green chemistry curriculum for undergraduate and graduate programs and conduct state-of-the-art research on green chemistry innovations.

OPTION TA-3:	***Publicize guidelines, chemical databases, evaluation tools and other information to simplify the selection of preferable alternatives***
1-42	Use an automated, web-based assessment of "green" chemicals, products, and processes for product design and procurement.
1-73	In 2000, the U.S. Army Defense Ammunition Center (DAC) began working with Chemical Compliance Systems, Inc. (CCS) to use CSS's extensive centralized Relational Chemical and Product Databases as the basis for a series of integrated, web-based modules within what has become the Munitions Analytical Compliance Suite (MACS). (CCS's centralized databases included over 650 regulatory lists.) MACS include eight modules. In a few months, the 9th and 10th automated modules the Emissions Risk Assessment and Human Health Risk Assessment–will be added. The most comprehensive of the MACS modules is the "Green" Munitions Analytical Compliance System (G-MACS).
1-115	Understand the information needed by businesses using chemicals to make informed choices and evaluate how to address these information needs throughout the supply chain (i.e., information transfer up and down the supply chain between manufacturers to chemical users).
1-116	Encourage greater collaboration and partnership across disciplines and institutions to increase overall knowledge. For example, consider the model of how pharmaceutical companies make decisions on which chemicals are too hazardous to pursue.
1-120	Create a unified database that includes data from sources around the world. This database would have to be designed to be accessible to different users (chemical product users; consumers, etc) and should be made public. (The "E-Chem" unified data portal newly introduced by OECD might be considered a "baby step" toward this.)
1-126	Combine life cycle analysis with trade-off rules, boundaries, and critical thinking. Understanding the purpose of the analysis and the good or service delivered allows for a good comparative analysis. However, there are a number of potential problems that must be considered to ensure good results.
1-137	As a key material solutions partner, work with our customers and their customers to better understand the impact of the product throughout its life cycle so they can make better informed decisions.
1-150	Give people at the business and community level a tool that will work for them.
1-180	Create a clearinghouse of best green chemistry practices. There are numerous initiatives being conducted around the world with an existing and developing body of knowledge that can be leveraged to speed implementation.
2-10	Develop a centralized database of chemicals and properties.
2-43	Strengthen government tools for identifying, prioritizing, and mitigating chemical hazards.
2-69	Create a database of "safe" chemical alternatives.
2-70	Ensure that information is transmitted through all consumers in the supply chain.
2-100	Utilize Chemical Compliance Systems, Inc. and their Green Product Compliance Analytical System, Green Process Analytical Compliance System and Green Munitions Analytical Compliance System web-based tools, developed for the U.S. Defense Ammunition Center to assess munitions from a green perspective (considers 43 ecological health and safety criteria)
2-103	Purchase the Chemical Compliance System's (www.chemply.com) Hazardous Material Management System database, which provides information on over 220,000 chemicals and their environmental characteristics. Making this tool available on the web will enable informed choices by consumers and assist in the selection of chemicals based on scores for ecology, human health, and safety.

OPTION TA-3:	***Publicize guidelines, chemical databases, evaluation tools and other information to simplify the selection of preferable alternatives***
2-108	Classify or rank existing chemicals (green, light green, yellow, and red).
2-115	Clarify the scope of "Green Chemistry."
2-117	Develop criteria for determining safe alternatives, including multi-media considerations; identify and publicize safe alternatives.
2-129	Establish a process, rather than creating a list; lists are only as good as the data (need current, accurate data).
2-131	Establish a "green seal," reflecting a specified level of greenness, or certification of approval.
2-137	Develop a grading or award system for products that meet certain green criteria as a joint effort within Cal/EPA; use of both green energy and green chemistry technologies should be considered. A standard, easily recognizable green logo could be used, reflecting different levels of "greenness" (bronze, silver, gold, and platinum); this would enable consumers to choose green products and motivate manufacturers to invest research and energy into the development of green products.
2-151	Identify less hazardous chemicals, as Canada did.
2-285	Inform substitution decisions in terms of the characteristics and risks presented by potential alternatives.
2-286	Create a “green chemistry scorecard” for suppliers, which would allow specific materials and their applications to be rewarded through favored purchasing policies.
2-287	Develop a matrix of information about the hazard traits of chemicals in use or considered for use, presented in ways that are useful for various audiences.
2-288	Fund development of the ingredient database.
2-300	Create an easily understood matrix of all chemicals currently in use with information on their hazard traits and biological consequences for use by downstream users, consumers, and other interested parties.
3-1	Develop science-based criteria for determining whether a particular product is greener or safer than alternatives.
3-4	Since well-informed consumers will not only handle and dispose of chemicals more safely, and will demand safer products with closed loop lifecycles, expand consumer education regarding product life cycle costs and impacts (e.g. appropriate selection, use, disposal, and alternative materials or practices). Disseminating information could occur through traditional media as well as outreach through community partners as well as the private sector. Educate people how chemicals are created, screened for use, and managed through a process. Show people “a day in the life of a chemical.” 2. California should provide complete transparent chemical risk information in a way the public can access, understand, and absorb.
3-112	Develop database of chemical alternatives that compares a number of sustainability parameters: performance, price, human health and environmental (e.g., toxicity, bioaccumulation, persistence) including carbon footprint and source sustainability.
3-143	Strengthen the recognition and pursuit of green chemistry processes and products by establishing clear criteria and voluntary certification based on comprehensive lifecycle considerations. Equally important, consumers need to be educated about responsible choices and practices.

OPTION TA-3:	***Publicize guidelines, chemical databases, evaluation tools and other information to simplify the selection of preferable alternatives***
3-145	Establish a Green Chemistry Coordination Council to collect and promote the sharing of information, highlight businesses with green practices, provide assistance to businesses lacking resources, and educate consumers. Catalog and make easily available information regarding best practice screening processes, green chemical design, collaborative efforts such as the ACS Green Chemistry Institute, and international efforts such as the Global Harmonization System. All stakeholders still have a lot to learn in this dynamic area, and everyone stands to gain from continued information sharing. DTSC's leadership in this area should be continued by establishing it as a central clearinghouse of information for the state and beyond. We further suggest building upon and making readily available the information provided by existing efforts: ACS Green Chemistry Institute, Cleangredients, USEPA Design for Environment Program, Performance Track, the chemical industry's HPV testing program, eChemPortal, EPEAT, and DTSC Technical Resource Center.
3-173	Provide clear and transparent characterization of chemical hazards to the public. Many entities can and are making decisions and take action that contribute to adoption of safer or lower hazard chemicals and products. To support such efforts, businesses, agencies, and the public need comprehensive, current, accurate, and reliable information about the relative hazard of different chemicals. The State of California should develop a matrix of information about the hazard traits of chemicals in use or considered for use, presented in ways that are useful and understandable to various audiences. This matrix should also make clear when gaps in data exist, so that businesses and individuals can choose to avoid chemicals with unknown hazards as well as those that are higher hazard
4-1	Chemicals should be assessed within the context of alternatives. Criteria for better or worse green products should be clear.
4-23	Develop a "green" rating system for products with agreed upon criteria
4-71	Create a list to be posted on the Internet of "bad actor" chemicals that have been found in products and the associated suppliers/manufacturers
4-141	Create a database on alternatives that compares a number of sustainability parameters: performance, price, human health and environmental (e.g., toxicity, bioaccumulation, persistence) including carbon footprint and source sustainability.

Chapter 8—Recognition, Awards, and Certification Options

Using recognition programs to stimulate green chemistry

SYNOPSIS

Awards and certification programs recognize the progress businesses are making toward green chemistry in their products and processes and help businesses and the public to identify and select certified alternatives. Stakeholders submitted 18 options, which are organized as two options in this chapter:

- Developing an awards program to publicly recognize green chemistry achievement and guide environmentally preferable purchasing and
- Establishing a program with specified criteria to certify and promote green products and services.

Throughout the Green Chemistry Initiative, at the symposia, and in other meetings, participants commented how recognition programs can help stimulate green chemistry. They frequently mentioned awards and recognition programs as "consensus" ideas. Stakeholders told us that many consumers and businesses in California are willing to preferentially select environmentally friendly products and services, but lack reliable, neutral, and accessible information to effectively make such choices. Many businesses, the said, also cite positive public recognition as a motivating factor for their green business decisions. Many comments recommended setting clear criteria for certifying products or granting awards with associated labels or logos. Altogether, recognition, awards, and certification ideas represent roughly 13% of the total number of comments submitted during the Conversation with California.

BACKGROUND

Although a detailed survey of existing recognition programs was not conducted, stakeholders mentioned a variety of current programs, in industry, in other states, and in other countries. Cal/EPA administers the following award programs:

- Governor's Environmental and Economic Leadership Award: An annual program recognizing notable, voluntary contributions which conserve resources, protect and enhance our environment, and build public-private partnerships.
- Pollution Prevention Program: A DTSC program recognizing businesses through the Mercury Elimination Leadership Program and vehicle service and repair model shop program.
- DTSC and Chemical Industry Council of California (CICC) Pollution Prevention Challenge Program. The department and CICC jointly developed this program as part of the pollution prevention workplan for 2006-08 (pursuant to the *Hazardous Waste Source Reduction and Management Review Act of 1989*[22/]). The program recognizes accomplishments in pollution prevention, waste reduction, and other environmentally friendly practices by members of CICC. Awards were presented to three California companies in 2007.

- Cal/EPA Environmental Technology Certification Program: From 1994 to 2002, the award-winning California Environmental Technology Certification Program (CalCert) was an independent, recognized scientific and engineering evaluation of environmental performance. Technology manufacturers and developers defined their performance claims and submitted supporting data to Cal/EPA. Staff reviewed the information, and when necessary, required additional testing to verify claims. The technologies, equipment, and products that are were proven received certification verifying their performance claims. The program was voluntary and self-supporting, which meant participating companies paid the cost of evaluating and certifying claims.

  CalCert recognition gave products, processes, and equipment greater visibility in the market and offered credibility to those technologies proven to have an environmental benefit. The Cal/EPA program partnered with and assisted in launching similar programs in six other states, the USEPA ETV program, the Canadian program (now known as Environmental Choice).

  Due to the current budget shortfall for the State of California, and associated budget uncertainty, Cal/EPA is not accepting any new applications into the Environmental Technology Certification Program. Although still authorized in several state statutes, the program is moribund.

DISCUSSION OF OPTIONS

OPTION RAC-1: Develop an awards program to publicly recognize green chemistry achievement and guide environmentally preferred purchasing.

The challenge of motivating businesses to develop and select safer alternatives with fewer environmental and health impacts is a key component of green chemistry. Stakeholders told us that a variety of incentives can stimulate this type of innovation and change within a company or an industry, including recognition of significant and noteworthy efforts through an awards program. Awards programs, they said, can be structured around specified criteria or may be developed to be more competitive, in which only outstanding candidates are honored.
To stimulate creativity, an awards program can focus on specific products, inventions, processes, or even ideas. Several commenters to the "Conversation with California" identified some of the more well-known awards programs, which are highlighted below. This is not an exhaustive list, however, of existing private or public sector programs.

According to commenters, the primary benefit of an awards program is the recognition and honor conferred by the award. They stated awards identify the recipient as a leader in green chemistry, raising its profile within its industry and market. A green chemistry award can also offer a secondary benefit to consumers by identifying manufacturers and products that have received awards for green chemistry. Increasing consumer uncertainty over the safety of a variety of common consumer products has resulted in a growing public preference for safer and greener alternatives. Among the options submitted, some suggested that a list of green chemistry award winners would help provide a level of assurance to consumers wanting to make green buying decisions and can result in greater sales for award recipients. An on-line list of green chemistry award winners intended for the general public would make the information particularly accessible, they asserted.

Several commenters said an awards program could be developed and administered by government as a stand-alone initiative, or the State could form a partnership with a third party to sponsor a program. Examples of existing green chemistry awards, cited in the comments during the Conversation with California, include:

- **Presidential Green Chemistry Awards**. Since 1996, USEPA has partnered with the chemical community to present the annual "Presidential Green Chemistry Challenge Awards." This awards program recognizes work that incorporates the principles of green chemistry to help achieve pollution prevention. The program typically gives awards for achievements in five categories: small business; academics; the use of greener synthetic pathways; the use of greener reaction conditions; and the design of greener chemicals. Nominations are judged by an independent panel of experts convened by the American Chemical Society using award selection criteria that focus on science and innovation, human health and environmental benefits, and applicability.

  Although the program does not provide independent green chemistry grants, it has supported the USEPA and National Science Foundation (NSF) partnership for environmental research. In the past, "Technology for a Sustainable Environment" grant solicitations have been available through this partnership to addresses the technological and environmental issues of design, synthesis, processing, production, and use of products in continuous and discrete manufacturing industries.

- **USEPA National Program for Environmental Priorities (NPEP)** is a voluntary program administered by the federal agency; it recognizes companies for accomplishments in areas such as waste and energy reduction, water conservation, and other environmental areas. NPEP encourages public and private organizations to form voluntary partnerships with USEPA that reduce the use or release of any of 31 priority chemicals. Ultimately, the program's goal is to work with industry and the public to reduce the use or release of 4 million pounds of priority chemicals by 2011. Organizations interested in becoming NPEP partners are eligible to receive public recognition for their contributions.

- **England's Green Chemistry Network,** which the Royal Society of Chemistry initially organized and supported, is a self-supporting endeavor housed within the Department of Chemistry at the University of York. The Green Chemistry network promotes green chemistry education, training, and practice through a variety of efforts including awards and prizes:

  - The IChemE environment awards, given since 2003, for sustainable development. Awards focus on reducing impact on the environment and for excellence in green chemistry and engineering;

  - The Crystal Faraday Green Chemical Technology awards, which celebrate outstanding achievement in the commercialization of green and sustainable chemical technology. These also have been awarded since 2003.

  - The UK Green Chemistry Awards, offered by the Royal Society of Chemistry since 2000.

- **Australian Green Chemistry Challenge Awards** have been offered since 1999 by the Royal Chemical Australian Institute (RACI). The Australian Green Chemistry Challenge

Awards recognize and promote fundamental and innovative chemical methods that accomplish pollution prevention through source reduction and that have broad applicability in industry. These awards also recognize contributions to education in green chemistry. The Green Chemistry Challenge Awards are open to all individuals, groups and organizations, both non-profit and for profit, including academia, government, and industry. The nominated technology must have reached a significant milestone within the past five years in Australia (e.g. one that has been researched, demonstrated, implemented, applied, patented, etc.). The awards must be an example of one of three green chemistry focus areas: alternative synthetic pathways; alternative reaction conditions; or the design of alternative safer or less toxic chemicals. In addition, the awards must benefit human health or the environment, and must be applicable to a large and broad-based segment of chemical manufacturers, users, or society. The award categories include small business, an academic or government institution, and green chemistry education.

- **Germany Haltermann Innovation Prize** started in 1998 and is awarded every two years for chemical-technical developments in the areas of product and process integrated environmental protection. The special emphasis is on processes for substance separation and environmentally sound products based on renewable resources.

- **Italian Green Chemistry Award** had its first deadline early in 1999. The 50 nominations were judged on scientific merit and economic and environmental impact. The first awards were given in March 1999 in the categories: (1) processes, (2) products, and (3) recycling.

- **American Chemical Society (ACS)** provides a number of recognition and monetary awards for green chemistry activities.[23] Two notable examples are the Kenneth G. Hancock Memorial Award, which honors outstanding student contributions to green chemistry, and the ACS National Award for Affordable Green Chemistry, which recognizes innovations in green chemistry that are less costly or of comparable costs to traditional counterparts.

OPTION RAC-2:	***Establish a program with specified criteria to certify and promote green products and services. Use existing certification programs, such as USEPA's Technology Verification Program, LEED Certification, or the Blue Angel, as models.***

To translate green chemistry innovations into permanent shifts toward safer products and production processes, commenters said a green chemistry program needs a mechanism to promote alternatives that are developed. Throughout the Conversation with California, stakeholders referenced a number of certification programs and how they can stimulate green chemistry by providing consumers with the purchasing information they need to make greener choices. For example, a green chemistry certification could inform buyers that products meet reliable standards or criteria.

Among the options submitted, several commenters suggested that California could develop a certification program that recognizes businesses that utilize green technology or product green products and services. A recognizable "green seal" or other type of standardized, easily recognized logo would identify certified products with relative levels or grades of green achievement designated on the product labels. Typically, participants noted, these types of programs are voluntary. These approaches can help to promote green products, increasing market

exposure, enabling consumers to choose green products, and motivating manufacturers to invest research and energy into the development of green products. They also suggested that government could promote green-certified products on government websites and provide links to the criteria used to grant the certification. Some contributors suggested that recognition or certification of green chemistry processes and products could be based on comprehensive life cycle considerations. Others suggested establishing a registry for companies seeking to align their business practices with green chemistry principles. Such a registry could accumulate examples of product development decisions and substitutions that have resulted in reduced waste produced and energy inputs.

Commenters said the criteria used for certification programs are critical to the acceptance and usefulness of the certifications. Both green energy and green chemistry technologies could be considered as criteria, as well as, energy use, waste generation, use of recyclable materials, and use of non-toxic ingredients. They recommended drawing on existing certification processes and criteria to serve as models. Green business programs, established in a number of California counties, certify businesses that adhere to greener practices. Other certification programs for green technology include the USEPA Environmental Technology Verification Program, the German Blue Angel environmental certification process, Green Seal, Energy Star, and Green Buildings/LEED certifications. From the comments received, several of these programs are described below:

- **Green Business Programs**. Green business programs, which certify that businesses meet specified standards of environmental performance, can be an effective means of stimulating green practices by companies, stakeholders said. Several programs administered by local governments were noted in the comments. For example, over 20 different industries, including auto repair shops, printers, hotels, restaurants, landscapers, wineries, janitorial and laundry services, grocery and retail stores, home remodelers, attorneys, architects, engineers, gift services, and a variety of office and home-based businesses, have successfully met the standards and are now recognized as Bay Area Green Businesses.

- **USEPA Environmental Technology Verification (ETV) Program** was established in 1995 to verify (not "certify") the performance of specific claims about innovative environmental technologies. Among the ETV program goals, the agency seeks performance data needed for widespread acceptance and implementation of new technologies. USEPA partners with independent testing organizations to develop test methods and protocols to assess innovative technologies in a variety of categories.

- **German Blue Angel** is the oldest environment-related label for products and services. Created in 1977 by the German government and administered by its environmental agencies, the Blue Angel eco-label promotes both environmental protection and consumer protection. It is awarded to products and services which are environmentally beneficial and which also promote occupational and consumer health and safety. Important factors include economical use of raw materials, production, usage, service life and disposal. Products awarded the label bear the logo of the Blue Angel directly on the product, while service companies use it on materials used to offer their services. About 3,700 products and services in 80 product categories currently have been granted the Blue Angel label.

- **LEED (Leadership in Energy and Environmental Design).** In 1998, the United States Green Building Council (USGBC) launched its "Leadership in Energy and Environmental Design" (LEED) program. The program instituted a rating system to identify and certify "green" buildings. In this program, external reviewers evaluate the environmental performance (inside and out) from a whole building perspective using life cycle analysis. Certification can be obtained for new construction projects as well as existing buildings and homes. It is a performance-oriented system where points are earned for satisfying specified criteria. Different levels of certification can be achieved based on the number of points earned, namely "certified, silver, gold, and platinum."

  A LEED applicant can earn points in six categories:

  - sustainable sites
  - water efficiency
  - energy and atmosphere
  - materials and resources
  - indoor environmental quality, and
  - innovation in upgrades, operation, and maintenance.

  The United States Green Building Council is a non-profit organization established in 1993 to promote the construction, maintenance, and certification of sustainable buildings (green buildings). Many stakeholders said the council is considered a consensus organization; the membership, which includes representatives in the following fields: architects, attorneys, builders, contractors, consultants, corporations, retail businesses, engineers, lending institutions, interior designers, landscape architects, city planners, environmental organizations, universities, media, utilities companies, and federal, state, local and agencies.

- **Green Seal.** The Green Seal organization presents a product or service with a "Green Seal" if it meets the environmental standard for its category, as demonstrated by rigorous evaluation, testing, and a plant visit. The non-profit organization uses a life cycle approach, evaluating a product or service throughout its development and production, from material extraction, through manufacturing and use, and ending with recycling and disposal. The Green Seal may be used on the product, on packaging, in advertising, promotional materials, catalogs, and in product descriptions. Green Seal charges applicants a fee based on the preliminary application for the assessment and certification service.

  Green Seal develops its standards with widespread input from a diverse group of stakeholders, including manufacturers, trade associations, universities, environmental and consumer groups, government officials, and the public. When a final standard is published, Green Seal provides a written response to all the comments received, and opens the standard to a formal appeal. Green Seal periodically reviews and updates its standards to reflect advances in technology and the marketplace.

  Green Seal supplements its in-house technical staff through partnerships with research institutions and individual experts around the world. Its primary research partner is the Center for Clean Products and Clean Technologies at the University of Tennessee at Knoxville. Other Green Seal partners include: Ecos Consulting Services, Healthy

Housekeeping Solutions, JP Kusz Ltd., GreenShift, Environmental Problem Solving Enterprises, GreenGuard, and Woolsafe.

- **Environmental Choice.** Begun in Canada and now operating in North America, the Environmental Choice Program (ECP) certifies and recognizes products and services that are environmentally preferable. It develops and promotes higher standards of environmental performance against which products and services can be assessed.

  These higher standards are called "Certification Criteria Documents" (or CCDs) and contain the exact environmental and performance requirements an applicant must meet to become ECP certified. CCDs are developed in cooperation with a broad range of stakeholders including representation from industry, environmental groups, consumer groups, academia and government. The criteria are intended to encourage and recognize reduced environmental impacts, to outline appropriate performance characteristics and to be challenging yet feasible. An important part of this development process is the four to eight week public review period in which comments are solicited from any interested stakeholders and the general public. Comments submitted to the ECP during this period are considered and the criteria revised accordingly. EcoLogo, which offers the Environmental Choice seal, belongs to the Canadian Government. The program is run by TerraChoice Environmental Marketing.

- **Scientific Certification Systems**. SCS is a third party evaluation and certification organization. Its programs focus on agriculture, electricity, manufactured goods, forestry, and fisheries. SCS provides certification, auditing and testing services, and standards. Their goal is to recognize the highest levels of performance in food safety and quality, environmental protection and social responsibility in the private and public sectors, and to stimulate continuous improvement in sustainable development.

CHAPTER TEAM

The principal editors for this chapter were:

Stan Phillippe, DTSC
Jesse Schnell, DTSC

The chapter team worked closely with the overall team, whose members are given in the Acknowledgements. They compiled each of comments about recognition, award, and certification ideas; these are organized as two options in this chapter. The references for those two major options are presented in the next section of this report.

Chapter 8—Recognition, Awards, and Certification Options

REFERENCES

The tables below cross-reference each option to Appendix B. The figures shown in the first column represent the "challenge area" and the option number.

OPTION RAC-1: Develop an awards program to publicly recognize green chemistry achievement and guide environmentally preferred purchasing.	
2-56	Disseminate information on accomplishments, best practices, costs, and benefits.
2-84	Develop a program to recognize green chemistry achievement, such as awards
2-96	Create a green business program to educate and encourage companies and recognize companies incorporating green chemistry practices.
2-98	Recognize the value and role of industry stewardship programs (e.g., American Chemistry Council's Responsible Care, which includes evaluations of chemical products and their uses to assure that they deliver their intended benefits while protecting public health and the environment, and a management system certified by third-party auditors) and create incentives for others to take similar steps
2-112	Offer incentives or awards for good ideas on products or project. Establish a "green inventor" or "imagineer" award.
2-136	Recognize and award green products because they can lead to greater sales and preferential purchase by environmentally conscious consumers. Use a logo in recognition or award program; see German Blue Angel award.
2-138	Include information geared towards the general public, particularly related to the purchase and use of certain products. Include: lists of manufacturers and products that have received "green" awards; information on the environmental impacts of plastics; greener alternatives to household chemicals; disposal options for universal waste; information on green chemistry; and a page called "What can I do to help the environment?" Increase awareness and enable the general public to put greater pressure on manufacturers and legislatures to make green chemistry and environmental protection a priority.

OPTION RAC-2: Establish a program with specified criteria to certify and promote green products and services. Use existing certification programs, such as USEPA Technology Verification Program, LEED Certification, or The Blue Angel, as models.	
1-131	Provide consumers with accurate information upon which they can make informed decisions could be a very useful tool in driving changes. There are many programs that are predicated on consumer choice. Cars are labeled with expected fuel efficiency ratings. Major home appliances have energy labels that can be used for comparisons. Plumbing fixtures show the water use. The clear intent is that consumers will use these labels to make more informed purchasing decisions.
1-132	Polls have shown that consumers want to have the information they desire readily available to them so that they are able to make informed decisions about the products they purchase. This must be a shared responsibility of the value chain.
2-53	Consider a certification program for green technology similar to USEPA ETV program
2-79	Develop labeling process for identifying and comparing green products and green product certification.
2-88	Develop a credible and effective third party labeling system for green products
2-131	Establish a "green seal," reflecting a specified level of greenness, or certification of approval.
2-134	Use Green Buildings LEED Certification as a model for green labeling or product certification. Include the following as criteria: use of green energy during manufacturing, waste generation, use of recyclable materials, use of non-toxic ingredients.
2-136	Recognize and award green products because they can lead to greater sales and preferential purchase by environmentally conscious consumers. Use a logo in recognition or award program; see German Blue Angel award.
2-137	Develop a grading or award system for products that meet certain green criteria as a joint effort within Cal/EPA. Consider green energy and green chemistry technologies. A standard, easily recognizable green logo could be used, reflecting different levels of "greenness" (bronze, silver, gold, and platinum). This would enable consumers to choose green products and motivate manufacturers to invest research and energy into the development of green products.
2-138	Include information geared towards the general public, particularly related to the purchase and use of certain products. Include: lists of manufacturers and products that have received "green" awards; information on the environmental impacts of plastics; greener alternatives to household chemicals; disposal options for universal waste; information on green chemistry; and a page called "What can I do to help the environment?" Increase awareness and enable the general public to put greater pressure on manufacturers and legislatures to make green chemistry and environmental protection a priority.
2-139	Use environmental certification in Germany, "The Blue Angel," as a model for the certification of products and services.
4-23	Develop a "green" rating system for products with agreed upon criteria
4-36	Encourage media publicity and engagement on toxics in products.

Endnotes

1. Chapter 1218, Statutes of 1989, adding article 11.9 (commencing with section 25244.12, chapter 6.5, division 20) of the Health and Safety Code (Senate Bill 14).

2. More information about the US program is posted at http://www.cdc.gov/exposurereport/default.htm

3. Chapter 599, Statutes of 2006, adding chapter 8 (commencing with section 105440, part 5, division 10) of the Health and Safety Code (Senate Bill 1379, Perata).

4. For more information on this database, see www.epa.gov/iris/intro.htm.

5. Examples of how QSARs are used in federal programs are posted at:

   www.oehha.ca.gov/multimedia/green/pdf/MathewsOct2_07.pdf
   www.oehha.ca.gov/multimedia/green/pdf/HenryOct2_07.pdf

6. More information is posted at http://www.epa.gov/pbt/tools/toolbox.htm.

7. More information is posted at http://www.ec.gc.ca/CEPARegistry/the_act/.

8. More information is posted at http://ec.europa.eu/enterprise/reach/index_en.htm.

9. More information is posted at http://www.mass.gov/dep/toxics/toxicsus.htm

10. More information is posted at http://www.deq.state.or.us/wmc/hw/tuwrap/tur.html

11. Dolphin Software offers a series of tools that integrates MSDS automation, regulatory compliance, hazard communication, environmental reporting, inventory management and total chemical management in one solution. More information is posted at http://www.dolphinmsds.com/default.asp?id=17

12. Developed by the non-profit Clean Production Action, the Green Screen evaluates the environmental preferability of chemicals based on four benchmarks, each defining a progressively safer chemical. More information is posted at http://www.cleanproduction.org/Green.Greenscreen.php

13. Chemical Compliance Systems, Inc. has developed hazardous materials databases, including one with chemical ratings based on 43 ecological, health and safety criteria. More information is posted at http://www.chemply.com/database.htm##2.

14. The first and oldest environment-related label in the world for products and services, The Blue Angel, is administered by Germany's Federal Environmental Agency, with the quality assurance and product labeling institute RAL Deutsches Institut für Gütesicherung und Kennzeichnung e.V. More information is posted at http://www.blauer-engel.de/englisch/navigation/body_blauer_engel.htm

15. Health and Safety Code section 25214.1 et. seq. For more information on the lead in jewelry law, see http://www.dtsc.ca.gov/LeadInJewelry.cfm.

16. From the definition used by the European Commission, see: http://ec.europa.eu/enterprise/csr/index_en.htm

17. From Industry Canada, see: http://strategis.ic.gc.ca/epic/site/csr-rse.nsf/en/Home

18. HARP is an integrated software package used by the local air districts, facility operators, and other parties to develop facility and emission inventories and health risk assessments. Further information is at http://www.arb.ca.gov/toxics/harp/harp.htm

19. Numerous books, essays, and articles have been written about assessing risk, hazard, life cycle, and alternatives in an environmental regulatory context. See, for example, *Making Better Environmental Decisions—An Alternative to Risk Assessment*, Mary O'Brien, 2002, for a detailed discussion about risk versus alternatives assessment.

20. ACC's Responsible Care® Management System (RCMS), which requires companies to measure and publicly report their performance in key areas: community awareness and emergency response, security, distribution, employee health and safety, pollution prevention, process safety, and product stewardship. Performance is verified by a third party and focuses on continued improvements.

21. The Education and the Environment Initiative is authorized by Chapter 926, Statutes of 2001, (Senate Bill 373, Torlakson) and Chapter 665, Statutes of 2003, (Assembly Bill 1548, Pavley). More information about EEI is located at http://www.calepa.ca.gov/Education/EEI/default.htm.

22. Chapter 1218, Statutes of 1989, adding article 11.9 (commencing with section 25244.12, chapter 6.5, division 20) of the Health and Safety Code (Senate Bill 14).

23. For more information, see ACS Green Chemistry Awards.

California Environmental Protection Agency

Air Resources Board • Department of Pesticide Regulation • Department of Toxic Substances Control
Integrated Waste Management Board • Office of Environmental Health Hazard Assessment
State Water Resources Control Board • Regional Water Quality Control Boards

Linda S. Adams
Secretary for Environmental Protection

Arnold Schwarzenegger
Governor

MEMORANDUM

TO: Chairpersons and Directors
Boards, Departments and Office

FROM: Linda S. Adams
Secretary for Environmental Protection

Linda S. Adams

DATE: April 20, 2007

SUBJECT: CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY (CAL/EPA) GREEN CHEMISTRY INITIATIVE

To date, much of our environmental protection emphasis has been to identify, reduce and control pollutants, wastes, and discharges. Each of your boards, departments and office have been instrumental in developing innovative and successful regulatory programs to evaluate the risks posed and to address pollution in the various environmental media: the emission of pollutants into the air, the discharge of contaminants into water, the handling and disposal of solid and hazardous wastes, and the application of pesticides. You have also been successful at identifying and integrating multimedia approaches in a number of your efforts, a lesson learned from our past experience with Methyl tertiary-butyl ether (MTBE).

Recent attention, however, has begun to focus more directly on the relationship between health and environmental effects and exposures to toxic substances, both in the workplace and in our day-to-day lives. A growing body of science and literature is emerging identifying a variety of concerns and challenges regarding the use and regulation of chemicals. The European Union and the Canadian government have adopted measures to evaluate hazards and reduce exposures to toxic chemicals while encouraging greater manufacturer responsibility for the products they produce. With this attention has also come increasing legislative interest. This year alone, there are over 50 bills that in some way or another deal with the management of individual chemicals and/or products of concern to public health and safety and the environment. The bills use different approaches (e.g., bans, phase-outs, limitations on uses) and rely on different administering agencies to implement their provisions.

Many of you have already begun to turn your attention to these issues in your respective areas. While these efforts will continue, we need to continue to evolve our programs towards a consistent means to evaluate risk and reduce exposure to dangerous

substances, encourage cleaner and less polluting industrial processes, identify safer chemical and non-chemical alternatives, promote education on risk reduction successes, and ensure that the efforts of each of your programs are consistent and coordinated. This effort should allow us to collaborate and gain the full benefit of each others' work, as well as to clearly identify goals and objectives that we all can strive to achieve.

In the absence of a unifying approach, interest groups and policy makers have been attempting to take these issues on one-by-one. Product by product, chemical by chemical, and now even city by city approaches can often have unintended, even regrettable consequences, even with the best of intentions. I believe we need to develop a coordinated, comprehensive strategy designed to foster the development of information on the hazards posed by chemicals, ways to reduce exposure to dangerous substances, approaches that encourage cleaner and less polluting industrial processes, and strategies to encourage manufacturers to take greater responsibility for the products they produce. For us to be successful in developing this strategy, we must have a better understanding of the toxicological and environmental effects of the toxic substances in products, in processes, and in commerce. For California, it will be important to build upon the availability of information that is generated through our existing programs, and draw upon the best mechanisms that have been developed within our programs as well as those that have been proposed elsewhere, such as in other states, the European Union, and other countries. Our goal must be to significantly reduce public health and environment impacts, as well as costs, by affecting the redesign of product formulations and manufacturing processes. Our strategy, and the policy that it champions, must have at its core and be governed by sound science.

To this end, I have asked the Director of the Department of Toxic Substances Control (DTSC) to lead this team effort on my behalf, in collaboration with the Cal/EPA boards, departments and office (BDOs). As with the Enforcement Initiative that Cal/EPA and the boards and departments undertook beginning in 2004, DTSC will lead this effort in consultation with other government agencies, industry and affected stakeholders. The Cal/EPA Green Chemistry Initiative will include a baseline assessment of existing programs, expertise and approaches related to the health and environmental effects of toxic chemicals and their sources, the identification of missing elements or "gaps" in how exposure to toxic chemicals is prevented or controlled, and the analysis of multi-media impacts.

DTSC and the Cal/EPA BDOs will use the results of this baseline assessment to develop lists of options the state could consider in filling the gaps identified in the baseline assessment. The options being developed should, at a minimum, be able to answer questions related to the toxicity of chemicals found in products, processes and commerce, the physical and chemical properties of chemicals and their potential to leach or migrate from wherever they may be found, the fate and transport of the chemicals in the environment, the health and environmental risks posed by those chemicals, the economic and technical feasibility of chemical and non-chemical alternatives to the use of particular chemicals, and the health and environmental risks posed by alternatives to those chemicals.

The options should also include areas where investment in research and development may play a role, where innovative technologies or acceptance of alternatives may be needed, and where chemical use restrictions may be warranted.

Through these efforts, it is my goal to develop recommendations for a Cal/EPA Green Chemistry Policy. I have asked the Director of DTSC to submit the list of options to me by January 1, 2008 from which we intend to draw and propose recommendations on a final policy by July 1, 2008.

I request each of you to dedicate the necessary resources towards this very important goal, and to designate a lead staff member to work with DTSC on this effort. I am assigning Assistant Secretary for Legislation Patty Zwarts and Assistant Secretary Janice Yonekura to act as my liaisons in this effort. The list of options to be developed should not only draw on the approaches and expertise in each of your BDOs, but it should also identify ways to enhance cross-BDO and cross-media collaboration towards common goals.

cc: Brian Prusnek
Deputy Cabinet Secretary

John Moffat
Deputy Legislative Affairs Secretary

Patty Zwarts
Assistant Secretary for Legislation

Janice Yonekura
Assistant Secretary for Waste and Cleanup Programs

Summary of Emerging Options

This document is a summary outline of all of the options which participants submitted through November 16, 2007. The emerging options include the input and comments from stakeholder meetings, symposia and forums, letters and emails, the Green Chemistry blog, and related venues. Each option presented in this record has been sorted into one of the broad categories defined below. Please note: a particular option may relate to more than one category; each option is sorted by its principal category for purposes of this document.

These options are organized into four groups known as challenge areas:

(1) Cradle to Cradle: Moving Towards a Cradle to Cradle Framework
(2) Green Chemistry: Stimulating Green Chemistry
(3) Toxics by Design: Identifying Toxics in Products by Design
(4) Toxics by Accident: Identifying Toxics in Products by Accident

Each option presented in this Record falls into one or more of the categories defined below:

Category	Types of Options Included (Definition)
Data Collection and Use (Information)	Identify and address information gaps; obtain and use better data. Establish mechanisms to expand and share information (about chemicals, toxicity, hazards, risks, life-cycle assessments, etc.). Develop a
Economic Incentives and Markets	Use market forces (incentives and disincentives). Encourage corporate responsibility and accountability. Establish funding mechanisms.
Statutory and Regulatory Requirements, Enforcement	Establish and harmonize laws and regulatory requirements; require disclosure, reporting, testing, or standards; prohibit uses or ban harmful chemicals; use or expand compliance and enforcement (regulatory system). More specifically, assess risks or hazards via a pre-market evaluation; consider life-cycle of a product; establish metrics to determine effectiveness of risk or hazard reduction strategies. Reduce or restrict use through reduction measures, standards, process or engineering changes, and product stewardship.
Voluntary Measures	Develop chemical data, reduce use, and find safer substitutes through voluntary measures. Encourage public-private partnerships. Identify and use non-regulatory models to stimulate green chemistry.
Education and Outreach	Increase public awareness. Enhance curriculum and academia programs. Provide clear and meaningful information to consumers. Foster training and workforce development in green chemistry.
Research and Technology	Conduct research on chemicals (risks and hazards), analytical methods, chemical designs and processes, and safer alternatives. Support increased research and development of green chemistry technologies establish laboratories and technical centers.
Technical Assistance	Provide technical assistance to businesses. Establish networks (between government, industry, academia, and the public) to promote green chemistry tools. Publish guidelines and methodologies.
Recognition, Awards, and Certification	Establish certification programs (for products, processes, and businesses). Recognize and award worthy achievements. Encourage innovation and change through preferred purchasing.

Reference Number	(1) Cradle to Cradle: Moving Towards a Cradle to Cradle Framework Options	Category							
		Data Collection & Use (Information)	Economic Incentives and Markets	Statutory and Regulatory Requirements, Enforcement	Voluntary Measures	Education and Outreach	Research and Technology	Technical Assistance	Recognition, Awards, and Certification
1-1	Establish baseline and enhance IT infrastructure to centralize and make accessible existing data with federal, state and local programs. Thus ensuring information gathered is accessible to others to facilitate use of existing data and programs.								
1-2	Develop a partnership and establishment of program w/academia.				X	X	X		
1-3	Foster participation in development of innovative alternatives through incentives for stakeholders. Do not regulate.		X		X				
1-4	Develop and establish mandatory criteria that must be addressed for all substances used in commerce. Take into account toxicity, effectiveness, volume used/reduction in use, long and short term health and environmental impacts (life cycle).	X	X	X					
1-5	Develop and establish balancing criteria for all substances used in commerce. Take into account long and short term costs/economics, "alternative analysis" and public acceptance.	X		X					
1-6	Prioritize and address chemicals by toxicity, risk and volumes used and/or released into commerce and the environment.	X							
1-7	Develop and use "global approach." Work with other states, countries and multiple organizations to ensure restrictions applicable to products are applicable to imports.			X					
1-8	Factor environmental, societal, environmental justice and economics into decisions.			X		X			
1-9	Foster outreach and education through partnerships to stakeholders.				X	X			
1-10	Mandate full disclosure of substances contained in products. "Green labeling" should be used with restraint.	X		X		X			
1-11	Mandate a surcharge on chemicals/products to support fund to address long term environmental impacts.		X	X					

Reference Number	(1) Cradle to Cradle: Moving Towards a Cradle to Cradle Framework Options	Data Collection & Use (Information)	Economic Incentives and Markets	Statutory and Regulatory Requirements, Enforcement	Voluntary Measures	Education and Outreach	Research and Technology	Technical Assistance	Recognition, Awards, and Certification
1-12	Research/develop new testing methods on relative toxicity and synergistic effects of substances.						X		
1-13	Realign and leverage with existing federal, state and local mandated reporting activities to avoid duplication and waste of resources.	X		X					
1-14	Establish product safety organization OR partnership with University of California to develop checklist and review new products.			X	X	X			
1-15	Use "precautionary principle" shift burden to industry.			X					
1-16	Foster "Reuse needs" to be considered in product design.								
1-17	Standardize terminology/definitions to promote the necessary and real change towards creating more sustainable, social and environmental solutions.	X		X		X			
1-18	Prioritize protection from chemical harm in decision making. Use data on all toxicological endpoints including cancer reproductive effects developmental effect etc.	X							
1-19	Develop regulations to phase out use of substances known to pose added risks and/or environmental harm.			X					
1-20	Use REACH as Model.	X		X					
1-21	Foster "Reduce Energy/ Resource Consumption" through take back programs.			X	X	X			
1-22	Foster ongoing and continual progress rather than one time improvements.		X						
1-23	Advertise Green Businesses.		X			X			
1-24	Do not focus exclusively on chemicals in products and chemical inputs. Manufacturing and production processes using chemicals should also receive attention in order to address health and safety concerns of workers - and to address community concerns for inherent safety of chemical-using or producing facilities.			X			X		

Reference Number	(1) Cradle to Cradle: Moving Towards a Cradle to Cradle Framework Options	Data Collection & Use (Information)	Economic Incentives and Markets	Statutory and Regulatory Requirements, Enforcement	Voluntary Measures	Education and Outreach	Research and Technology	Technical Assistance	Recognition, Awards, and Certification
1-25	A working task group should be convened to explore nano-technology and balance the benefits and risks. The group would partner with industry to set priorities and quantify optimal R&D resources.								
1-26	Support development of a chemical risk analysis process such as that being implemented in Canada.	X		X					
1-27	Support mandatory reporting and enforcement of chemical use by manufacturers and distributors.	X		X					
1-28	Develop task groups to do expanded research and development of safer alternatives to priority chemicals in consumer products, including investment in green chemistry research.								
1-29	Need responsible producer management at end-of-life.			X					
1-30	Rethink the processes for allowing chemicals into the market.	X		X					
1-31	Educate the companies and consumers world-wide.					X			
1-32	Teach green chemistry and green design at schools.					X			
1-33	Design with intent of End of Life								
1-34	Design with intent of End of life 1) Take back 2) Producer responsibility with idea of economic change of design 3)Facilitate COUGE recycling 4) Design to be biodegradable 5) Design to last		X	X					
1-35	Develop a database of ingredients used in consumer products similar to the Skin Deep database that is currently available for cosmetics. In order to ensure accuracy, California would need the regulatory authority to regulate consumer products and to require disclosure of ingredients in consumer products.	X		X		X			

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1-36	Establish mandatory requirements needed to fill gaps about chemicals. In addition to CMR data, we need other endpoints: neurotoxins, long-term toxicity, endocrine disruption, immunotoxicity. Industry should be responsible for developing these data, with government's role is to audit/verify.	X		X					
1-37	Develop an information clearinghouse on DTSC's website. This information would include hazard and use data as well as information about safe alternatives.	X	X			X			
1-38	Hold CEOs personally liable for adverse environmental and public health harm from toxic chemicals. They should also be held responsible for the veracity of information provided to the department under any new regulatory requirements.			X					
1-39	Legislate something similar to the State of Massachusetts (S-1268 & H-2275) The Act for a Healthy Massachusetts: Safer Alternatives to Toxic Chemicals	X		X					
1-40	Change state MSDS's requirements to be similar to the State of Pennsylvania MSDS requirements which are more informative than federal MSDS's.			x					
1-41	Develop Mentorship program that establishes Environmentally responsible companies as mentors to less compliant companies. Mentor to assist less fortunate companies and receive tax incentives commensurable with number of mentees.								
1-42	AUTOMATED, WEB-BASED ASSESSMENT OF "GREEN" CHEMICALS, PRODUCTS AND PROCESSES FOR PRODUCT DESIGN AND PROCUREMENT	X						X	
1-43	WEB-BASED MACS EMISSIONS AND HEALTH RISK ASSESSMENT MODULES	X							
1-44	An Automated Web-based System for Identifying Munition and Nonmunition Chemicals of Concern Chemical Homeland Security System (C–HoSS)	X							
1-45	Change policy to change Materials flow (i.e. eliminate special tax treatment for extraction of virgin materials and subsidies for agriculture.)		X	X					
1-46	Tax the use of virgin materials		X	X					

Reference Number	(1) Cradle to Cradle: Moving Towards a Cradle to Cradle Framework Options	Data Collection & Use (Information)	Economic Incentives and Markets	Statutory and Regulatory Requirements, Enforcement	Voluntary Measures	Education and Outreach	Research and Technology	Technical Assistance	Recognition, Awards, and Certification
1-47	Regulate mining, oil and gas nonhazardous solid wastes under RCRA. Eliminate special tax treatment for extraction of virgin materials and subsidies		X	X					
1-48	Establish depletion quotas on extraction and import of virgin materials/ Tax the production of virgin materials		X	X					
1-49	Establish requirements for product reuse, recyclability or biodegradability			X					
1-50	Mandate consumer separation of materials for recycling. Establish weight volume based disposal fees.		X	X					
1-51	Tax hard to dispose products. Establish deposit fund for packaging hazardous products.		X	X					
1-52	Establish a fee rebate based on energy efficiency.		X	X					
1-53	Tighten regulation of waste management at RCRA facilities			X					
1-54	Rethink the processes for allowing chemicals into the market.			X					
1-55	Regulation does not hurt the economy. It propels the industry to think in new ways.								
1-56	Change how we use Taxes and charges ; make the individual actor pay for the full cost . Example prorate based on emissions, lbs of waste disposed to encourage reuse and recycling. Include everyone ...from household wastes all the way up to the big chemical companies and corporations. " Pay by the Bag" approach.		X	X					
1-57	Government can help by avoiding recessions and making workers more adaptable through improvements in education and training.								
1-58	A dominant position in markets for an advanced technology can lock in control of a long stream of follow-on product and process innovations, making market entry much harder for technology "followers.		X						

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1-59	It might actually be to the economic advantage of manufacturers to be second rather than first—to absorb the spillovers from investments made initially by competitors (foreign or domestic) and thus start production further along the technological learning curve.		X						
1-60	Where technology policy is concerned, the hands-off approach is radical for it risks the most; the only prudent approach is to err on the side of government involvement in the sponsorship of new technologies.								
1-61	The government is a significant consumer of technology in its own right as it goes about providing for our common needs. In areas ranging from national defense to infrastructure, like any other large customer the government must open our wallet to get the technology it needs. Very often that means sponsoring research and procurement that launch new industrial capabilities.		X						
1-62	Transforming Technology takes a major step forward by analyzing the types of policy change needed to realize modern technology's potential								
1-63	Environmental regulation needs to be overhauled to promote long-term innovation and pollution prevention; more effective economic incentives for investments in clean technologies are long overdue; current measures of industrial productivity need to be reconceptualized so they recognize environmental costs; and altogether more attention needs to be paid to how clean technologies can be transferred successfully from country to country			X					
1-64	The need, in short, is for technological systems that are environmentally "closed"—that is, detached as much as possible from natural systems								
1-65	The existing damage won't stabilize and decline until pollution per unit of output and materials consumption per unit of output—factors that are at their core technological—decline rapidly enough to outweigh growth in economic output.								

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1-66	"Technological transformation for environmental sustainability" is thus a process that reduces environmental damage per unit of output (or value-added) fast enough to outpace production increases								
1-67	Technology is not the limiting factor: technical solutions available right now could make dramatic environmental improvements at small or negative cost. Lack of information, lack of capital, management failures, and short-sighted or obsolete public policies that impede environmental improvements								
1-68	Government subsidies can be introduced as temporary measures, being phased out when wider policy goals are achieved.		X						
1-69	Timing is important. A recession is a bad time to introduce a new tax.		X						
1-70	'Feebate' scheme to reward or penalize consumers of specified chemicals		X	X					
1-71	Fiscal instruments (tax changes) and regulations (emissions standards) work best in parallel.		X						
1-72	Tax exemptions seem to have a psychological effect on taxpayers that is out of proportion to the benefits received.		X						
1-73	In 2000, the U.S. Army Defense Ammunition Center (DAC) began working with Chemical Compliance Systems, Inc. (CCS) to use CSS's extensive centralized Relational Chemical and Product Databases as the basis for a series of integrated, web-based modules within what has become the Munitions Analytical Compliance Suite (MACS). (CCS's centralized databases included over 650 regulatory lists.) MACS includes eight modules. In a few months, the 9th and 10th automated modules the Emissions Risk Assessment and Human Health Risk Assessment–will be added. The most comprehensive of the MACS modules is the "Green" Munitions Analytical Compliance System (G-MACS).	X						X	

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1-74	Chemistry has enabled the development of countless products that consumers use each and every day, and consumers want to understand what impact these products may have on the environment and on their health. Industry shares this desire, and continues to strive to develop, produce and market products that are both beneficial and safe for people and the environment.					X			
1-75	.. the question is not just, “How do we control toxic substances?”, but also how do we successfully manage both toxicity and exposure--risk--while providing the solutions society needs?			X					
1-76	Risk assessment methods that integrate knowledge regarding potential hazards of chemicals with an understanding of their uses and exposures;								
1-77	Product stewardship and risk management programs that establish mechanisms to assure exposures remain in the safe region for typical uses and foreseeable misuses; and			X					
1-78	Laws and regulations that: • are science-based, • balance potential risks with benefits, • factor in existing scientific knowledge as well as reasonable uncertainties, and • consider the degree of risk to people and the environment.			X					
1-79	Find a way to successfully manage both toxicity and exposure (i.e., risk) while providing the solutions California needs.			X					
1-80	What if you could have a plastic polymer that you could recycle with the efficiency and a robust system similar to paper and aluminum? Polylactic acid can be hydrolyzed from PLA back into Lactic acid and repolymerized back into PLA. This process does not need complex chemistry to separate copolymers because PLA is a homopolymer and would yield only lactic acid.								

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1-81	The end-of-life vision for NatureWorks Biopolymer in the long term is to maintain a journey to zero waste – keeping the Biopolymer, regardless of form, out of the landfill and being to able to recycle into the same use or higher valued use if possible.								
1-82	Look at other industries/partnership (e.g. military- “green munitions”) in order to make info (CCS tools) available				X			X	
1-83	Hazard is largely inherent to a chemical, and doesn’t fundamentally change over space or time, whereas any exposure information necessarily represents only a “snapshot” in both space and time.								
1-84	A chemical’s hazard is relatively intrinsic, largely or entirely independent of how the chemical is used, where or how it enters the environment, or other factors that vary with time and place. Hazard data are therefore relevant (i.e., necessary though not sufficient) in characterizing risk whatever the use of a chemical, and hence are useful in understanding any and all potential uses of or exposures to a chemical -- and what kind of exposure-reducing efforts may need to be taken.								
1-85	Conditions that determine exposure can and often do differ enormously for every setting and point in time that a chemical is present. And even if a “snapshot” of current exposure were able to be assembled, the next new use or activity leading to a release would alter the exposure picture.								
1-86	Risk and exposure assessment at this time are simply too uncertain and unreliable to serve as a basis for deciding for which chemicals hazard data should be developed. While ultimate decisions concerning risk identification and management need to account for exposure as well as hazard, in all but the most exceptional cases, chemical prioritization approaches should be hazard-, not risk-driven.								

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1-87	Transparency: Policies should ensure that any descriptions of exposure information are clear and transparent in describing the scope and nature of the information and its limitations, including by addressing all of the elements specified above under Scope and Completeness and Quality.								
1-88	Policies should require that conclusions or recommendations be carefully written and explicitly qualified so as to limit their perceived and actual applicability to those settings for which information has been provided and deemed sufficient to warrant the conclusion or recommendation. Furthermore, the degree of uncertainty associated with a conclusion or recommendation should be stated and should reflect the extent of exposure information available. Lastly, policies should ensure that in the absence of good exposure information, exposure should be assumed possible or likely.			X					
1-89	Ensure access to information gathered by others								
1-90	Negotiate for access to confidential business information (CBI) submitted under the European Union's REACH Regulation and under the Canadian Environmental Protection Act (CEPA)	X							
1-91	Require companies making/importing chemicals in California that are subject to REACH or CEPA to submit the same information to California officials	X							
1-92	Enhance existing IT infrastructure to receive and share the large volumes of REACH data								
1-93	Map the flow of chemicals in California by developing and sharing production/use info	X							
1-94	Require California producers/importers and users to submit and update information on production and processing (amounts, facility locations), uses (including in products), and post-use management	X							
1-95	Much of the information reported to EPA is designated confidential business information (CBI). Under TSCA, EPA is prohibited from divulging any CBI to the public or to other governments, including the State of California.								

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1-96	MORE THAN 18 MONTHS AFTER THE ORIGINAL DEADLINE, THE HPV CHALLENGE IS FAR FROM COMPLETE								
1-97	Two-and-a-half years after final data sets were due, fewer than half (47%) have been submitted.								
1-98	10% of eligible HPV chemicals were not volunteered for the Challenge by the companies that produce them; EPA has issued rules to compel testing for only 6% of these chemicals.								
1-99	The average quality of sponsors' initial submissions, while originally quite good, has declined over the course of the Challenge, especially in the past 18 months. The grade point average for initial industry submissions has declined from a solid B-plus in 2001 to a C-minus in 2006.								
1-100	Because the HPV Challenge is voluntary, EPA has very limited ability to ensure that the data submitted by sponsors are of high quality and complete. While EPA and other commenters have often identified deficiencies in initial submissions, there is no legal or binding obligation on the part of sponsors to heed those comments.				X				
1-101	THE MAJORITY OF CHEMICALS IN COMMERCE ARE NOT HPVS								
1-102	HPV chemicals constitute the bulk of chemicals in commerce when measured by tonnage, non-HPV chemicals far outnumber HPV chemicals.								
1-103	Findings indicate that the chemical industry is not making the development of, and public access, to hazard data on all HPV chemicals "evergreen" practices.								
1-104	Embrace the idea of screening of chemicals to get meaningful information and results in a reasonable amount of time. Methods for screening may be different than for full testing.								
1-105	Develop a map of chemical use in California that shows where chemicals come from, how they are used, and where they go.								

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1-106	Develop approaches that better address the significance of levels of biological activity as ways to predict and understand toxicity and potency, along the lines of the recommendations from the National Academy of Sciences.								
1-107	Talk to chemistry departments at universities so that they understand the importance of the hazard traits of toxicity, persistence, and bioaccumulation. Encourage the development of new curriculum and requirements for chemistry undergraduate and graduate students.					X			
1-108	Include variability and differential human susceptibility in the models and approaches. We know that there are distributions of many of the factors that predict human response to chemicals. We have not fully integrated these issues into the ways that we think about chemicals, and we need to.								
1-109	Lower the barrier to obtaining access to data and create incentives for the production of data, rather than maintaining the current framework which actually provides incentives to avoid producing data.		X	X					
1-110	Create lists of chemicals of concern at different levels of evidence or certainty. There may be chemicals that are of concern as possible toxic air contaminants or carcinogens but that do not make it onto the lists of the Toxic Air Contaminants or the Proposition 65 chemicals, for example. There could be “feeder” lists that would help us have an early view on what the potential chemicals of concern are.	X							
1-111	Focus more on what people are exposed to in the real world.			X					
1-112	Focus more on products and the chemicals in products, which get little attention.			X					
1-113	Overcome gaps in education related to new methods. Some of these may include computational toxicology and bioinformatics, as well as other things that we have discussed. Building such capacity (e.g., more training, resources, scientists) may lead to better models and approaches.					X			

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1-114	Educate the public and consumers and other users of products about how to select and use “safer” products. We need to address their information needs in ways that are understandable to make it possible for them to do so.					X			
1-115	Understand the information needed by businesses using chemicals to make informed choices and evaluate how to address these information needs throughout the supply chain (i.e., information transfer up and down the supply chain between manufacturers to chemical users).	X						X	
1-116	Encourage greater collaboration and partnership across disciplines and institutions to increase overall knowledge. For example, consider the model of how pharmaceutical companies make decisions on which chemicals are too hazardous to pursue.		X		X	X		X	
1-117	Reduce the differences in the ways that we treat pharmaceuticals and environmental chemicals. The workshop identified several areas where information and methods developed in the pharmaceutical industry could be useful for environmental chemicals, and these should be addressed.			X					
1-118	Implement the policy that “no data means no market,” meaning that chemicals for which safety data are not available are to be banned from sale or use.	X		X					
1-119	Increase the budget for state agencies responsible for evaluating human and ecological risk i.e OEHHA.		X	X					
1-120	Create a unified database that includes data from sources around the world. This database would have to be designed to be accessible to different users (chemical products users; consumers, etc) and should be made public. (The “E-Chem” unified data portal newly introduced by OECD might be considered a “baby step” toward this.)	X				X		X	
1-121	Ensure that data are available to the public and address limitations related to confidential business information.					X			

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1-122	Look at a product from all the various aspects of its life cycle. It is critical to ensure the total picture of benefits and impacts is understood. Failure to look across the entire life cycle when making decisions can lead to unintended consequences and often fail to solve the issue of concern. Dissecting a product into all the various processes that contribute to its production and disposal can help us better understand how our production and consumer habits affect the environment.	X							
1-123	Establishing trade-off rules and boundaries is critical to success. However, despite the availability of an ISO standard on LCA, not all life cycle assessments are conducted using that standard. In addition, assumptions and boundaries can be defined differently in different assessments. These facts make it difficult and unwise to try to compare one life cycle analysis to another group's work.								
1-124	For example, this analytical technique has been adopted by some manufacturers who hire private research firms to conduct LCAs for their products. With a growing environmental consciousness on the part of consumers, marketing a product as "environmentally-friendly" can mean money in the bank for manufacturers.								
1-125	three LCAs have been conducted on cloth vs. disposable diapers by separate firms hired by different groups. Each analysis came out with different results and each group marketed their products using the numbers from the studies they backed. This has raised great concern in scientific and environmental circles. The assumptions and boundaries used in any LCA must be transparent to avoid confusion and misuse.								
1-126	A life cycle analysis must be combined with trade-off rules, boundaries and critical thinking. Understanding the purpose of the analysis and the good or service delivered allows for a good comparative analysis. However, there are a number of potential problems that must be considered to ensure good results.							X	

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1-127	Due to differing assumptions developed up front: comparisons between studies difficult								
1-128	No single, globally accepted method exists for LCA work								
1-129	To help alleviate concerns over the trend to use LCA as a marketing tool, the Society of Environmental Toxicology and Chemistry (SETAC) has established guidelines for conducting LCAs by both governmental and private agencies, as well as developed a code of ethics. It is suggested that DTSC consider following this type of standard.	X							
1-130	Concerned about the growing tide of consumer deceptive trade practices litigation, some of it based on product labels. The State of California is a significant jurisdiction for such claims, including class action lawsuits. Any eco-labeling program developed and overseen by the state should exempt eco-labeling from forming the basis for such liability, relying instead on state regulatory controls to enforce eco-labeling standards. It would defeat the public policy goals of having an eco-labeling program, if the very program that the State designs to inform consumer decision-making becomes the basis for private parties to claim money damages for purported misinformation. Additionally, any eco-labeling program must be harmonized with existing State and Federal regulations.					X			
1-131	Providing consumers with accurate information upon which they can make informed decisions can be a very useful tool in driving changes. There are many programs that are predicated on consumer choice. Cars are labeled with expected fuel efficiency ratings. Major home appliances have energy labels which can be used for comparisons. Plumbing fixtures show the water use. The clear intent is that consumers will use these labels to make more informed purchasing decisions.	X	X			X			X
1-132	Polls have shown that consumers want to have the information they desire readily available to them so that they are able to make informed decisions about the products they purchase. This must be a shared responsibility of the value chain.	X	X						X

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1-133	While most of the initial consumer labels focused on single attributes (water, energy or fuel efficiency), most purchasing decisions are not that simple. Typically in green chemistry, there are a number of attributes that must be evaluated. A food nutrition label is perhaps a more analogous situation where consumers need to consider a variety of factors (sugar, protein, fat), various desirable nutrients (vitamins, minerals) and some to be avoided or minimized (sodium, saturated fat).					X			
1-134	A consumer choice approach to green chemistry, like a food nutrition label, would provide the relevant information in the hands of consumers and allows each person to make the most appropriate choice for their situation. It is critical to define the components and metrics for such a label, and the process should engage all of the stakeholders in its development.								
1-135	Environmentally Preferred Purchasing (EPP) can be an effective approach to drive change by assigning an advantage in the purchasing process for products and services that meet a pre-determined set of "green" or “sustainable” attributes. Using this approach, brand owners, retailers and government regulations set the marketplace expectations and develop market demand for new technologies. It is up to manufacturers – and their suppliers to deliver products and services that meet the market demand, or risk being left behind.	X	X			X			
1-136	Developing and marketing materials to meet rising consumer demand for “green” or sustainable products.		X			X			
1-137	As a key material solutions partner, work with our customers and their customers to better understand the impact of the product throughout its life cycle so they can make better informed decisions.					X		X	
1-138	The application of science-based EPP definitions so that measurable environmental improvements can be delivered.		X			X			
1-139	Government preferred purchasing or government sponsored preferences		X			X			

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1-140	Government specified product standards (e.g., CAFE standards, energy efficiency standards for buildings, bans on incandescent lighting bulbs, etc.) Must be preceded by the appropriate infrastructure to take and recycle emerging waste streams. I.e . mercury containing bulbs are routinely disposed of with residential wastes. More energy efficient but equally harmful in the environment if not handled properly					X			
1-141	It is particularly important to think through the “signals” that are being sent to markets to avoid unintended consequences. For example, specifying increased recycle content will significantly raise barriers to entry and delay introduction of new, innovative materials since recycling infrastructure and markets take time to develop. A flexible, performance based approach avoids the government picking technological winners and losers, but it must be done using a holistic, long-term view.		X			X			
1-142	To be sustainable, a solution must be economically viable in the long run. Unending subsidies and credits are not appropriate and can disrupt markets. However, these tools can be very powerful to initiate, develop and commercialize new technologies and products. Rewarding early adopters should be the objective. These risk sharing mechanisms between the private and public sectors should have a finite limit.		X						
1-143	It is important to remember that not all incentives require revenue or an exchange of money. Expedited permitting or regulatory relief can be very important to companies and cost governments little to implement and can even streamline the government processes in some cases.		X						
1-144	SUBSTITUTIONS MAY CHANGE THE NATURE OF THE PROBLEM RATHER THAN SOLVE IT			X					

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1-145	Mandatory bans and forced substitutions often are not a complete solution because, as one issue is addressed, another set of concerns may arise. This is the difference between “informed substitution” and “regrettable substitution”, with the goal of “informed substitution” being to avoid “regrettable substitution”. For example, the health and convenience of our lives has been greatly enhanced by modern refrigeration. Refrigerators originally used ammonia, a toxic chemical, as a coolant. As scientific discoveries were made, chlorofluorocarbons (CFCs) replaced ammonia. While CFCs are practically non-toxic, they were later implicated in depleting the ozone layer and eventually banned. CFCs were then replaced with hydrochlorofluorocarbons (HFCs), which have no impact on the ozone layer, are non-flammable, have low toxicity, and high energy efficiencies. Scientists have now learned that HFCs could contribute to global warming if released into the air. Alternative coolants such as hydrocarbons and carbon dioxide have been considered, but both need to be carefully examined because of the potential for emissions and the possible dangers from higher operating pressures.			X					
1-146	Substituting one material for another is never as simple or straightforward as it might at first appear. i.e. mercury containing light bulbs			X					
1-147	SUBSTITUTIONS MAY RESULT IN UNINTENDED ADVERSE CONSEQUENCES			X					
1-148	SUBSTITUTION IS NOT THE ONLY VIABLE APPROACH TO CONTROL RISK			X				X	
1-149	We must involve people at the business and community level.					X			
1-150	We must give people at the business and community level a tool that will work for them.			X					
1-151	Extended Product Responsibility (EPR) – put incentive on manufacturer to minimize costs of products, i.e., spur reuse and disposal management costs.		X						
1-152	Implement a California Toxic Substances Control Act - CA TSCA. Require all new chemicals sold in California be tested for toxicity before they are marketed.			X					
1-153	Require American Society for Testing and Materials (ASTM) Standards.			X					

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1-154	Provide consumer education so consumers know what questions to ask.					X			
1-155	Provide consumer education on what will be hazardous when product is thrown away, wake up consumers that there is no “away.”	X				X			
1-156	Encourage C2C curriculum (K-12 and Postsecondary).					X			
1-157	Require chemistry students to take toxicology classes								
1-158	Require training for companies doing business in CA on concepts of green chemistry (i.e. mandatory employee training type program)								
1-159	Identify end points for cradle to cradle								
1-160	Should there be industry specific cradle to cradle standards?			X					
1-161	A company that manufactures chemicals in and/or imports chemicals into California should have a publicly available overview of the approach it uses for chemical evaluation and assessment. Companies should affirm to the state that the chemical evaluation and assessment approach is publicly available.					X			
1-162	The state of California should establish research and development centers focused on sustainable chemistry and/or sustainable engineering within its University of California system, such as Centers for Excellence in Sustainable Chemistry at leading University of California campuses that are networked to address major sustainability opportunities and issues.					X			
1-163	California, should adopt the output of the Canadian Chemical Management Plan (based on Canada’s categorization and prioritization of the existing chemical inventory) as a solid, scientifically sound foundation.			X					

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1-164	The August 2007 Montebello Agreement between the US, Canada, and Mexico will result in significant chemical evaluation work being completed in a relatively short timeframe. DTSC should take advantage of the upcoming work to be conducted by the US, Canada, and Mexico. This would clearly allow DTSC to save time and resources, while advancing the protection of health and the environment. It would also allow DTSC to be viewed as a global leader in integrating the Montebello evaluation outcomes into its own process.			X					
1-165	"Green Chemistry" is not just about substitution of one hazard for another; it is ultimately about the reduction of risks to health and the environment that are otherwise unmanaged. A risk reduction policy seems to be a much better approach to accounting for the economic, social, health, and environmental dimensions of green chemistry, particularly because by definition it will address not only inherent toxicity (hazard), but potential exposures as well. Perhaps most importantly, a risk reduction policy (one that addresses both hazard and exposure) correlates very well with the pollution prevention policies that have been at the heart of many existing DTSC programs, and can serve as a meaningful focal point in encouraging the development of sustainable chemistry, green engineering, and products that improve the lives of Californians and the State environment			X					
1-166	California must establish a process by which state-wide priorities can be identified, where existing and new risk reduction measures – spanning the entire spectrum from research and financial incentives to regulation – can be appropriately assessed, and where the relative benefits and impacts of the approach can be evaluated. In short, a risk reduction policy provides an important and appropriate organizing principle for DTSC's "Green Chemistry" recommendations.			X					

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1-167	DTSC's "emerging options" document contains several recommendations aimed at compliance and enforcement issues. In general, it will be difficult to enforce broad concepts of "green chemistry," largely because what constitutes "green chemistry" (or green engineering) will differ depending on the product, process, company, or industry involved. To the extent that regulatory actions are recommended by DTSC, appropriate enforcement measures will likely need to be considered. It is critical that those enforcement measures be capable of uniform application. In addition, California should address what steps might be necessary to deter false claims of "green-ness" that mislead consumers and distort the market.			X					
1-168	DTSC should not wait for the conclusion of the CGCI to engage in discussions with U.S. EPA and the Canadian government on how the State can coordinate with and leverage those programs in support of the CGCI.			X					
1-169	There is a need for education that the broad scope of "green chemistry" includes "green engineering," and that it is not limited to simplistic hazard substitution. Moreover, a concerted effort to disseminate appropriate information on the accomplishments, best practices, costs, and benefits of "green chemistry" would help assure that all interested stakeholders understand the concept and limitations of the approach. Health and safety information should never be considered proprietary or confidential information.			X		X			
1-170	Collecting and delivering material to a processing site is probably no more complex than the current system for collecting recyclables. The "reverse distribution" system that powers recycling is energy intensive itself and the cost can only be supported by a high-value recycled material. On the other hand, our logistics are already well-optimized to deliver material to a landfill. Thus, proper segregation at the landfill—the mine, if you will--and processing geographically as close as possible could be an economical combination.								

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1-171	We must start using natural substances that are not toxic and end the relentless abuse of animals in toxicity testing.								
1-172	Chemicals should be regulated based on risk of exposure from the use in a product not a raw material or substance outright. For example, no lead in paint or toys, but allow lead as a raw material for other non-risk products, such as, lead-acid batteries.								
1-173	Green chemistry principles should be agreed upon and clearly articulated.								
1-174	Chemical hazards and risks should be described and communicated effectively with extensive and accessible data management.					X			
1-175	Toxic chemicals should be prioritized according to risk in a practical, objective and . transparent manner using sound science.			X					
1-176	Green chemistry chemical evaluation process should be collaborative and include scientific experts in toxicity and exposure from all stakeholder groups.								
1-177	Voluntary collaboration with regulatory clout will support a green chemistry infrastructure to eliminate or mitigate hazard while promoting innovation and substitution.				X				
1-178	Green chemistry progress metrics should be developed and adopted with a commitment to transparency and proactive response to new information on any risk or benefit posed by chemicals.			X					
1-179	Enforcement efforts should be pursued in two directions: voluntary with incentives and regulatory to dictate changes. The California Green Chemistry Initiative should leverage voluntary industry efforts to create better alternatives to high hazard substances, to mitigate risk and to make full use of market-based incentives. Recognition should be given for early adaptors and/or outstanding achievements in green chemistry. These would then be complemented by regulatory compliance to meet public expectations for safe chemical management.				X				

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1-180	California should create a clearinghouse of best green chemistry practices. There are numerous initiatives being conducted around the world with an existing and developing body of knowledge that can be leveraged to speed implementation.	X						X	
1-181	California should develop a technical center of excellence in green chemistry as a key element of the California Green Chemistry Initiative. The center would be available to provide technical assistance, lead development of a green chemistry curriculum for undergraduate and graduate programs, and conduct state- of- the- art research on green chemistry innovations.				X	X		X	
1-182	The California initiative should promote public education and awareness of chemicals used in commerce and the principles of green chemistry. Programs addressed to consumers or primary (K-12) education should focus on scientific literacy to create a broader understanding of the costs and benefits of both chemicals policy and product innovation. These programs should provide the foundation for effective communication using product labels, hazard warnings, etc., and other policy 'options.					X			
1-183	a “Green Chemistry” program, in and of itself, should not be picking “winning” or “losing” products. Instead, it should be removing barriers and creating objective tools to allow companies to create new products and enable consumers to recognize and choose them.		X						
1-184	Green chemistry should ensure the safety of consumer products through the use of sound science in the decision-making process.			X					
1-185	A green chemistry program should be designed with guidance from all stakeholder interests.								
1-186	A green chemistry program should be designed to promote products which are technologically and commercially feasible to produce.								
1-187	Green chemistry must foster innovation and not limit the development of new chemistry technologies.								

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1-188	A green chemistry program must ensure that product efficacy, performance, and usability are not compromised or undermined.								
1-189	A green chemistry program should build on existing statutory and regulatory structures, voluntary initiatives, and data development efforts.			X	X				
1-190	Education plays a key role in effective decision-making, uncovering new innovations, and training the next generation of society's leaders in science, business, health and public policy. With a topic like green chemistry, where effective decisions will require collaborative approaches and solutions not yet imagined, education needs to play a key role. Green chemistry requires integrated, systems approaches and knowledge on a broad range of topics. For example, chemists need an understanding of toxicology, while policy makers need to understand business processes and markets to develop efficient and effective policies. Successful implementation of green chemistry requires a level of collaboration not often taught or practiced today.					X			
1-191	The National Science Resources Center and its Science and Technology for Children® (STC®) program is a comprehensive, researched-based K-6 science curriculum consisting of 24 instructional units that explore the life, earth, and physical sciences and technological design.					X			
1-192	LCAs first and foremost are useful in comparisons of specific products/processes - as support to the decision making process.								
1-193	at some point, even with material recycling, those useful products are worn out or discarded. The atoms don't disappear--they get recycled, burned, degraded or put in a landfill. But recycling programs, unless 100% efficient are simply slower routes to the incinerator or the landfill.								

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1-194	For biological materials, it is argued, cradle-to-cradle is a spontaneous system. In an ecosystem, all waste is food. Food is not necessarily recycled by organisms in the same article-to-article way as synthetic materials are; organisms also "burn" it as an energy source in addition to being a raw material for creating new living structures.								
1-195	Must adhere to the ISO standards, so that no LCA results carried out by companies can be published unless critically reviewed by 3rd party or published in a peer reviewed journal.			X					
1-196	The development of a standardized environmental product declaration system is a logical first step for reliable Eco-labeling systems.								
1-197	Ever-expanding research confirms that many chemicals that are useful to society are also known to be hazardous to human biology and health, particularly in utero and in developing children								
1-198	appropriate use-restrictions for chemical ingredients when scientific safety-based assessments indicate that they cannot be used safely in a consumer product or use application.			X					
1-199	education of consumers and other organizations will be critical to driving change and fostering innovation within other groups. We challenge DTSC to develop educational components as a part of the overall approach to California's Green Chemistry Initiative.					X			
1-200	Organizations which put accurate, unbiased information into the hands of consumers are also an important component,					X			

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1-201	The successful management of chemicals already in the marketplace according to their characteristics and actual uses, rather than simply banning substances. This focus recognizes the important difference between risk and hazard, i.e., that hazardous substances properly managed may not pose actual risks, and would create a system that is based on successful management of identified risks, as opposed to establishing prohibitions based on potential hazard.			X					
1-202	Prohibitions should be put in place only when an unacceptable level of risk is identified that cannot be adequately mitigated or that is not offset by the aggregate benefits of continued use. This approach is science-based, and relies on data generated through experimentation or by means of modeling (structure-activity relationships).			X					
1-203	A chemical management system must be RISK-BASED.			X					
1-204	The system should SCREEN all chemicals (new and existing) to determine further information needs in a TIERED, risk-based approach.	X		X					
1-205	The system should initially leverage AVAILABLE INFORMATION								
1-206	The system should recognize the SHARED RESPONSIBILITIES of each party within the VALUE CHAIN			X					
1-207	The system should promote TRANSPARENCY								
1-208	We are concerned that some parties in California's Green Chemistry Initiative discussion are focusing only on the hazards of certain chemicals without regard to exposure, substitution costs, benefits to society, and other important factors.								
1-209	There is also a need to retain certain business information as confidential in order to protect intellectual capital. Health and environmental information should not be considered confidential.					X			

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1-210	the greatest opportunity for California is in establishing flexible approaches that support the use of life cycle-assessment to more holistically evaluate the balance between societal needs, protection of public health and the environment, and sustainable production and consumption, rather than through traditional regulatory paradigms.	X							
1-211	decisions of preferability and substitution should be based on the comparative life cycle impacts of a chemical and its potential substitute. While a safety-based characterization scheme may focus on toxicity, persistence and bioaccumulation, there are a number of other parameters which are relevant to the sustainable use of a particular chemical in a formulation such as raw material sourcing and carbon footprint. All relevant aspects of sustainability should be taken into consideration for a potential substitution decision. Similarly, any plan to consider substitution of chemicals should require that the efficacy and benefits of that compound be considered as any diminution of efficacy may negatively impact public health and well-being through reduced hygiene and sanitation.	X		X					
1-212	The Green Chemistry Initiative must ensure that product efficacy, performance, and usability are not undermined, and that the ability to innovate is not compromised.			X					
1-213	In order to facilitate informed substitution of high priority substances towards those with a more favorable environmental and human health profile, the State could develop database of chemical alternatives that compares a number of sustainability parameters: performance, price, human health and environmental (e.g., toxicity, bioaccumulation, persistence) including carbon footprint and source sustainability.	X		X		X			
1-214	In order to assess the performance of these programs and measure the impact of these reforms, the State should monitor metrics that will assess releases of chemicals to the environment and exposure to humans.			X					
1-215	Increased Transparency and Access to Information on Chemicals in Commerce					X			

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1-216	Of greatest concern for my organization and me right now is what is happening to our plastic waste once it leaves the US shores not as litter but as commerce. The Green Chemistry Initiative must first acknowledge that fossil plastic is downcyclable not recyclable. And that most of our fossil plastic waste is being shipped overseas and being handled under conditions that are harming water, air, public health and the land surrounding so-called recycling facilities.								
1-217	Our continued embrace of plastic needs to be looked at with a cradle-to-cradle perspective, which requires a close look at what is happening overseas.								
1-218	We in California need to develop closed-loop safe and just ways of handling our waste.								
1-219	Look at the chemical information that is already available to California.								
1-220	Make it clear that the Green Chemistry Initiative process will be governed by a risk-based science approach.								
1-221	Support an understanding of both the benefits and the burdens of new regulatory proposals.								
1-222	Consider process technology as part of a green chemistry program.								
1-223	Look at the chemical information that is already available to California:								
1-224	Criticisms of the TSCA to protect human health and the environment often overlook the real need for resources to properly administer the statute. Without the proper staffing and financial resources, any regulatory program will have limited effectiveness		X	X					
1-225	The Pharmaceutical Industry should retain its TSCA exemption status from GCI. The EU Reach program currently exempts pharmaceuticals, since they recognize that the Pharmaceutical Industry is heavily regulated by FDA-like government agencies and there may be product quality concerns if there are modifications to the registered formulations.			X					

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1-226	We support California's initiative to move beyond a chemical-by-chemical approach and build a more systematic, scientific and collaborative process to address priority chemicals. As Governor Schwarzenegger recently stated:								
1-227	As part of the agreement signed in Montebello, the three countries agreed to share data, information and safety assessments so that all North Americans would have continued access to safe and effective products with improved sustainability and environmental quality profiles. With California's expertise at the table, collaborating with the agencies involved could accelerate the benefits of this effort across the North American region.			X					
1-228	This process must be the tool for focusing resources and attention on a limited number of chemicals that are important to evaluate. The process should be collaborative and should include scientific experts in toxicity and exposure from academia, chemical manufacturers, product formulators, and nongovernmental organizations. The manufacturers of the chemicals and consumer products could provide toxicity and exposure/use data to determine whether the uses of "priority chemicals" are safe or should be restricted.					X			
1-229	Some consumers have expressed a desire to know what ingredients are in the products they use in their everyday life. These consumers are interested in having this knowledge in order to make informed product choices.								
1-230	The Green Chemistry report argues that there is a need to close the "technology gap" through market-based incentives to support green chemistry. This could include funding for university research grants, scholarships, and similar programs, as well as awards for innovation, tax credits, low-interest loans, and other incentives. These positive incentives should be open to all companies that are innovators and sell products in California -- not simply be limited to companies located in California.		X						
1-231	Speed to Market of products is most important to companies than any other incentive								

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1-232	Recognize that some countries do not follow US patent laws.								
1-233	Provide safe harbors similar to medical profession for Companies taking initiative in Substituting ingredients			X					
1-234	Develop Metrics & demonstrate Cost effectiveness and long term benefits Health impacts, Environmental etc.			X					
1-235	Cost to second wave formulators who take advantage of R&D								
1-236	It is important that producers assume responsibility for the safe stewardship of their materials in order to promote environmental sustainability. Producers should be responsible for collection through processing/disposal, financially and operationally, with no cost to local government.		X						
1-237	Extended producer responsibility (EPR) will shift the responsibility for the end-of-life management of discarded materials from local government to private industry producers, thereby incorporating the costs of product collection, recycling, and/or disposal into product price, and encouraging product design that has a reduced impact on the environment and human health. The end results are products and product chains that have a reduced impact on the environment and that costs associated with a product's impact are paid by those manufacturing or using the product, rather than general taxpayers.		X	X					
1-238	Substitute chemicals should be held to the same standards as the chemical they are intended to replace.			X					
1-239	The GCI process should level the playing field and strive for consistency across the board.								
1-240	Time-to -market is critical in any new product launch. Delays and uncertainties increase the financial risks and reduce the initiative.								
1-241	Current Regulations impede pollution prevention								

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1-242	Investment tax credits, public private partnerships grants, low interest revolving fund loan, personal property tax exemption for laboratory equipment. Preferred tax treatment for equity fund investment in California's CGI movement.								
1-243	program funding with in DTSC's Science Pollution Prevention and Technology Development must be reestablished in order for the technology staff to review and validate the GCI performance claims made by companies.		X						
1-244	Encourage the Department to assure sufficient funding is available to conduct the necessary process steps that lie ahead.		X	X					
1-245	Avoid the temptation to shortcut the process for political expedience.								
1-246	Consider moving to a concurrent dialogue sessions with representatives of stakeholder groups whose talents align with the relevant issue.								

Reference Number	(2) Green Chemistry: Stimulating Green Chemistry Options	Category							
		Data Collection and Use (Information)	Economic Incentives and Markets	Statutory and Regulatory Requirements, Enforcement	Voluntary Measures	Education and Outreach	Research and Technology	Technical Assistance	Recognition, Awards and Certification
2-1	Chemical policy needs to be harmonized worldwide; California should avoid creating its own unique requirements.			X					
2-2	California law should harmonize with other states and countries.			X					
2-3	Use life cycle perspective that includes social values.								
2-4	Environmental regulation must be based on thorough scientific data that has clear evidence of harm to human health and environment.	X		X					
2-5	Mandatory labeling/product disclosure indicating the presence and/or hazards of chemicals even if health data is unavailable.			X					
2-6	Emphasize strict labeling of contents.			X					
2-7	Require chemicals manufacturers to report information about the long term health effects of chemicals in use by 2016.			X					
2-8	Perform a comprehensive gap analysis at the outset to avoid duplicative and possibly contradictory regulatory actions (e.g. laws, existing databases, inventories, etc.).			X					
2-9	Compile a comprehensive list of all reports that must be filed with Federal, State and local agencies, including the information and data submission requirements for each; determine whether current reports provide sufficient baseline information, and if additional information should be obtained.	X		X					
2-10	Develop a centralized database of chemicals and properties.							X	
2-11	Prioritize protection of the most vulnerable people (e.g., children) and resources (e.g., endangered species, critical resources). In other words, identify currently unaddressed ways children are exposed to potentially harmful substances.	X							
2-12	Require real world information about how chemicals interact with each other.			X			X		

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2-13	Identify voluntary programs (USEPA Industry HPV Challenge Program, etc.), program requirements, number of participants, sectors represented and effectiveness.				X				
2-14	Survey a statistically significant sample of California businesses to determine if they have adopted strategies or programs to implement environmental management systems; convene a business/industry stakeholder-advisory panel.				X				
2-15	Link GC efforts to already-existing environmental compliance activities; identify actual sources of pollution and environmental problems and then evaluate whether a prevention answer would work.								
2-16	Remove known chemical hazards from the market immediately via Prop 65, Silent Spring/Harvard study, tax incentives etc.		X	X					
2-17	Establish regulatory framework that drives green chemistry through prohibitions, cost structures, etc. (i.e. disincentives for using practices that are not in agreement with green chemistry principles).		X	X					
2-18	Governments should provide incentives for the implementation of sustainable technologies.		X						
2-19	State government should lead the way to driving demand for cleaner products through its own procurement processes.			X					
2-20	State should invest in new testing methods since many of the current testing methods are out of date or do not exist.			X			X		
2-21	Regulatory agencies should provide technical expertise to organizations lacking internal resources.			X				X	
2-22	Cal-EPA should designate the Center for Occupational and Environmental Health at UC-Berkeley and UCLA as the lead entities within the UC system to address matters pertaining to chemicals policy and green chemistry in California.						X		

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2-23	Partner w/UC to create an institute for sustainable manufacturing and green chemistry research.						X		
2-24	Create a green chemistry program at the University of California.						X		
2-25	Education: Green chemistry curriculums should be expanded from middle school through post-secondary education.					X			
2-26	Develop a "Safe Home Environment" place for children to visit/learn.								
2-27	Identify priority chemicals for toxics use reduction and create a list as targets for toxics use reduction.	X		X					
2-28	Identify accurate and effective methods to test for and evaluate the potential hazard traits of chemical substances.						X		
2-29	Businesses that use large quantities of toxic chemicals should be required to annually report on the quantities of toxic chemicals used, and prepare and biennially update toxics use reduction plans.	X		X					
2-30	California businesses should be surveyed to provide information regarding each facility it owns or operates in the state, the full-time equivalent number of employees at that facility, and whether a listed substance is manufactured, processed, or otherwise used in a facility. The total quantity used statewide should be established as a baseline against which toxics use reduction progress can be measured.	X							
2-31	Fees should be established on businesses that use toxic chemicals. Such fees should be used to fund agency toxics use reduction activities, including data analysis, and the provision of technical assistance.		X	X				X	
2-32	Prohibition of diacetyl.			X					

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2-33	Alkaline battery study.								
2-34	Incandescent lamp ban.			X					
2-35	Ewaste: donation of reusable computers.			X					
2-36	Prohibition on polystyrene containers.			X					
2-37	Marine debris - reduction and recycling.			X					
2-38	Mercury added thermostat collection.			X					
2-39	Cleantech Advantage Act: create a tax credit for cleantech research.		X						
2-40	Water quality: sewage sludge.			X					
2-41	P2: Design for the Environment Program				X			X	
2-42	Ensure that chemical producers generate, distribute, and communicate information on chemical toxicity, ecotoxicity, uses, and other key data.	X		X					
2-43	Strengthen government tools for identifying, prioritizing, and mitigating chemical hazards.	X		X				X	
2-44	Support research, development, technical assistance, entrepreneurial activity, and education in green chemistry science and technology						X	X	
2-45	Protect proprietary technology and intellectual property			X					
2-46	Don't impede discovery through unnecessary legislation and regulation			X					
2-47	Don't expect continuous breakthrough								
2-48	Value continuous improvement								
2-49	Incorporate pollution prevention								
2-50	Increase grants to accelerate commercialization		X						
2-51	Add criteria to State revolving fund allocations to encourage use of green technologies		X						
2-52	provide matching fund offsets to water providers who choose new green technologies		X						

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2-53	Encourage Cal/EPA to consider a certification program for green technology similar to USEPA's ETV program								X
2-54	Consider tax credits for developers and users developers of green technologies		X	X					
2-55	Examine ways to expand education and training programs for students and chemists through partnerships with industry				X				
2-56	Disseminate information on accomplishments, best practices, costs and benefits.							X	X
2-57	Collaborate with Universities to further the study and application of Green Chemistry						X		
2-58	Support research and development through various initiatives (eg. University-based center, government funding, cooperative state research, etc		X				X		
2-59	Education and training – at various levels including but not limited to K-12 programs – is critical to advancing green chemistry.					X			
2-60	Develop and share production/use information (data on amounts, facility locations, and uses of chemicals; MSDS updated to include all data; consumer product contents disclosure)			X				X	
2-61	Advance the science (improve toxicological methodology; use biomonitoring data; press industry and federal government to move forward, collaborate with universities)						X		
2-62	Require CA producers, importers and users to submit and update info on amounts, facility locations, and uses (including in products)	X		X					
2-63	Require updating of MSDS to reflect all available data (HPV, REACH, Canada)			X					
2-64	Require disclosure of chemicals in consumer products, perhaps initially on priority chemicals	X		X					
2-65	Prioritization is essential	X							
2-66	Opportunities exist to leverage other state-mandated activities (e.g., the biomonitoring program)	X							
2-67	Collaboration needed between UC, state agencies and industry				X		X	X	

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2-68	Promote the exchange of information about best management practices, incentives and barriers among industries/corporations, and between industry and customers; one way to do this is through a mentoring program (e.g., large corporations mentoring small ones, or via the "ACC" (American Chemical Council)) is suggested							X	
2-69	Create a database of "safe" chemical alternatives.							X	
2-70	Ensure that information is transmitted through all consumers in the supply chain.	X		X				X	
2-71	Enable the public to drive green chemistry by providing them with information, such as through a database with green information								
2-72	Adopt an expansive view of green chemistry that includes not only substitutes, but also processes, "designing" molecules, and addressing all potential exposures								
2-73	Use existing sources for identifying/collecting data, including MSDSs								
2-74	Focus research on impacts of chemicals on early childhood development	X					X		
2-75	Develop testing methods			X					
2-76	Data gaps need to be filled and better understood			X					
2-77	Provide technical assistance to industry							X	
2-78	Develop definitions for identifying green chemistry								
2-79	Develop labeling process for identifying and comparing green products and/or green product certification								X
2-80	Offer R&D tax credits as an incentive for industry		X	X					
2-81	Offer tax credits for green chemistry capital investments as an incentive for industry		X	X					
2-82	Offer low interest loans as an incentive for industry		X						
2-83	Offer a grants program as an incentive for green chemistry		X						

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2-84	Develop a program to recognize green chemistry achievement, such as awards								X
2-85	Develop a system for public contracting, such as preference points, that takes lifecycle costs analysis into account.								
2-86	The most sensitive receptors should be the basis for acceptable risk	X							
2-87	Prioritize chemicals that should be restricted	X		X					
2-88	Develop an credible and effective 3rd party labeling system for green products			X					X
2-89	Life Cycle Assessment should play a key role			X					
2-90	California should harmonize its program with other leaders			X					
2-91	Develop a more involved relationship between the industry and academia to develop and exchange toxicology information						X	X	
2-92	Look to universities to work on alternatives							X	
2-93	Companies are innovators. Companies and industry associations should be encouraged to share best practices in regards to green chemistry and sustainability including incentives and barriers. Large companies can mentor small companies.							X	
2-94	Educate consumers. Provide green information to consumers to change the marketplace and consumer attitudes, enable informed choices, and drive green chemistry. Create a database for the public to get green information.								
2-95	Promote academic programs in green chemistry. Enhance current programs, including training in ecotoxicity and green chemistry for chemistry students.								
2-96	Create a green business program to educate and encourage companies and recognize companies incorporating green chemistry practices.							X	X

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2-97	Use large associations/organizations, such as the American Chemistry Council, to facilitate interactions between suppliers and customers, including mentoring.							X	
2-98	Recognize the value and role of industry stewardship programs (e.g., American Chemistry Council's Responsible Care, which includes evaluations of chemical products and their uses to assure that they deliver their intended benefits while protecting public health and the environment, and a management system certified by third-party auditors) and create incentives for others to take similar steps		X		X			X	X
2-99	Incorporate biomonitoring as part of the green chemistry policy	X							
2-100	Utilize Chemical Compliance Systems, Inc. and their Green Product Compliance Analytical System, Green Process Analytical Compliance System and Green Munitions Analytical Compliance System web-based tools, developed for the U.S. Defense Ammunition Center to assess munitions from a green perspective (considers 43 ecological health and safety criteria)							X	
2-101	Conduct a baseline assessment of chemical information -- both hazard and exposure data -- already available to the State; coordinate on information needs with others, even before the end of the GCI process								
2-102	Ensure that GCI will be governed by science, examine the basis for assumptions about the adequacy of current protective measures in the process of identifying policy options; understand both the burdens and benefits of new regulatory approaches; acknowledge that engineering/process improvements are as much a part of "green chemistry" as product improvements/substitutions.						X		

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2-103	The state of California should purchase the Chemical Compliance System's (www.chemply.com) Hazardous Material Management System database, which provides information on over 220,000 chemicals and their environmental characteristics. Making this tool available on the web will enable informed choices by consumers and assist in the selection of chemicals based on scores for ecology, human health, and safety.							X	
2-104	Streamline regulations			X					
2-105	More R&D for private/government, including R&D prior to using chemicals in products		X				X		
2-106	Make green products affordable								
2-107	Encourage development of chemicals that are reusable, recyclable, biodegradable								
2-108	Classify/rank existing chemicals (green, light green, yellow, red)							X	
2-109	Require new chemical registration, including information on fate, transport, and health effects			X					
2-110	Create a Green Chemistry Department (NOTE: Not clear if this means an academic department, or a State agency.)								
2-111	Create a partnership between State, industry, the public, etc.				X			X	
2-112	Offer incentives or Awards for good ideas on products or project; establish a "green inventor" or "imagine-eer" award		X						X
2-113	Provide venture capital to business or manufacturers that design green chemistry products or processes		X						
2-114	Until the Green Chemistry Initiative is operational, DTSC and other departments should not oppose legislative or other efforts to restrict exposures to toxic chemicals.			X					
2-115	Clarify the scope of "Green Chemistry"							X	
2-116	Look at existing as well as emerging/new chemicals and products.								

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2-117	Develop criteria for determining safe alternatives, including multi-media considerations; identify and publicize safe alternatives							X	
2-118	Prioritize based on exposures	X							
2-119	Focus on upstream processes			X					
2-120	Provide funding for re-tooling manufacturing		X	X					
2-121	Incorporate into K-12 education and the Environmental Education Initiative					X			
2-122	Consider a bond act to provide funding			X					
2-123	A regulatory component is needed			X					
2-124	Do not reinvent the process, as a whole new process could have a negative effect; instead study Canadian list, REACH and others to determine their usefulness/validity	X		X					
2-125	Consider efficacy, safety and costs as important.								
2-126	Establish methods to assess impacts at the molecular level, and methods beyond CMR(?) data								
2-127	Innovation should be based on knowledge about what we are replacing and with what								
2-128	Provide a way to ensure exclusivity of a reformulated product in a market without competitors for a given period								
2-129	Establish a process, rather than creating a list; lists are only as good as the data (need current, accurate data)							X	
2-130	Consider tax incentives, phase tax/penalty approach		X	X					
2-131	Establish a "green seal," reflecting a specified level of greenness, or certification of approval			X				X	X
2-132	More education for business groups; involvement of UC Extension			X				X	

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2-133	Invest in green chemistry research and development, develop leading university centers; invest in EDC (endocrine disrupting chemicals) research, encourage collaborative work between green chemists and EDC researchers to foster strategies for avoiding EDCs in new products; promote public education into the dangers of EDCs and the need for alternatives		X				X		
2-134	Use Green Buildings/LEED Certification as a model for green labeling/product certification; include the following as criteria -- use of green energy during manufacturing, waste generation, use of recyclable materials, use of non-toxic ingredients								X
2-135	A California Toxic Substances Control Act (CAL TSCA) is needed; this would require all new chemicals to be tested for toxicity before they are marketed, as would all existing chemicals sold in the State; DTSC with assistance from OEHHA would evaluate the results. OEHHA should be given more resources to speed up its current evaluation process and to implement CAL TSCA. CARB's authority should be expanded to forbid the use of aerosol products where there are greener alternatives, and of certain toxics determined under CAL TSCA as a threat.			X					
2-136	Recognition and award for green products would be a strong motivator because they can lead to greater sales and preferential purchase by environmentally conscious consumers: recognition with the use of a logo would be most effective; see German Blue Angel award, www.Blauer-Engel.de								X
2-137	DTSC should develop a grading/award system for products that meet certain green criteria as a joint effort within Cal/EPA; use of both green energy and green chemistry technologies should be considered. A standard, easily recognizable green logo could be used, reflecting different levels of "greenness" (bronze, silver, gold and platinum); this would enable consumers to choose green products and motivate manufacturers to invest research and energy into the development of green products.							X	X

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2-138	DTSC website should include information geared towards the general public, particularly related to the purchase and use of certain products, including: lists of manufacturers and products that have received the DTSC "green" awards to motivate submission of information to DTSC for review; information on the environmental impacts of plastics; greener alternatives to household chemicals; disposal options for universal waste; information on green chemistry; a page called "What can I do to help the environment?" (which also should be posted on Cal/EPA's home page). Increased awareness will enable the general public to put greater pressure on manufacturers and legislatures to make green chemistry and environmental protection a priority.								X
2-139	Environmental certification in Germany, "The Blue Angel," (www.blauer-engel.de/englisch/navigation/body_blauer_engel.htm) can be used as a model for the certification of products and services.			X					X
2-140	Security & Prosperity Agreement between US-Mexico-Canada should look to leverage, not duplicate			X					
2-141	Evaluate elements of REACH and CEPA and choose those most relevant to California	X		X					
2-142	California should ID its goals for chemicals policy as a first step								
2-143	Share of data (From Canada's DSL to EU REACH) to other programs, avoid duplication, use equivalent testing systems			X					
2-144	No data, no market idea: levels the playing field with all chemicals both new and old			X					
2-145	Transparency, as in REACH and the Canadian system, is important : Two way flow of information – data could benefit a company that didn't have that knowledge beforehand								
2-146	An available method for providing substitutions, as in REACH, will be important			X					
2-147	Collaboration of different agencies i.e. government agencies should work together, as with in Canadian system			X	X			X	

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2-148	Adopt a phased approach for existing / new chemicals, as with CEPA	X		X					
2-149	Clear criteria are important, as in Canada, especially for PBT								
2-150	Be sure to provide an effective stakeholder process, as Canada did			X					
2-151	Identify less hazardous chemicals, as Canada did	X		X				X	
2-152	Avoid generation of new/different data where it's already being generated								
2-153	Provide incentives or public funding for R&D on alternatives		X						
2-154	Employ wiki data and other new and emerging technologies for consumers, industry and others								
2-155	Bring social science into the picture to help stimulate behavior change in consumers and businesses								
2-156	Promote product stewardship and manufacturer responsibility which will lead to greener products and production			X				X	
2-157	Data and the lack or unavailability of same is a major issue in the GCI process. • Data represents great value to the developer, in terms of resources, time, and opportunity for market advantage • Data is intellectual property, confidential business property that must be protected • Data gap will always exist – must prioritize chemicals for additional testing – have to consider exposure, as well as hazard – have to consider how chemical will be used, in characterizing data needed • Substitute chemicals must meet same data requirements as the chemicals they are replacing								
2-158	Cannot eliminate all toxicity in chemicals – trade-offs must be identified through life cycle analysis			X					
2-159	GCI should look at existing federal and international requirements before adding another layer of regulation								

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2-160	Is "natural", "organic", "bio-derived" necessarily safe?								
2-161	DTSC should, in conjunction with other state agencies, conduct a base-line review of physical and intellectual capabilities to support and nurture the green chemistry R&D initiative.								
2-162	Public private arrangements between universities and private industry should be encouraged, particularly as they relate to green chemistry solutions.							X	
2-163	Command and control regulations slow down industry's ability to innovate: delays and uncertainties increase financial risks and reduce initiative.								
2-164	Failure of DTSC to "fully adopt RCRA rules" has imposed heavier burden on industry, thereby discouraging recycling.								
2-165	DTSC should conduct a feasibility review for the following economic and tax incentive ideas: investment tax credits, public private partnership grants, low interest revolving fund loan, personal property tax exemption for laboratory equipment, preferred tax treatment for equity fund investment in California's GCI movement.		X						
2-166	DTSC should host a Green Chemistry Symposium IV dedicated entirely to technology transfer, start-up funds, equity funding, and possible CalPERS investment in California companies with homegrown technology that solve California environmental problems.		X						
2-167	DTSC should reestablish funding for Technology Development staff to review and validate the green chemistry/ green engineering performance claims made by companies seeking economic incentives in the form of grants, low interest revolving loans, and preferred equity funding – without the certification component. Should look at US EPA's Design for the Environment program.		X	X					
2-168	DTSC should begin an immediate effort to ramp-up its Life Cycle Analysis (LCA) capability.								

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2-169	DTSC should consider how UC Berkeley's Science Education Public Understanding Project (SEPUP), and educational outreach program, might accelerate outreach and conversely how green chemistry concepts might be incorporated into the teaching modules.							X	
2-170	There are problems with the GCI process (too many topics, too little time, relatively superficial discussions, etc.) – DTSC must pay attention to the process design, so that it is not pressured by impatience and the traditional regulatory development method. • Provide sufficient funding to finish process • Avoid shortcuts for political expediency • Ramp up sophistication and relevance (have concurrent dialogue sessions with representatives of stakeholder groups whose talents align with the relevant issue)								
2-171	GCI must have a strong science foundation.								
2-172	Establish clear criteria and voluntary certification for green chemistry based on comprehensive lifecycle considerations (including energy, C02 impact, water usage, packaging, recyclability, etc.)							X	
2-173	Explore models other than, or building upon, the current Materials Safety Data Sheet (MSDS) system to provide needed chemical hazard data throughout the supply chain.								
2-174	Establish a Green Chemistry Coordination Council to collect and promote the sharing of information, highlight businesses with green practices, provide assistance to businesses lacking resources, and educate consumers.								
2-175	Prioritize chemicals for screening, testing and appropriate restrictions: build upon Canada's model of analysis and prioritization as well as the Proposition 65 review process. Allow chemicals of high concern for targeted, low-exposure uses as determined in an open process by DTSC.								

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2-176	Greater investment in pollution prevention in the short term as well as extension of the current CA Pollution Prevention model to downstream chemical users as an element of the long term Green Chemistry strategy.							X	
2-177	Continue the Conversation with California to sustain progress in Green Chemistry. The dialogue between DTSC and stakeholders has been very helpful and will result in more well-developed, effective policy.								
2-178	Should not have California-specific data development requirements and pre-market approval process for chemicals or consumer products. Rather, DTSC should collaborate with other government efforts, such as Canada's Chemicals Management Plan and the Montebello Agreement between Mexico, Canada, and the US.			X					
2-179	Efforts to establish chemical priorities should be collaborative and should include scientific experts in toxicity and exposure, chemical manufacturers, consumer product manufacturers, and nongovernmental organizations								
2-180	Pre-market approval of chemicals or consumer products would be an incredibly burdensome and expensive process for the State of California and would unnecessarily slow down the development of products.			X					
2-181	California should establish relationships with the Canadian and European chemicals management programs with a view to establishing data and information sharing among the jurisdictions. All efforts should be made to maintain consistency and harmonization with Canada and Europe to avoid duplication of effort.								
2-182	Chemicals that are regulated by other agencies should not be subject to duplicative reporting and/or contradictory regulation.			X					

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2-183	California should provide a well-defined prioritization mechanism, based on both inherent chemical hazards and a qualitative evaluation of exposure potential. It should include a decision-making process that involves stakeholders, is transparent and available on the internet with the screening criteria clearly explained.								
2-184	California should develop pilot applications in close collaboration with key stakeholders to test various green chemistry policy options.				X				
2-185	California should encourage voluntary industry efforts to create better alternatives to high hazard substances, to mitigate risk and to make full use of market- based incentives. Recognition should be given for early adaptors and/or outstanding achievements in green chemistry. These would then be complemented by regulatory compliance to meet public expectations for safe chemical management.				X				
2-186	California should create a clearinghouse of best green chemistry practices.								
2-187	California should develop a technical center of excellence in green chemistry. The center would provide technical assistance, lead development of a green chemistry curriculum for undergraduate and graduate programs, and conduct state- of- the- art research on green chemistry innovations.							X	
2-188	The California initiative should promote public (including K-12) education and awareness of chemicals used in commerce and the principles of green chemistry. Programs should focus on scientific literacy and effective communication on using product labels, hazard warnings, etc..					X			

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2-189	Green chemistry goals are similar in policy focus and intent to those of reducing greenhouse gas emissions. The California Climate Action Registry has been effective in protecting, encouraging and promoting early actions to reducing GHG emissions, and successful in engaging voluntary stakeholder participation. Such a vehicle could be used as a prototype for Green Chemistry Initiative efforts.								
2-190	When California purchases chemicals for state contracts, it should pay a modest premium for a set period of time for new "green materials" that show promise								
2-191	Make capital available to companies on preferential terms to encourage Green Chemistry and Green Engineering manufacturing process development		X						
2-192	Foster innovation and encourage universities, educational institutions, and industry to partner in developing effective “greener” ingredients that reduce environmental impact							X	
2-193	Encourage company performed safety-based assessments of consumer products prior to the marketing of a product, that take into consideration all of the phases of a product’s life-cycle			X					
2-194	Make it a requirement that companies have a chemicals management programs based on sound scientific risk assessment to protect human health and the environment			X					
2-195	Require appropriate use-restrictions for chemical ingredients when scientific safety-based assessments indicate that they cannot be used safely in a consumer product or use application			X					
2-196	Promote consumer awareness of the importance of reading and following label instructions for safe product use, storage, and disposal								
2-197	Support collaborative efforts to encourage public and private partnerships to develop “greener” products and “environmentally responsible” ingredients				X			X	
2-198	Establish research programs to identify opportunities for the use of green chemistry in consumer products								

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2-199	Support policies designed to overcome barriers to commercial application of green chemistry research and development efforts.								
2-200	Recognize companies that develop sustainable business operations, processes, and/or products								
2-201	Non-refillable refrigerant cylinders to service air conditioning systems must be banned. This would eliminate the emission of greenhouse gases remaining in disposable containers when they are discarded. Also, it would save millions of pounds of steel and thousands of cubic yards of landfill space each year			X					
2-202	Commercial Dry Cleaners should be required to use CO2 systems in place of the Perc systems they now use.			X					
2-203	Metal shops should replace the use of cutting oils and biocides with CO2, which is an excellent coolant and lubricant.			X					
2-204	California should make a marketing program to promote companies that are actively engaged in Green Chemistry and Green Engineering, and products that are the result of Green Chemistry and Green Engineering.								
2-205	California must develop requirements to obtain hazardous traits data to support a comprehensive assessment of chemical hazards for chemicals currently in use and those proposed for use			X					
2-206	Cal / EPA should push for the investment in improved methods to allow for the detection of early evidence of effects and to allow for better ways to look at the potential for cumulative effects of mixtures								

Reference Number	(2) Green Chemistry: Stimulating Green Chemistry Options	Category							
		Data Collection and Use (Information)	Economic Incentives and Markets	Statutory and Regulatory Requirements, Enforcement	Voluntary Measures	Education and Outreach	Research and Technology	Technical Assistance	Recognition, Awards and Certification
2-207	Require companies to generate comprehensive safety and health data for all chemicals in their products by 2016 for the following listing of hazardous traits: Mutagenicity and genetic toxicity; Reproductive effects; Developmental toxicity; Cancer; Immunological effects; Neurological affects; organ effects, such as liver, kidney, eye, blood, and heart; Respiratory effects; Endocrine disruption; Other disruptions of signaling and hormone systems; Impacts on water and air quality and ecosystem health.			X					
2-208	Establish partnerships with other states to create an interstate clearing house of environmental safety and health data				X			X	
2-209	Develop a data audit system to evaluate the scientific validity of the data								
2-210	Place fees on products and processes for which there is inadequate health and safety information		X						
2-211	Require chemical producers to complete a full life-cycle analysis of products to foster cradle to cradle management								
2-212	Create labeling requirements to inform consumers of the potential health and environmental impacts of the chemicals contained in products			X					
2-213	Make companies that make or sell products in CA containing hazardous chemicals take them back at the end of their life cycle and ensure their proper disposal								
2-214	Take immediate action to reduce or eliminate the use of chemicals that are toxic, bioaccumulative and persistent			X					
2-215	Require the use of safer substitutes for toxic chemicals when available. Require the development of non-toxic alternatives when safer substitutes are not available			X					
2-216	Phase out chemicals that harm the health of humans or the environment or whose impacts are unknown			X					

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		Data Collection and Use (Information)	Economic Incentives and Markets	Statutory and Regulatory Requirements, Enforcement	Voluntary Measures	Education and Outreach	Research and Technology	Technical Assistance	Recognition, Awards and Certification
2-217	Create economic penalties as part of a regulatory program for companies using toxic chemicals followed by a ban after a period of time		X						
2-218	Develop, implement, and enforce regulations in the public interest without undue influence from parties advancing private interests by the creation of a public advisory committee to advise DTSC on what best serves the public interest regarding health, safety and a protected environment								
2-219	Reduce impacts of chemical exposure on the most highly impacted communities, e.g., developmentally vulnerable; communities bearing a disproportionate exposure to toxic chemicals; and workers exposed to toxic chemicals on the job			X					
2-220	Use full cost accounting when making decisions regarding chemical use and management including not only R&D but also the cost to communities of a degraded environment, health care, economic decline, education for developmentally impacted children, environmental clean-up, disposal of toxic materials, worker exposures and lost work days, and even premature death			X					
2-221	Support workshops and education forums that are accessible to communities so they can hear about the green chemistry issues								
2-222	Provide grants funded from revenue from fees imposed on companies using toxic chemicals to groups engaged in grassroots outreach and education on green chemistry issues		X						
2-223	Make information about chemicals to which the public and workers may be exposed more accessible, including mandatory labeling, indicating the presence of chemicals that may be hazardous			X					
2-224	The next 4 rows are responses to the question, "Should CA adopt the European Union's Registration, Evaluation, Authorization and Restriction of Chemicals (EU REACH) list or the Canadian Domestic Substances List (DSL)?"								

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2-225	Don't adopt all or either the EU REACH or Canadian DSL list. Instead consider the elements of each and choose the most appropriate ones for inclusion in CA's program avoiding any duplication. Then once these programs have been evaluated fill in the gaps not covered by the elements that were selected								
2-226	Acquire the data collection of both programs, Do this immediately								
2-227	Don't adopt either the EU REACH or the Canadian DSL at all								
2-228	Start with existing information already collected in CA. Then compare list to DSL list								
2-229	The next 5 rows are responses to the question, "What are the three best concepts/implementation ideas from EU REACH that should be integrated into a CA green chemistry program?"								
2-230	Develops baseline information on all chemicals. Has a prioritization strategy taking into account benefits, economy and risk with risk being the final arbiter								
2-231	It is based in data seeking, uses clear criteria and tiered testing requirements, and has a method for providing substitutes								
2-232	It has transparency of the health and safety data. There is a two way flow of information - information going up and down the supply chain - the data could benefit a company that didn't have that knowledge before hand. The information is also transferred to users								
2-233	It overturns the presumption of innocence for any chemical shifting the burden of proof of safety to the manufacturer.			X					
2-234	Without data you cannot market the product. This levels the playing field for all chemicals both new and old								

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2-235	The next 4 rows are responses to the question, "What are the three best concepts/implementation ideas from the Canadian DSL list that should be integrated into a CA green chemistry program?"								
2-236	The DSL list takes a comprehensive approach of mandatory and volunteer information and uses a phased introduction approach with a timetable for new chemicals if sufficient information is available. It has a risk based prioritization strategy that uses hazard and exposure in setting those priorities. It creates a manageable universe of chemicals prioritized by level of concern identifying the less hazardous chemicals and targeting the worst chemicals first.								
2-237	Like REACH, It has transparency of the health and safety data. There is a two way flow of information.								
2-238	The list is the result of collaborative work of several different government agencies working together in an agency integration								
2-239	There is a "portal" - an electronic tool to link to other systems.								
2-240	The next 7 rows are responses to the question, "Are there parts of EU REACH or Canadian DSL that CA should avoid?"								
2-241	DSL uses old data and has an over reliance on alternatives to testing. It does not have incentives or public funding for R&D on alternatives								
2-242	Avoid generation of new/different data where it’s already been generated. Limit or avoid animal testing. Avoid "hazard" based assessment. PBT criteria is not adequately protective								
2-243	EU should be seen as a tool and not the "be all end all" notion.								
2-244	Business liability was questioned pertaining to the information provided by others. CBI information was not available to the public								
2-245	Avoid the EU lack of clarity and no requirement for government evaluation								

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2-246	Avoid the lack of prioritization relative to intrinsic toxicity which could lead to a poor resource to use								
2-247	Avoid over reliance on alternatives to testing								
2-248	The next 5 rows are responses to the question, "In a global internet, web-based world, building on the policies of EU REACH and the Canadian DSL, what is the next level in cradle-to-cradle green chemistry policy?"								
2-249	There should be universal training in Green Chemistry starting in K-12 education and development of a curriculum to train our future scientists. Data gaps should be identified and filled and we should create a usable info depot/clearing house to make the system consumer friendly					X			
2-250	We should invite other countries to give us data input, e.g., Southeast Asian countries, and promote sharing the data among governments at the state and national level, while limiting the amount of C.B.I. that businesses can claim								
2-251	The concept of Extended Producer Responsibility (EPR) and Green Chemistry should be integrated and the concept that product stewardship is the manufacturer's responsibility should be promulgated								
2-252	End of life should be factored into the risk equation and total lifecycle cost should be promulgated to industry. Industry should price their products to incorporate the true environmental / societal costs. The concept of an end of life label should be introduced								
2-253	At the same time there should be a social sci-attitude adjustment that includes a ratcheting down of solid waste acceptance both by government and consumers. Current waste streams must be turned into resource streams and the cost can be internalized								

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2-254	The next row is a response to the question, "How do you think CA can stimulate a Green Chemistry transformation in the design of products and processes? Consider public health and the environmental effects of chemicals during the process of designing products and industrial processes.								
2-255	There should be strong environmental law that produces strict regulations and at the same time there should be financial incentives for promoting and facilitating reclamation. Incentives can come in the form of financial awards; tax incentives; favorable terms by state procurement departments; R&D tox credits; Tox credits for green chemistry capital investments; and low interest loans		X						
2-256	Prior to developing new programs DTSC must evaluate what regulations and information are currently available and whether these tools are being appropriately implemented								
2-257	State of California should develop an integrated program that features the following actions: 1) Introduce a regulatory requirement that all existing chemicals undergo a tiered process of scrutiny for their environmental, social and health/toxicity impacts. 2) Introduce a regulatory requirement that this information should be passed in a standard form along the supply chain. 3) Require manufacturers to label consumer products with all the chemicals and materials (including nanotechnology) that these contain. 4) Develop interactive consumer tools and technologies that assist consumers to interpret and use labeling data in their shopping. 5) Require industry to conduct green chemistry assessments for chemical products sold or used within California. 6) Expand greatly the investment of resources into green chemistry education and research at California State-supported universities, including the UC system. 7) Introduce a modest toxicity tax on all intermediates and chemical products used or sold within the State of California.	X	X	X					

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2-258	Include the following policy elements to further Green Chemistry in California: 1) Strengthen the recognition and pursuit of Green Chemistry processes and products by establishing clear criteria and voluntary certification based on comprehensive lifecycle considerations. 2) Explore models to provide needed chemical hazard data throughout the supply chain. 3) Establish a Green Chemistry Coordination Council to collect and promote the sharing of information, highlight businesses with green practices, provide assistance to businesses lacking resources, and educate consumers. 4) Prioritize chemicals for screening, testing and appropriate restrictions. 5) Greater investment in pollution prevention in the short term as well as extension of the current CA Pollution Prevention model to downstream chemical users. 6) Continue the Conversation with California to sustain progress in Green Chemistry.		X		X			X	
2-259	DTSC should prohibit the import, sale, or use of certain RV toilet additives containing formaldehyde and derivates of formaldehyde			X					
2-260	When deciding if chemicals should be banned or not, the burden of proof should be on the chemical producing companies to fully disclose the chemicals in their products and to adequately demonstrate that the chemicals and products are safe. California should not fail to act in the face of uncertainty to ban chemicals suspected of toxicity. Chemical companies should be required to fund independent research of the impacts of their products, not just research conducted by their own scientists. The research should address the effects of multiple chemicals—only testing chemicals in isolation will fail to address the real world impacts. Chemicals found to be harmful to people or wildlife should be banned or phased out. Research efforts should also include the monitoring of various species, especially amphibians and upper trophic level predators, so as to better understand what chemicals are already present in the environment and what their impacts are. Incentives should be instituted that encourage the production and use of products that do not contain toxic chemicals.		X	X					

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		Data Collection and Use (Information)	Economic Incentives and Markets	Statutory and Regulatory Requirements, Enforcement	Voluntary Measures	Education and Outreach	Research and Technology	Technical Assistance	Recognition, Awards and Certification
2-261	DTSC should make educational programs a key component of its Green Chemistry Initiative.							X	
2-262	Toxicology should be incorporated into the formal training of chemists.								
2-263	Green Chemistry Initiative Science Advisory Panel meetings should be open to the public.								
2-264	Do not use animals in toxicological studies.								
2-265	DTSC needs to carefully review and identify with stakeholders the current significant barriers that impede investment in, and adoption of, sustainable technologies.								
2-266	When evaluating alternatives to existing flame retardant chemicals, Cal-EPA must also address affordability issues			X					
2-267	A voluntary certification program for green chemistry processes and products will clarify goals for industry members while empowering consumers with the information they need to make informed choices								
2-268	Companies that manufacture chemicals in and/or imports chemicals into California should have a publicly available overview of the approach it uses for chemical evaluation and assessment and should affirm to the state that the chemical evaluation and assessment approach is publicly available.								
2-269	Companies that manufacture chemicals in and/or imports chemicals into California should have a management system that includes process and product safety elements and be subject to third party certification by representatives of a nationally recognized auditing Board. They should affirm to the state that the management systems are in place and that third party certification has occurred.			X					

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		Data Collection and Use (Information)	Economic Incentives and Markets	Statutory and Regulatory Requirements, Enforcement	Voluntary Measures	Education and Outreach	Research and Technology	Technical Assistance	Recognition, Awards and Certification
2-270	California should establish research and development centers focused on sustainable chemistry and/or sustainable engineering within its University of California system, such as Centers for Excellence in Sustainable Chemistry, at campuses that are networked to address major sustainability opportunities and issues.								
2-271	California should make risk assessment, including toxicology and life cycle thinking, part of the required curriculum for chemistry and/or chemistry related degrees conferred by State institutions.								
2-272	California should establish an awards program to provide financial incentive and recognition for innovations								
2-273	California should encourage companies in important value chain sectors to identify information needs of the value chain's members (upstream and downstream companies) and to establish communication processes to meet those information needs								
2-274	If DTSC determines that it needs its own regulatory program specific to California, it should adopt the output of the Canadian Chemical Management Plan (based on Canada's categorization and prioritization of the existing chemical inventory) as a solid, scientifically sound foundation.			X					
2-275	DTSC will need to build from the foundation of an established process and to leverage evaluation work generated by other parties.								
2-276	DTSC must also recognize that a prioritization of chemicals to be tested is essential.								
2-277	DTSC must be pragmatic in leveraging existing information that support the DTSC's overall program.								
2-278	Decisions should be based on high quality scientific data that are up to the GLP (Good Laboratory Practice) standard.								

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2-279	Data required for chemical evaluation should be harmonized with the data requirements of other regulatory jurisdictions; persistency, bioaccumulation potential, toxicity (PBT) characteristics, and carcinogenic, mutagenic and reprotoxic (CMR) characteristics form a suitable base line for decision making.								
2-280	The decision making process on any chemical should weigh risk against benefit, not just hazard			X					
2-281	There should be ready access to data used to support conclusions								
2-282	All stakeholders should have opportunity to participate								
2-283	There should be positive incentive for introduction of best practices		X						
2-284	There should exist a framework for incremental improvement								
2-285	Substitution decisions should be informed in terms of the characteristics and risks presented by potential alternatives			X				X	
2-286	The creation of a “green chemistry scorecard” for suppliers would allow specific materials and their applications to be rewarded through favored purchasing policies.							X	
2-287	The State of California should develop a matrix of information about the hazard traits of chemicals in use or considered for use, presented in ways that are useful for various audiences.							X	
2-288	The State of California should fund development of the ingredient database.							X	
2-289	The Green Chemistry Initiative must acknowledge that fossil plastic is downcyclable not recyclable. Plastic is not fine. It is melted down or burned; smoke and ash fill the air. Untreated polluted water runs into local streams turning them dark grey. Workers are subjected to toxic fumes and heavy metals where PVC is downcycled. Also the ocean is now full of plastic particles. These particles affect the fish and wildlife								

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2-290	The key issue for CGI is to fund the replacement of outmoded plant and equipment. Worldwide detoxification of the industry will cost something on the order of $10 trillion, perhaps $500 billion in California alone. There is only one reliable source for such funding: an excise tax on chemical sales to create a Chemical Trust Fund.								
2-291	If Cal/EPA recommends or develops toxicity testing policies or procedures, guidance must include measures that insure the development and incorporation of relevant, reliable and predictive non-animal methods, and must not be limited to ICCVAM-validated methods.			X					
2-292	A static, required list of toxicity tests should be avoided as check-the-box toxicology. A list of required tests promulgated legislatively should be avoided. Tiered, thoughtful testing strategies should be pursued with flexibility and creativity. Seek input from animal protection stakeholders, who have a unique set of qualifications and can specifically address the reduction and replacement of in vivo animal tests, before recommending testing strategies or regulations. The vision of the National Academy of Sciences report, "Toxicity Testing in the 21st Century", which calls for a reinvention of toxicity testing using high-throughput in vitro and in silico screens and tests based on human relevance, should be backed by California. The Toxcast Program should be embraced. http://www.epa.gov/osp/ftta.htm. California should put incentives into place for chemical manufacturers and testing laboratories to develop and validate human-relevant methods.		X						
2-293	Pre-market approval of chemicals or consumer products should not be attempted because this would be an incredibly burdensome and unworkable process for the state of California.			X					
2-294	Green chemistry programs should be designed to ensure that products remain technologically and commercially feasible to produce and that product efficacy, performance and usability are not compromised or undermined.								

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2-295	Decisions affecting human health and the environment should be based on the intrinsic hazards of a chemical and a new approach to toxicity testing.			X					
2-296	Chemical manufacturers should prove their products are safe			X					
2-297	Hazardous chemicals and chemicals with inadequate safety data should be phased out or restricted			X					
2-298	Industry should bear the costs associated with their chemical production or use			X					
2-299	Safer alternatives to hazardous chemicals should be required			X					
2-300	California should create an easily understood matrix of all chemicals currently in use with information on their hazard traits and biological consequences for use by downstream users, consumers, and other interested parties							X	
2-301	There should be mandatory labeling for consumer products indicating the presence of chemicals that have not been tested for their impact on human health								
2-302	Act quickly to eliminate or restrict known chemicals for which we already have adequate data demonstrating that they cause serious harm from use in California and require safer alternatives when available			X					
2-303	Base assessment of chemicals on a full life cycle analysis and hazard traits								
2-304	Create requirements to obtain scientifically defensible full life-cycle analysis data from producers to support complete chemical hazard assessment			X					
2-305	Create a public advisory panel or committee in addition to the science advisory group								
2-306	Incorporate full cost accounting including “externalities” in chemical policy decisions		X						
2-307	Encourage the growth of green chemistry investment and real world enterprises		X						

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2-308	Extend producer responsibility to placing the burden of end of life disposal, including sustainable practices such as recycling								
2-309	Continue to broaden the tent of stakeholders as the Green Chemistry Initiative moves forward.								
2-310	Initiative implements protective regulations, including restrictions and bans								
2-311	The GCI should implement protective regulations, including restrictions and bans on chemicals for which the weight of evidence demonstrates a severe hazard to human health and/or the environment								
2-312	DTSC should make educational programs a key component of its Green Chemistry Initiative, considering the full range of educational opportunities: sponsored research, collaborative grants, modules for courses K-12 and at the university level, programs to educate consumers, media and policy makers.					X			
2-313	We are being exposed to far too many chemicals in our daily environment and many of us are getting sick. It is especially necessary to get them out of commercial cleaning products that are used everywhere, from stores to doctor's offices and even hospitals.								

Reference Number	(3) Toxics by Design: Identifying Toxics in Products by Design Options	Category							
		Data Collection and Use (Information)	Economic Incentives and Markets	Statutory and Regulatory Requirements, Enforcement	Voluntary Measures	Education and Outreach	Research and Technology	Technical Assistance	Recognition, Awards, and Certification
3-1	Develop science-based criteria for determining whether a particular product is greener or safer than alternatives.	X		X				X	
3-2	1. Develop criteria for appropriate use of cosmetic pesticides and consider banning inappropriate use. 2. Ban the most toxic cosmetic pesticides via legislation/regulation; possibly create monetary incentives for new home builders to substitute non-toxic chemicals in landscaping or create more sustainable landscaping designs (i.e., drought tolerant landscaping, water conservation, plants indigenous to the region,etc).		X	X					
3-3	1. Evaluate things that have worked in the past to reduce toxics in products/the environment, including gaps and opportunities; consider legislating toxic reduction efforts, e.g., A. Legislative Efforts have helped on numerous toxic reduction efforts. i. Mandatory emissions standards for automobiles in California. This has had a tremendous impact by mandating a shift in demand allowing the auto manufactures to voluntarily comply if they want to participate in the California market. B. Usage Fees (Tax) can help to move a product's sales price closer to the total product life cycle costs (inclusive of decommissioning, disposal, clean up, associated human health care cost, and environmental rectification costs that are now born by tax payers). i. Bottle Tax gives an incentive to be environmental conscious to reduce the toxins in the waste we consumers create. ii. Cigarette Tax provides a disincentive for consumption. C. Rebates for use of preferred product purchases. Example: i. Rebates for Hybrid automobile purchases.		X	X					

Reference Number	(3) Toxics by Design: Identifying Toxics in Products by Design Options	Category							
		Data Collection and Use (Information)	Economic Incentives and Markets	Statutory and Regulatory Requirements, Enforcement	Voluntary Measures	Education and Outreach	Research and Technology	Technical Assistance	Recognition, Awards, and Certification
3-4	1. Since well-informed consumers will not only handle and dispose of chemicals more safely, and will demand safer products with closed loop lifecycles, California should expand consumer education regarding product life cycle costs and impacts (e.g. appropriate selection, use, disposal, and alternative materials or practices). Disseminating information could occur through traditional media as well as outreach through community partners as well as the private sector. Educate people how chemicals are created, screened for use, and managed through a process. Show people “a day in the life of a chemical.” 2. California should provide complete transparent chemical risk information in a way the public can access, understand, and absorb. 3. California should create convenient, credible chemical evaluation tools that businesses, schools or individuals can easily use when selecting chemical products. These could use prior art such as the Green Screen or Pfizer’s Solvent Alternatives Chart. These tools could show examples of the risk as well as hazard, and define hazard/risk as high, medium and low and compare to products and services used by consumers everyday. If something is a hazard, show the alternatives or how the risk relates to the pathways for exposure (Is it in a product, or solely for use in a process? If it is in a product, what entails safe use? etc.)	X				X		X	

Reference Number	(3) Toxics by Design: Identifying Toxics in Products by Design Options	Category							
		Data Collection and Use (Information)	Economic Incentives and Markets	Statutory and Regulatory Requirements, Enforcement	Voluntary Measures	Education and Outreach	Research and Technology	Technical Assistance	Recognition, Awards, and Certification
3-5	1. California could create a labeling system that is accessible, and accurate. 2. California should enable and streamline disposal of household hazardous waste (curbside pick-up or more local collection centers.), and improve the publicity of and accessibility to this disposal, and ensure safety of the collection sites. 3. Part of the education/outreach process should include manufacturers public disclosure of product selection and chemicals used in those products. Define/ID toxic & non-toxic chemicals in specific products, proper use, dangers of inappropriate use, and include information re; disposal. Include Life Cycle Analysis, and impacts thereof.		X	X		X			
3-6	Create a task force by collaborating with regulatory agencies, UC, Chemical Abstract Service, industry manufacturers and the public to create a web portal to ID chemicals (toxic & non-toxic), how each is created/screened for use/managed through a process, and disseminate/access information.					X			

Reference Number	(3) Toxics by Design: Identifying Toxics in Products by Design Options	Category							
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3-7	1. California should prioritize chemicals used in commerce in California based on exposure potential and toxicity, and work to reduce exposure to the most hazardous substances. To do this, California should gather data regarding all chemicals manufactured in or used in commerce in California, including in what products, how and in what volumes they are used. Additional data regarding available toxicity characteristics should also be gathered for each of those chemicals. Gaps in toxicity and exposure data should be identified. 2. The data should be used to prioritize or rank chemicals in terms of hazard as a function of toxicity and exposure. Tools for such ranking are available from other efforts such as Canada's CEPA program, and USEPA, and should be evaluated for use in California. Subsequent efforts should then focus on working with industry to find viable, safer alternatives for the highest ranked chemicals (i.e., those that pose the biggest threat in terms of toxicity and exposure), while at the same time engaging industry and our University system to fill in important gaps regarding toxicity and exposure data. 3. Biomonitoring efforts should be tapped to help fill exposure gaps. In evaluating and ranking chemicals, considerations should be given to the performance, and feasibility of alternatives.	X		X		X			
3-8	Ban the use of single-use polystyrene and other plastic/non-biodegradable polymer materials in order to protect the natural environment for present and future generations, exercise environmental stewardship by reducing the amount of polystyrene and other nonbiodegradable polymeric substances that enters our waste stream, storm drains, watershed and coastal environment.			X				X	

Reference Number	(3) Toxics by Design: Identifying Toxics in Products by Design Options	Category							
		Data Collection and Use (Information)	Economic Incentives and Markets	Statutory and Regulatory Requirements, Enforcement	Voluntary Measures	Education and Outreach	Research and Technology	Technical Assistance	Recognition, Awards, and Certification
3-9	Work with the military and aerospace industry as well as the plating industry, to evaluate and revise outdated milspecs to allow for more "environmentally friendly" plating chemistries. Technological advances have generated more environmentally friendly electroplating technologies (e.g., cyanide-free plating solutions). However, a wide-spread switch to more "green" plating practices has been hampered by outdated "milspecs" (i.e., the military specifications for most plating done for military and aerospace applications).		X			X		X	
3-10	1. Prioritize protection of most vulnerable people and resources. For example, get information on exposures of children to harmful substances through toxics in products, and seek changes to reduce or eliminate these toxics. Focus on consumer products with lots of exposure potential. This needs a regulatory action. 2. Look for initial easy fixes by integrating existing programs that have identified actual sources of pollutants. 3. Drive the demand for cleaner products through state procurement practices. 4. Designate the Occupational and Environmental Health at UC Berkeley and LA as lead entities within the UC system to address research relevant to Green Chemistry and Chemicals Policy in California.	X	X	X			X		
3-11	1. Include human health and environmental considerations, performance, cost, and feasibility in evaluating alternatives materials and processes. 2. Provide positive incentives for green chemistry. Use the Green Chemistry principles articulated by Anastas in evaluating alternatives.		X	X					

Reference Number	(3) Toxics by Design: Identifying Toxics in Products by Design Options	Category							
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3-12	1. Use the Green Chemistry principles in developing useful approaches to pollution prevention. 2. Leverage resources with USEPA programs, Canadian CEPA, etc.(e.g., information from the HPV program and the VCCEP program, and the ICCA Global Initiative on HPV chemicals) 3. Conduct a baseline assessment to determine needs. 4. Study available hazard and exposure data and how California can best use these data. 5. Identify "green approaches" that have worked as well as those that have not worked.	X							
3-13	Electronic devices: removal of hazardous substances.			X					
3-14	Adoption of work standards for diacetyl.			X					
3-15	Ban brominated and chlorinated fire retardants.			X					
3-16	Prohibits the use of phthalates in Children's products.			X					
3-17	Lighting waste: toxic reduction.			X					
3-18	Drinking water: pipes and fittings: lead content.			X					
3-19	Hazardous packaging.			X					
3-20	Products containing diacetyl.			X					
3-21	PBDE prohibition.			X					
3-22	E-waste: personal computers.			X					
3-23	Establish emission limits for composition wood treated with formaldehyde.			X					
3-24	High production volume chemicals.								
3-25	Toxic packaging materials.			X					
3-26	Chemicals of concern.								

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3-27	Cal/EPA should use any useful information developed by the U.S.EPA Design for the Environment program and work with industry/businesses to implement elements espoused by the EPA regarding how businesses should "design for the environment". These elements include the following: 1.Evaluate the human health and environmental impacts of its processes and products. 2. Identify what information is needed to make human health and environmental decisions (e.g., hazard characteristics data and identification of “safer” alternatives). 3.Consider cross-media impacts and the benefits of substituting chemicals. 4. Reducing the use and release of toxic chemicals through the innovation of cleaner technologies that use safer chemicals. 5. reducing the use and release of toxic chemicals through the innovation of cleaner technologies that use safer chemicals. 6.Make products that can be more readily reused, refurbished, remanufactured, or recycled. 7.Monitor the environmental impacts and costs associated with each product or process. 8.Recognize that although change can be rapid, in many cases a cycle of evaluation and continuous improvement is needed. Pa		X	X	X	X		X	
3-28	Cal/EPA should develop layperson information on common chemicals in common commercial products for the purpose of educating the public.					X			
3-29	Cal/EPA should develop a fact sheet on chemicals policy in the U.S. and post it on their GCI website to educate the general public.					X			
3-30	Cal/EPA should engage in culturally appropriate outreach to consumers to help them make informed choices and move purchasing towards greener products. Media such as television commercials (featuring Arnold Schwarzenegger, perhaps), comic books, radio, could be utilized. Partnering with Hollywood would go a long way.					X			

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3-31	Cal/EPA should develop guidance on what its citizens as individuals could do to move towards greener, sustainable living.					X			
3-32	Cal/EPA should work with the U.C. system to develop a green chemistry curriculum for all chemistry and engineering majors.					X			
3-33	Cal/EPA should work with other state agencies including DGS to develop information on green purchasing, and disseminate this information to counties and cities and to private sector businesses for their use.		X			X		X	
3-34	Responsible parties should be required to identify the individual constituents of their products or, if that information was considered to be confidential business information, to provide the appropriate health information on their products. Responsible parties should be required to report new factual information regarding adverse health effects of their products or of the individual constituents of their products. This information could be reported to a centralized, publicly addressable database. The adverse effects reporting requirements for pesticides, as set forth in Section 6 (a) (2) of the Federal Insecticide, Rodenticide, and Fungicide Act, could be used as a starting point.	X		X					
3-35	California should require that chemical manufacturers, importers and users supply Cal/EPA with the structure of chemicals in use in California commerce, physicochemical properties, and all available toxicity and hazard data. California should use Quantitative Structure-Activity Models to evaluate exposure potential and predict toxicity where data are not yet available. This information should go into any prioritization scheme.	X		X					

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3-36	California could impose restrictions on amounts of hazardous chemicals in products that are released to the environment over the life of the product. California could require elimination of certain compounds known to be hazardous from products, such as carcinogens, mutagens, reproductive toxicants, developmental toxicants, and chemicals that are persistent and bioaccumulative.			X					
3-37	California could generate environmental codes of practices and procedures in the development and design of products that encompass the manufacture, distribution, use, and end-disposal or recycling of the product that all manufacturers, importers, distributors, and users of products must follow. These practices could include bans of specific chemicals from consumer products.		X	X					
3-38	In following the EU's REACH program as a model, California could do the following: 1. Register all chemicals in commerce in California and require a summation of the chemical properties, toxicity and hazard of each in order to be registered for use. 2. Develop a list of chemicals of concern based on usage and toxicity or hazard information. 3. Register products containing these hazardous materials including imported products and publish this information. 4. Required tiered sets of toxicity information according to usage, amounts produced/imported, or other indicators of exposure. 5. Eliminate the use and/or require strict regulation of use of highly persistent or bioaccumulative chemicals, carcinogens, mutagens, reproductive toxins developmental toxins, neurotoxicants, and any other compound capable of causing serious or irreversible harm. 6. Develop models to simulate exposure scenarios for common chemicals in common products to inform decisions on chemical management.	X		X					

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3-39	California should evaluate the best practices for chemical management schemes pointed out in the April 2007 report entitled "Not That Innocent: A comparative analysis of Canadian, European, and United States Policies on Industrial Chemicals by Richard Denison for application to a California Green Chemicals Policy.	X		X					
3-40	California should work with industry to reduce toxics in products, and where that proves difficult because no safe alternative exists, California should require product take-back at no cost to the consumer. This shifts the physical and financial responsibility away from local governments and consumers back to the product manufacturer.		X	X				X	
3-41	California should ban the export of toxic products and waste to developing countries as they lack the infrastructure to handle these materials.			X					
3-42	California should co-ordinate across agencies for a comprehensive green chemistry program and smooth implementation.			X					
3-43	California should develop clear criteria for prioritizing chemicals by toxicity, including aquatic toxicity. Evaluate Canada's criteria and those in REACH for applicability to California.			X					
3-44	California should develop clear criteria for identifying chemicals as persistent or bioaccumulative.	X		X					
3-45	California should use Quantitative Structure Activity models to help identify toxicity potential and exposure potential of chemicals used in commerce in California.	X							
3-46	California should evaluate what other states have done and utilize appropriate elements from those programs, including the Massachusetts Toxics Use Reduction Act, the Oregon Toxics Use and Hazardous Waste Reduction Act, , and Oregon's Executive Order to reduce persistent and bioaccumulative Toxicants.	X		X					

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3-47	California should promote chemical reclamation and recycling technology to reduce chemical waste, which in turn reduces chemical manufacture.			X				X	
3-48	California should require mandatory take-back for unused pharmaceuticals.			X					
3-49	California should ban the export of hazardous waste to developing countries.			X					
3-50	California should create legislation that includes chemicals used in personal care products under DTSC authority. Partner with Europeans who have been working on this.								
3-51	California should evaluate products already available to screen chemicals in products including the Chemical Compliance Systems tool used by the DOD and US Army to evaluate munitions, paint, etc.	X							
3-52	Using data on toxicity and use, prioritize chemicals into low, medium, high, and very high concern categories. Develop clear criteria for manufacturers and users of chemicals prioritized into very high, high, medium, and low concern	X		X					
3-53	Work with major users of chemicals of very high and high concern to reduce or eliminate their use of these chemicals in their products.			X	X			X	
3-54	California should use data from the Canadian CEPA program summaries of chemicals in their prioritization program, and any summaries that come from EU's REACH program.	X		X					
3-55	California should look at available data sources to obtain information on chemical toxicity. These include EPA's various programs (IRIS, HPV, VCCEP)TSCA Test Submissions of unpublished technical reports, European Chemical Substance Information System, OECD member countries, and International Programme on Chemical Safety.	X							

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3-56	Ensure access to info gathered by others by 1) requiring companies submitting data under Canada's CEPA and EU's REACH to submit it to California, 2) negotiate for access to CBI data submitted under CEPA and REACH, 3) enhance IT infrastructure to receive and share data.	X							
3-57	Map the flow of chemicals in California, require submission of data from California producers/users on amounts of chemicals produced/used, and where, amount and use in products and post-use management.	X							
3-58	Require updates of MSDS to reflect all available data					X			
3-59	Require disclosure of chemicals in consumer products, focusing initially on high concern chemicals	X				X			
3-60	California should help advance the science by developing, road-testing and sharing new toxicology testing methods and strategies that account for endocrine disruption, developmental neurotoxicology, timing of exposure , toxicogenomics, etc, including high throughput screening methods. Collaboration with the federal government and Universities is important.				X	X			
3-61	Consider environmental justice in setting Green Chemistry policy and initiatives for data requirements and analyses. Include consideration of communities bearing a disproportionate exposure to toxic chemicals in their communities and on the job.			X					
3-62	Address cumulative exposures in communities when collecting and analyzing data and making decisions								
3-63	Data requirements, analysis should be based on a full cost accounting, including such externalities as the cost of pollution to communities, health care costs, environmental clean-up, disposal of toxic materials, worker exposure and lost work days, and premature death.								

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3-64	Require companies to generate comprehensive safety and health data based on the hazard traits of chemicals for all chemicals in their products by 2016.	X							
3-65	Establish partnerships with states to create an interstate clearing house of environmental health and safety data			X				X	
3-66	Develop a data audit system to evaluate the scientific validity of information gathered from external sources.			X					
3-67	Require chemical producers to complete a full life-cycle analysis of products to foster cradle-to-cradle management.								
3-68	Place fees on products and processes for which there is inadequate health and safety information.								
3-69	Create labeling requirements that will inform consumers of potential health and environmental impacts of the chemicals contained in products.			X					
3-70	Take early action on bad actor chemicals directed toward eliminating impacts to the most sensitive populations including vulnerable humans and ecosystems/species.			X					
3-71	Require safer substitutes where available; use regulatory authority to require safer substitutes, including non-chemical solutions, and seek additional legal authority if necessary to do so.			X					
3-72	Ban hazardous chemicals over time with a robust phase-out program including specific timelines by which users/producers must comply.			X					
3-73	Where no evidence exists for the safety of a chemical, restrict its use until safety can be comprehensively demonstrated.			X					
3-74	Develop regulations to require extended producer responsibility including take-back of hazardous materials, recycling of materials and use of less toxic materials. California can look at the Green Dot program in Europe as a model.			X					

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3-75	To include public interests in Green Chemistry efforts, create a public advisory committee, in addition to the Science Advisory Committee to advise California on what best serves the public interest, including sustaining healthy communities, a protected environment, and safe workplaces.								
3-76	DTSC should consider using life-cycle analysis guidelines established by the Society of Environmental Toxicology and Chemistry in using LCA to compare water, energy, raw material use to generate products, and the transportation and waste of same.								
3-77	If California considers an eco-label program, labeling should be based on science and life-cycle analysis, and involve a multi-stakeholder working group to generate the standards for eco-labeling.					X			
3-78	California needs a California Toxic Substances Control Act which would require all new chemicals to be tested for toxicity before they are marketed in California, and would established requirements for toxicity testing of existing chemicals.			X					
3-79	The Office of Environmental Health Hazard Assessment should be given more funding to evaluate alternative chemicals to determine whether alternatives pose an unacceptable risk.		X	X					
3-80	The authority of the Air Resources Board should be expanded to apply to other types of products, not just aerosolized products, which would increase the ability to forbid the use of certain toxic chemicals in consumer products.			X					
3-81	Cal EPA ought to encourage the use of renewable resources, continuously recycled materials, and green energy (i.e., alternative fuels and solar power) in manufacturing. Any program to reward or recognize "Green Chemistry" efforts ought to recognize companies that use renewable or continuously recyclable materials, and/or implement the use of green energy to support their manufacturing operations.								

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3-82	Cal EPA should develop model Life Cycle Analysis paradigm, starting with a single widely used product with environmentally detrimental properties, and analyze every aspect of that product's lifecycle, from the harvesting and processing of raw materials, to that product's ultimate disposal or "end of life" management.					X			
3-83	The State of California should implement a modern, comprehensive chemicals policy in line with current scientific knowledge on human health, and which requires a full evaluation of the health impacts of both newly developed and existing industrial chemicals now in use .			X					
3-84	To further stimulate Green Chemistry and Green Engineering, California should consider the following incentives: (1) awards like EPA's Green Chemistry Challenge (see http://www.epa.gov/greenchemistry/pubs/pgcc/presgcc.html for more information); (2) tax incentives/subsidies/grants/low interest loans for research and development; and (3) marketing exposure for Green Chemistry processes and products.		X						
3-85	When California purchases chemicals for state contracts, it could decide to pay a modest premium for a set period of time for new "green materials" that show promise. The goal of this subsidy would be to help a new material achieve greater economies of scale, but avoid locking in an inefficient permanent subsidy..		X						
3-86	California could additionally make capital available to companies at preferential terms, whether via grant or lower interest loans, to encourage Green Chemistry and Green Engineering manufacturing process development..		X						

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3-87	California could also consider a marketing program (perhaps akin to the “California cows” and dairy ads currently on television) whereby the state would promote companies that are actively engaged in Green Chemistry and Green Engineering, and products that are the result of Green Chemistry and Green Engineering..		X			X			
3-88	CSPA’s Product Care program is a stewardship program for the consumer and institutional specialty products industry where participating companies have agreed to go beyond government regulations in emphasizing health, safety and environmental concerns by carefully designing products, purchasing raw material and packaging, operating safe manufacturing facilities, promoting safe storage and distribution, providing useful product information, answering consumers questions and anticipating product disposal needs. CSPA believes that these types of product stewardship programs should be considered as frameworks for programs developed under the Green Chemistry Initiative..								
3-89	Develop and use cost- and time-efficient high-throughput human cell and tissue methods, as they are developed and validated, and computer-based methods such as (Q)SAR, and intelligent, tiered testing schemes to evaluate potential toxicity of chemicals in commerce.								
3-90	Data gathering requirements must take advantage of existing data gathered from other testing programs as well as intelligent testing strategies. Requiring a fixed list of toxicity tests for all chemicals is wasteful.								
3-91	A recent report by the National Academy of Sciences, entitled "Toxicity Testing in the Twenty-First Century: A Vision and a Strategy," recommends an overhaul in the way chemicals are tested for toxicity. California's implementation of green chemistry goals should be consistent with this vision, and the state should commit resources to this effort.								

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3-92	The U.S., Canada and Mexico have now agreed to a program to screen thousands of chemicals to see if further research is necessary to protect human health. It will follow work already being done in Canada prioritizing chemicals based on whether they show strong evidence of persistence, bioaccumulation and toxicity. USEPA has ongoing projects with the domestic chemical industry to gather data about large volume chemicals and fill in necessary information gaps. California should piggy-back any new chemical policy onto these programs rather than try to create its own testing agenda..			X					
3-93	If we are going to promote green chemistry, then let's do it! A glass-bead product for highway markings from China is available and for a cheaper price, but you also could get significant levels of lead and arsenic in the product as a result. Another glass-bead product is domestically produced and does not contain dangerous levels of these heavy metals.		X	X					
3-94	Prohibitions of chemicals should be put in place only when an unacceptable level of risk is identified that cannot be adequately mitigated or is not offset by benefits of the chemical..			X					
3-95	Materials classified as persistent bioaccumulative toxicants, very persistent or bioaccumulative, carcinogens, mutagens, or reproductive toxicants should be subject to an environmental and human health risk assessment conducted by the producer or importer and reviewed by the Office of Environmental Health Hazard Assessment.			X					
3-96	Schools (primary, secondary, and colleges and universities) as the trainers of tomorrow's leaders and the institutions conducting foundational research, should play a critical role in the Green Chemistry Initiative. California should engage educators to develop curricula, sponsor research, and educate consumers, the media, and policymakers..					X			

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3-97	The authority of the Air Resources Board should be expanded to apply to other types of products, not just aerosolized products, which would increase the ability to forbid the use of certain toxic chemicals in consumer products.			X					
3-98	As California selects specific approaches for chemical controls, they should adhere to these principles: 1. management must be risk-based; 2. screen all new and existing chemicals to determine further information needs in a tiered, risk-based approach; 3. leverage available information; 4. recognize the shared responsibilities of each party within the value chain; 5. promote transparency. The process Canada is using is consistent with these principles. The objectives of REACH and the responsibility it places on all members of the value chain are also consistent with this, although questions remain regarding implementation of REACH.								
3-99	In obtaining data to understand chemical risks, there is a need to retain certain business information as confidential in order to protect intellectual capital. Health and environmental data should not be considered confidential. .			X					
3-100	Life cycle assessment should be used to more holistically balance between societal needs, protection of public health and the environment, sustainable production and consumption.	X							
3-101	An effective green chemistry program should consider the concepts of risk management and net benefit as elemental to identifying topics of focus for this Initiative.“Risk” is usually expressed as a probability that an event will occur. Expressing risk in this way allows relative comparisons to be made about exposures to various substances and events. For example, expressing risks as a probability allows us to compare a variety of risks associated with daily living.								

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3-102	In California's Green Chemistry Initiative, risk management efforts can involve a variety of approaches such as: Substituting alternative input materials, Making process changes during manufacturing, Installing technological controls (e.g., pollution control equipment), Requiring use of personal protective equipment, Instituting a range of pollution prevention options, Training, Labeling, Imposing various storage, transport and disposal requirements			X					
3-103	Assessment of chemicals should focus on their intrinsic hazards and move away from reliance on time-consuming risk assessment methods that can be readily manipulated. Assessments should integrate the concepts of “cradle to cradle” and alternatives assessment to look for the least hazardous options in all cases. Furthermore, they should be based on the most sensitive criteria, such as the need to protect vulnerable human populations, endangered species, or water quality.			X					
3-104	In weighing benefits, such an analysis must also consider the "externalities", such as costs to communities in terms of lost wages from sick leave, health care costs, environmental degradation and the economic impacts that brings, expensive clean up actions, higher education costs due to higher rates of behavioral and developmental problems in highly exposed populations, etc..			X					
3-105	The problem and cost of disposal at the end of the life of the products or processes in which they are used need to be considered. We can impose rules on manufacturers, requiring take back and recycling, but we must also remember that those processes in themselves are expensive and have their own environmental or health impacts..		X						

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3-106	California should move toward a model in which hazard traits are prioritized. This will be essential in protecting and growing the California economy. While the EU may accept risk management as a premise, hazard trait analysis can provide our companies with a competitive advantage by enabling them to develop/choose safer alternative chemicals and to respond to shifts in international regulatory frameworks as they occur.	X							
3-107	We need a system that focuses on a chemical's rank relative to environmental performance and impacts on health, including worker health.	X							
3-108	While a safety-based characterization scheme may focus on toxicity, persistence and bioaccumulation, there are a number of other parameters which are relevant to the sustainable use of a particular chemical in a formulation such as raw material sourcing and carbon footprint. All relevant aspects of sustainability should be taken into consideration for a potential substitution decision.	X		X					
3-109	California could focus on the 500 high priority substances identified in Canada's program. To address unique circumstances that might exist in California, the State could have a process to add substances to the high priority list, as necessary, based on hazards, uses and exposures to workers and consumers in California. Once the high priority chemicals are identified, use and exposure should be considered to determine whether there are impacts on human health and/or the environment. .	X							

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3-110	The State could work in coordination with other North American initiatives (e.g., Canadian Domestic Substances List prioritization, EPA and OECD High Production Volume Chemical programs, Security and Prosperity Partnership (SPP) of North America Regulatory Cooperation Framework) in order to assess the risks of the highest priority chemicals. In undertaking such programs, SDA urges the State to proceed with any chemical assessments in a manner that would avoid unnecessary animal testing. In cases where real impacts exist, risk management strategies should be implemented in order to reduce those impacts, including use-specific restrictions where there are unacceptable risks. .								
3-111	For alternatives identified, there should be a separate Life Cycle Assessment by an outside party, or state-funded Center for Excellence in order to confirm that there is no loss in performance with the alternative, to avoid unintended consequences, and to assist in commercialization. The State also could develop a Cooperative Extension-type program to assist companies in Cradle-to-Cradle product design/formulation and assist in adoption of new alternative chemistries and processes. .	X						X	
3-112	the State could develop database of chemical alternatives that compares a number of sustainability parameters: performance, price, human health and environmental (e.g., toxicity, bioaccumulation, persistence) including carbon footprint and source sustainability..	X		X				X	
3-113	the State could map the flow of chemicals in California using information drawn from existing sources such as EPA's Inventory Update Reporting (IUR), the data received by Canada during its data call-ins for high priority chemicals, and other contributions from the public..	X							

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3-114	California could expand access to information on chemicals for consumers, businesses and regulators by leveraging its preeminence in data management and mining in order to organize the world's chemical data. For example, the dossiers for the EPA High Production Volume (HPV) Chemical Challenge program, and the related European program are often difficult to find and the data difficult to extract. By partnering with the information technology sector (e.g., Internet search firms), the State could expand access to chemical information, support its local industry and raise awareness of chemical safety information currently available..							X	
3-115	California could expand product-specific chemical ingredient disclosure for consumer products which currently do not have that requirement. .	X							
3-116	The State could establish a registry for companies seeking to align their business practices with the Green Chemistry principles and acknowledge their intent..								
3-117	For the Green Chemistry Initiative to have integrity it cannot allow exporting waste that is causing great harm overseas. We in California need to develop closed-loop safe and just ways of handling our waste, including recyclable plastics. The current model of exporting plastic to countries such as China needs to be stopped if California is serious about its Green Chemistry Initiative..			X					

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3-118	Priority Chemicals—California should establish a program to identify, assess and manage priority chemicals based on an evaluation of hazard and potential for exposure- Move quickly by leveraging priorities identified in the Canadian Chemical Management Plan. Create a collaborative effort between California and Canada to accelerate progress in both geographies.- Include a means for adding and deleting priority chemicals based on unique California circumstances. - Leverage the recently assembled U.S. Inventory Update report to provide initial volume, use and exposure information. Identify uses and user industries for the high priority chemicals that raise the greatest concern. Expect producers of priority chemicals and manufacturers with high concern uses to provide hazard and exposure information on those chemicals/uses to the program. Provide the agency with authority and a due process to establish restrictions for uses of priority chemicals that have unacceptable risks..	X		X					
3-119	Organize this overall effort in a collaborative approach involving chemical producers, targeted users/industries, the agency and appropriate academic and other 3rd party experts. Engage with US EPA and the recently announced Canada-US-Mexico Montebello Agreement to avoid duplication and expedite action on priority chemicals in California and throughout North America..			X					
3-120	In pursuing the objective of the Green Chemistry Initiative to expand toxicology information on chemicals, California should encourage the use of alternatives to animal testing and require testing only as a last resort. - The agency and UC university system could work with other experts to provide assistance on alternative screening methodologies that can be utilized to provide adequate toxicology information for recommendations and decisions about priority chemical uses. .	X						X	

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3-121	Expect and encourage manufacturers of consumer products to communicate information about the ingredients in products, either on the package or on the internet at the manufacturer's discretion and with appropriate provisions for protection of Confidential Business Information. - Expect and encourage chemical and product manufacturers to update their MSDS's to the new 16-section ANSI standard and to reflect the latest hazard information from voluntary (e.g. HPV) and regulatory (e.g. Canada CMP) programs. - Encourage companies in important value chain sectors to work together to identify "beyond MSDS" information needs both upstream and downstream and to establish processes for communication to meet those needs. - Leverage California's capability and interest to assemble a chemical information system on hazard, use and exposure from global sources. .	X			X				

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3-122	California should prime the pump to initiate early and significant advancements in Green Chemistry and to recognize and reward success. - Provide economic incentives for business innovation in green chemistry. - Provide economic support and incentives for innovation at California's University system: scholarships, research funds, technology licenses, etc. - Focus the above programs on development and commercialization of alternatives for restricted priority chemicals, including for small business application and on innovations that create breakthroughs in performance, value and environmental quality. - Establish an Annual Green Chemistry Recognition program for new chemicals, products and processes and for advances in research, analytical and toxicological methods that best exemplify the objectives of GCI,		X						
3-123	Develop a registry in which all stakeholders can document Green Chemistry successes - Develop an extension service through the UC university system to expand reapplication of successes across the potential user community.					X			
3-124	Continue the Conversation with California via ongoing workshops, symposia, and other communication approaches to maintain and build on the momentum established in the program to date.					X			
3-125	California should incorporate the work that will be developed as a result of the Montebello Agreement between the United States, Canada and Mexico. The environmental agencies of the three companies will coordinate efforts to advance chemical assessment and management in North America.			X					

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3-126	California should consider existing data and information already available to California and the public before making judgments on additional chemical specific data and information needs. There are existing programs such as the High Production Volume (HPV) Challenge Program and the Extended HPV Program, which have provided valuable toxicology and exposure information that is publicly available. Hazard information from such sources can be used in light of exposure scenarios to evaluate potential risk and ensure appropriate risk management. In addition, the information from the recent evaluation and categorization of chemicals on the Canadian Domestic Substance List (DSL), Canada, should be considered by California..	X							
3-127	Rather than imposing regulatory burdens, innovation through green chemistry can be promoted with positive incentives and partnerships. Green Chemistry should be encouraged through the sharing of expertise, financial support for research, information exchange, and public education. Incentives could be offered for companies to pursue and foster Green Chemistry and Green Engineering..		X		X			X	
3-128	Green chemistry programs should include process technology considerations as alternative chemistry is being evaluated. This technology can have a significant impact on minimizing potential adverse health or environmental effects of a chemical substance. Process technology can reduce both human and environmental exposures to chemicals, for example, through enclosed systems, recycling of by-products, and controlling potential environmental releases. Use of these process technologies can eliminate the need for substitution of critical raw materials..			X					
3-129	California should impose appropriate use-restrictions for chemical ingredients when scientific safety-based assessments indicate they cannot be used safely in consumer product or use application..			X					

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3-130	California should push collaborative efforts to encourage public and private partnerships, with a goal of developing greener products and environmentally responsible ingredients based on life cycle considerations, rather than mandatory and voluntary state labeling programs that endorse green products or programs that stipulate a single third-party certification of green products or numerical ranking.		X		X			X	
3-131	CalEPA collaborate with the Canadian government not only on the priority list of chemicals but the program in general. In our opinion, this collaboration would avoid needless duplication, inefficiencies and burdens, as well as take advantage of credible, high-quality scientific work already completed.				X				
3-132	California should bring its expertise to the table in the Montebello agreement to share data and assessments so that all North Americans would have continued access to safe and effective products with improved sustainability and environmental quality profiles.			X					
3-133	Work with affected industries to implement a means of ingredient communication that would provide consumers with the information they can use to make even better informed decisions regarding the products they use in their homes.				X				
3-134	CalEPA could work with scientific experts to examine best practices and to develop a toolkit for safety assessment programs and for safety assessments. Companies also could make a description of their safety assessment process available on the Internet. This could help provide context for product ingredient communication.	X		X	X	X			

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3-135	California should close the "technology gap" through market-based incentives to support green chemistry. This could include funding for university research grants, scholarships, and similar programs, as well as awards for innovation, tax credits, low-interest loans, and other incentives. These positive incentives should be open to all companies that are innovators and sell products in California -- not simply be limited to companies located in California.	X	X			X			
3-136	The chemical industry or chemical importers should take the responsibility to describe the environmental characteristics of their products. The financial burden of testing chemical products appropriately lies with the producer or importer. Such testing should be carried out at independent test facilities, and it may be beneficial to California to encourage the creation of such test centers within the state – either as independent entities or as part of the CA University system.			X					
3-137	Self certification by the producer would be based on independently run tests of a chemical's characteristics in terms of whether the chemical should be considered persistent, bio-accumulative, and toxic (PBT), or should be considered a very persistent and very bio-accumulative (vPvB), or should be considered to have significant possibility of being carcinogenic, mutagenic, or reprotoxic (CMR category 2). These classifications are well recognized in global regulatory systems, and the data necessary for such classifications can be clearly defined. The data and rationale behind the assessment shall accompany the submission. The submission would be reviewed by the CA EPA and final determination of the chemical's classification will lie with CA EPA.								

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3-138	Materials classified as PBT, vPvB, or CMR category 2 should be subject to risk analysis. If risk levels are judged too high, then industry should have the opportunity to introduce appropriate measures to reduce risk within a given time span, or face phase out of the material. Within a phase out strategy, the potential use of alternatives must address any risks associated with such substitution. It should not be acceptable to propose substitution by a material for which there is little data on its characteristics. Fundamentally, lack of data should not be rewarded.			X					
3-139	Incentives could be given to develop products with improved characteristics, e.g. non-PBT or polymeric chemical additives. Similarly, improved stewardship, such as driven by the BFR industry's Voluntary Emission Control Action Program (VECAP) should be encouraged and rewarded.		X	X	X				
3-140	Conduct studies of why specific chemistries are being used in terms of industrial structures and histories. Regulatory standards or established industry practices can actually exacerbate the creation of risks. Flammability standards have encouraged the use of brominated flame retardants; companies often simply use specific chemicals in manufacturing because they are accustomed to doing so and their technologies and ordering systems are built on the chemicals.			X					
3-141	GIS data could be integrated with workplace use, health, ecological, and other data to identify patterns that affect chemical impacts. We need to understand, in particular, the distributional effects of chemical exposures.								

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3-142	Develop new monitoring systems that can track chemicals and materials as they are introduced into consumer products or industrial systems, and identify far more promptly emerging problems. These could include developing biomonitoring schemes, consumer and ecological health surveillance, and feedback from workers and downstream users or manufacturers.	X							
3-143	1. Strengthen the recognition and pursuit of Green Chemistry processes and products by establishing clear criteria and voluntary certification based on comprehensive lifecycle considerations. Equally important, consumers need to be educated about responsible choices and practices.							X	
3-144	2. Explore models other than, or building upon, the current Materials Safety Data Sheet (MSDS) system to provide needed chemical hazard data throughout the supply chain.Our members often find the data included on the Material Safety Data Sheet (MSDS) to be insufficient for determining chemical hazards. Many times important information is addressed in a superficial, boiler-plate fashion or missing altogether. The same raw material from different suppliers may have divergent information. This is in part due to some government regulations requiring that an MSDS be obtained directly from the manufacturer. While we recognize that confidential business information needs to be protected, best possible data on hazard and ecological effects should be made readily available to the supply chain and other stakeholders.The Global Harmonization System for the Classification and Labeling of Chemicals (GHS) should be considered, as well. Any model chosen should include the appropriate ecological as well as toxicological information	X							

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3-145	3. Establish a Green Chemistry Coordination Council to collect and promote the sharing of information, highlight businesses with green practices, provide assistance to businesses lacking resources, and educate consumers. We suggest the DTSC catalog and make easily available information regarding best practice screening processes, green chemical design, collaborative efforts such as the ACS Green Chemistry Institute, and international efforts such as the Global Harmonization System. All stakeholders still have a lot to learn in this dynamic area, and everyone stands to gain from continued information sharing. DTSC's leadership in this area should be continued by establishing it as a central clearinghouse of information for the state and beyond. We further suggest building upon and making readily available the information provided by existing efforts: ACS Green Chemistry Institute, Cleangredients, U.S. EPA's Design for Environment Program, Performance Track, the chemical industry's HPV testing program, eChemPortal, EPEAT, and DTSC Technical Resource Center							X	
3-146	4. Prioritize chemicals for screening, testing and appropriate restrictions. We suggest building upon the model of Canada's analysis and prioritization as well as the Proposition 65 review process. Chemicals of high concern should be allowed for targeted, low-exposure uses as determined in an open process. The use of a transparent and rigorous process to evaluate risk factors as indicated by toxicological, epidemiological, and exposure data will allow us to compare the relative importance and safety of chemicals as well as determine whether any restrictions or substitutions are appropriate								

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3-147	5. Greater investment in pollution prevention in the short term as well as extension of the current CA Pollution Prevention model to downstream chemical users as an element of the long term Green Chemistry strategy. Pollution prevention programs and policies such as SB 14 have been promoted for quite some time, yet they never receive anywhere near adequate funding and attention. This suggests the possibility of 1) taking chemicals of top priority concern, 2) identifying the specific applications or industry uses posing the greatest risk from those chemicals, and 3) applying a collaborative process of agency, industry and third-party experts to identify or develop viable alternatives that can maintain efficacy, but reduce risk in those targeted applications	X						X	
3-148	6. Continue the Conversation with California to sustain progress in Green Chemistry. The dialogue between DTSC and stakeholders has been very helpful and will result in more well-developed, effective policy.					X			
3-149	While the focus of the Initiative has been on chemical safety, green chemistry in the broader sense should incorporate an accounting of embedded energy, C02 impact, water usage, packaging, recyclability and so forth. Industry on the whole is already moving toward a greater consideration of these factors in our practices. The difficulty of quantifying and ascribing relative importance to these factors points to the need for commonly-held practices or industry standards.			X					
3-150	The authority of the Air Resources Board should be expanded to apply to other types of products, not just aerosolized products, which would increase the ability to forbid the use of certain toxic chemicals in consumer products.	X		X					

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3-151	California must evaluate what regulations and information are currently available and whether these tools are being appropriately implemented and applied prior to developing new programs. Indeed, we expect this analysis is already underway, pursuant to the mandate to conduct a “baseline assessment” of existing programs and information described in the April 20 memorandum from Cal-EPA Secretary Linda Adams announcing the Green Chemistry Initiative.			X					
3-152	This initiative should address the problem of chemicals being used in our daily lives that have not been tested for neurotoxicity in children. I urge you to include restrictions and bans on chemicals that demonstrate a hazard to our health and/or environment.			X					
3-153	Chemical data development efforts should build on existing statutory and regulatory structures, voluntary initiatives, and data development efforts, and collaboration by California in ongoing work by other government agencies to assess chemicals and consumer products.- leverage efforts by Health and Environment Canada in addressing priority chemicals in the Chemicals Management Plan. California could also participate in the e Security and Prosperity Partnership (SPP) under the Montebello Agreement involving trilateral cooperation among the governments of Canada, the United States and Mexico to share chemical information and safety assessments.			X	X				
3-154	California should work with industry to implement a means of ingredient communication that would provide consumers with the information they can use to make informed decisions regarding the products they use in their homes.	X				X			

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3-155	California should engage in collaborative efforts to encourage public and private partnerships with the goal of developing “greener” products and “environmentally responsible” ingredients rather than mandatory and voluntary state labeling programs that endorse green products or programs that stipulate a single third-party certification of green products.	X			X			X	
3-156	Provide incentives for companies that innovate and develop technologically and commercially feasible products using green chemistry. Provide recognition for companies that develop sustainable business operations, processes, and/or products.								
3-157	Change our current, risk-based method of policy making, which limits the scope of chemical evaluation and puts people in harm’s way before allowing the government to make chemical regulations. The only groups who benefit from "risk management" are chemical suppliers—they don’t have to run toxicity tests or report their findings, they don’t have to report quantities or end uses of potentially toxic substances, and they have no incentive to update manufacturing methods or reformulate, as that always comes with some monetary cost. They need markets and incentives to design better products, but won’t comply without preventative regulation in place.			X					
3-158	Conduct a detailed, comprehensive assessment of existing laws, regulations and programs and ensure that recommendations for chemical screening, prioritization and evaluation include lessons learned from those programs. Cooperative agreements with existing programs are essential to avoid duplicative or ineffective efforts.			X					
3-159	Conduct a detailed, comprehensive assessment of existing chemical toxicity reporting and data availability programs and ensure access to those data as applicable to California. Assurances of some measure of formulation confidentiality would encourage producers and manufacturers to make toxicity and use data available.								

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3-160	Information on chemical importation, use, and exposure patterns in California should be quantified and analyzed before requiring the generation of toxicity data; exposure and use data can and should be used to prioritize chemicals.	X							
3-161	A static, required list of toxicity tests should be avoided as check-the-box toxicology; instead, tiered, thoughtful testing strategies should be pursued with flexibility and creativity. For example, bioaccumulation, biopersistence, solubility, and other physicochemical parameters should be determined prior to conducting dose-related evaluations such as percutaneous absorption testing; moving up from there would involve a full characterization of the chemical or material using in vitro cell and tissue assays. For the sake of flexibility as science advances a list of required tests promulgated legislatively should be avoided.								
3-162	Seek input from animal protection stakeholders, who have a unique set of qualifications and can specifically address the reduction and replacement of in vivo animal tests, before recommending testing strategies or regulations. The National Academy of Science's recent report addressing the future of toxicity testing should be embraced as part of a GC initiative, not only in the interest of animal welfare, but in the interest of a healthy environment	X				X			
3-163	Keep pace of new methods to evaluate toxicity other than new animal testing. These include: The OECD QSAR Toolbox and other International QSAR Foundation activities, OECD and NTP toxicogenomics initiatives, ILSI/HESI's Tiered Toxicology Testing Proposal for Pesticide Chemicals, the OECD Integrated Approaches to Testing and Assessment workshop (taking place in December of 2007), as well as others such as those presented during the Cal/EPA workshop October 1-2, 2007.								

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3-164	The responsibility to analyze the human health & environmental profile of the chemicals, and manage chemicals in an appropriate way in accordance with their profile. REACH is a good example of such responsibility. Such a system should give clear certainty to industry that a chemical can continued to be used once the assessment is completed and approved, & it should also not continuously be challenged on the basis of data which are not scientifically sound.	X							
3-165	Product stewardship programs, designed to better management throughout the supply chain of the substance, & continued minimization of the impact of the substance, should be recognized & encouraged.	X	X		X			X	
3-166	A science-based assessment that evaluates human health and environmental considerations, performance, and cost and feasibility must include an examination of traditional and alternative technologies, materials and processes. Incentive-based approaches can allow companies to more easily and effectively share this knowledge, best management practices, and opportunities.								

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3-167	Establish a California-specific chemical evaluation process to identify uses of concern for priority chemicals that were not on the original CEPA categorization process or that will not be addressed under the Montebello Agreement in the timeframe required. The process should utilize a tiered approach, in which chemicals and their uses are prioritized for further evaluation. The process should also utilize risk-based screening and should focus on potential “data needs” versus “data gaps”. Producers and users of identified priorities should be engaged in a collaborative process to bring hazard, use and exposure information to improve decision-making. As California proceeds with its process, it should leverage information already generated or that will be generated under regulatory or voluntary chemical evaluation programs. California must be transparent in the processes used to make risk evaluation and risk management decisions.			X					
3-168	Require manufacturers to label consumer products with all the chemicals and materials (including nanotechnology) that these contain. Consumers currently lack the information required to discriminate between products based on their toxicity impacts, so industry has few incentives to develop new green chemistry products. In parallel, develop interactive consumer tools and technologies that assist consumers to interpret and use labeling data in their shopping. The Toxics Release Inventory succeeded because information tools made its data highly accessible.	X	X			X			

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3-169	Require industry to conduct green chemistry assessments for chemical products sold or used within California. These assessments would consider whether there are green chemistry design options available and use options analysis to justify how products are designed. These assessments can be modeled on the Massachusetts TUR Act but be updated greatly to reflect the combination of both products and processes. Companies currently do not generate enough decision-making information within their businesses. Registration of chemicals for marketing could be linked to the use of green chemistry design tools: if these tools have been used, then approval of the chemicals could be expedited..			X					
3-170	As far as possible the data required for chemical evaluation should be harmonized with the data requirements of other regulatory jurisdictions. In practice we would suggest persistency, bioaccumulation potential, toxicity (PBT) characteristics, and carcinogenic, mutagenic and reprotoxic (CMR) characteristics form a suitable base line for decision making. Use of these factors makes most efficient use of data generated and avoids unnecessary additional testing. We support the goal of minimizing animal testing..								
3-171	Adopt a proactive approach to obtaining data needed to assess hazard traits.The current practice is for the state to consult various lists and data sources to try to track down whatever information is available to assess hazards of chemicals. The information available varies enormously, and little is available for many chemicals. The State needs to have the authority to obtain the information and test results needed to assess and characterize the hazards of chemicals			X					

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3-172	Methods are needed to reflect current understanding of issues including the importance of timing of exposure and how effects at different life stages can differ; differences in susceptibility including the particular susceptibility of children; the importance of multiple exposures to multiple chemicals; and the significance of biological perturbations in increasing likelihood of diseases or disorders. Cal EPA should engage experts to work toward incorporating current science into better methods for assessing the hazards of chemicals. These would likely include use of genomics and related technologies and other high through put approaches. It would also include systematic validation. Such efforts should be guided by the policy goal to adopt the best currently available methods	X							
3-173	Provide clear and transparent characterization of chemical hazards to the public. Many entities can and are making decisions and take action that contribute to adoption of safer or lower hazard chemicals and products. To support such efforts, businesses, agencies, and the public need comprehensive, current, accurate, and reliable information about the relative hazard of different chemicals. The State of California should develop a matrix of information about the hazard traits of chemicals in use or considered for use, presented in ways that are useful and understandable to various audiences. This matrix should also make clear when gaps in data exist, so that businesses and individuals can choose to avoid chemicals with unknown hazards as well as those that are higher hazard	X				X		X	
3-174	To develop a scientifically-based program, it is important to ensure the integrity of the scientific information and expertise that are engaged.The State should adopt the highest standards for ethical conduct and independence of the experts upon which it relies. Standards recently adopted at the International Agency for Research on Cancer for its review of potential carcinogens provide a useful model.	X							

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3-175	To comply with the spirit of the California Green Chemistry Initiative, it is absolutely necessary that formulators use standardized ingredient properties and criteria. At this time, one of the most difficult aspects of Green Formulation is access to, and the variability of, data describing the potential hazards of chemical ingredients. The ingredient database would characterize the human health, environmental, safety, and regulatory aspects of ingredients used in formulated products								
3-176	The industry itself will not focus on or develop alternatives unless there is a regulation. This results in a “chicken and egg” problem and the chemicals and products that pose problems continue to be used, exposing workers, people in the surrounding communities and consumers. An important feature of this model program should be the work on alternatives. It is important to use or establish independent entities with detailed technical knowledge and experience, to find, develop, test and demonstrate viable and cost effective alternatives. The industries using the candidate chemicals or products must work with the independent entities to test potential alternatives. The health and environmental characteristics of the potential alternatives must be investigated and the alternatives must be safer than the original chemicals and products they will replaces	X		X					
3-177	Consider all existing programs that regulate chemicals. As each of these specific program elements and specific data requirements is evaluated for purpose and benefit, a shorter list can be compiled of specific program elements that should be examined more closely. Additionally, gaps in programs that could lead to exposures that could give rise to unacceptable levels of risk should also be noted. The objective of this review is to focus further efforts on those topics where risks are not now managed at an acceptable level.			X					

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3-178	There must be an acceptable way to prioritize chemicals for additional testing. Hazard traits are certainly one criterion, but it is only part of the story. GCI must not consider hazard at the exclusion of exposure. Were it so, there would be a misalignment of limited resources for marginal value.								
3-179	Admittedly too much emphasis has been placed in prior year on reducing exposure (risk) and too little emphasis on reducing toxicity (hazard). The transition movement within the chemical in industry, however, has begun. Emphasis on a transition to hazard reduction (i.e. green chemistry)is and will continue to build. However, GCI needs to forthrightly acknowledge that elimination of all toxicity through chemical substitution is not possible. At best there will always be tradeoffs which will need to be evaluated via Life Cycle Analysis (LCA) methodology s.	X		X					
3-180	The GCI should look at the current body of federal and international law when determining whether or not to superimpose yet another layer of regulation on an already heavily regulated industry.	X							
3-181	Substitute chemicals should be held to the same data requirements as the chemical(s) they are intended to replaces.			X					
3-182	The GCI process should level the playing field and strive or consistency across the board.			X					
3-183	Conduct a base-line review of physical and intellectual capabilities to support and nurture the green chemistry R&D initiative. Additionally, CICC recommends that public private arrangements between universities and private industry be encouraged, particularly as it relates to green chemistry solutions.		X			X			

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3-184	In a command and control regulatory environment, private industry can only proceed as quickly as regulators can regulate. Time-to-market is critical in any new product launch. Delays and uncertainties increase the financial risks and reduce the initiative. California must ascertain its capability to manage whatever regulatory structure might be envisioned and begin making adjustments accordingly.			X					
3-185	There are numerous opportunities to reclaim process streams that may require refining (i.e. distillation, filtration, etc) prior to recycling the material back into the same process. The Chemical Industry Council and the DTSC have embarked on a partnership to promote voluntary pollution prevention and reduce waste. CICC is eager to work with DTSC to implement regulations allowing more flexibility for generators to reclaim streams onsite without having to go through tiered permitting or Part B Permit. CICC recommends that we work collaboratively with the Department to fix this problem and reduce waste generation			X	X				
3-186	Provide incentives to industry to develop green chemistry capabilities. These suggestions include: investment tax credits, public private partnership grants, low interest revolving fund loan, personal property tax exemption for laboratory equipment, preferred tax treatment for equity fund investment in California's GCI movement.								
3-187	Host a Green Chemistry Symposium dedicated entirely to technology transfer, start-up funds, equity funding, and possible CalPERS investment in California companies with homegrown technology that solve California environmental problems.								

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3-188	Program funding within DTSC's Science Pollution Prevention and Technology Development group should be reestablished in order for the Technology Development staff to review and validate the green chemistry/ green engineering performance claims made by companies seeking economic incentives in the form of grants, low interest revolving loans, and preferred equity funding.			X					
3-189	Cal/EPA should begin an immediate effort to ramp-up its Life CycleAnalysis (LCA) capability. Unquestionably, one cannot envision competency in Cradle toCradle techniques without enhanced in-house LCA capability			X					
3-190	The Lawrence Hall of Science, UC Berkeley began a program some 20 years ago known then as theChemical Education Public Understand Project (CEPUP), now the Science Education Public Understanding Project. W e recommend California consider how this program might accelerate outreach and conversely how green chemistry concepts might be incorporated into the teaching modules.	X				X			
3-191	Important elements of GCI should: protect proprietary technology and intellectual property, avoid unnecessary legislation and regulation which might impede discovery, avoid the false hope of continuous breakthrough discovery, and properly value and promote continuous improvement –pollution prevention.								

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		Data Collection and Use (Information)	Economic Incentives	Statutory and Regulatory Requirements, Enforcement	Voluntary Measures	Education and Outreach	Research and Technology	Technical Assistance	Recognition, Awards, and Certification
4-1	Chemicals should be assessed within the context of alternatives. Criteria for better or worse green products should be clear.	X	X	X		X		X	
4-2	Improve import standards for products manufactured offshore.			X					
4-3	Establish corporate and manufacturing codes of conduct.		X	X					
4-4	Develop best practices for supply chain management.		X	X					
4-5	Require full disclosure from suppliers.			X					
4-6	Establish process and product benchmarks, and distinguish between process chemicals and product chemicals.			X					
4-7	Help establish a product safety/product liability organization to determine a safety check list and review products according to the check list.			X					
4-8	Provide funding for adequate research on toxins using modern methods.		X						
4-9	Educate the public on what items they use that are toxic and natural alternatives that could be used instead					X			
4-10	Educate companies on greener alternatives and penalize companies for selling toxic items			X				X	
4-11	Use sound scientific information to define what is "toxic" and "non-toxic"	X				X			
4-12	Identify specific industry sectors that generate the most toxic products and identify green production and processing for those sectors	X		X		X			
4-13	Develop educational programs for children					X			
4-14	Use tools that are already available for decision-makers (such as purchasing managers) which collect and analyze information on environmental hazards, health hazards and cost of chemical inventories and products (e.g., Dolphin Software, www.chemply.com)	X							
4-15	Government responsibility for international cooperation on imports and exports of products			X					

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4-16	Develop mechanisms for improving the flow of information through the manufacturing process	X		X					
4-17	Expand and randomize government testing of food and products			X					
4-18	Improve enforcement for retailers and upstream			X					
4-19	Address the issue of how to find out what's in products from abroad			X					
4-20	Establish rigorous manufacturing process controls			X					
4-21	Require manufacturers/suppliers to certify the safety of the products they sell to retailers		X	X				X	
4-22	Build toxicological and exposure database on chemicals in use in California	X		X					
4-23	Develop a "green" rating system for products with agreed upon criteria		X			X			X
4-24	Ensure that data development and identification of toxics are done by qualified experts			X					
4-25	Review current and next generation technologies to help with product recalls			X					
4-26	Prioritize chemicals of concern based both on risk and exposure			X					
4-27	Require testing, or submission of equivalent level of information, on materials prior to re-use			X					
4-28	Incorporate emerging toxicological issues such as endocrine disruption in the definition of toxic			X					
4-29	Evaluate the synergistic effects of chemicals in products			X					
4-30	Establish a quality assurance/quality control program for precursors and raw materials			X					
4-31	Scrutinize who is liable for a toxic product in the chain from manufacturing to sale and ensure there are consequences for the responsible party		X	X					
4-32	Provide assistance to small manufacturers and encourage pooling of resources to improve safeguards and quality control on inputs.			X				X	
4-33	Require company accountability for out sourcing		X	X					
4-34	Strengthen trade agreements between the state and other countries			X					

Reference Number	(4) Toxics by Accident: Identifying Toxics in Products by Accident Options	Category							
		Data Collection and Use (Information)	Economic Incentives	Statutory and Regulatory Requirements, Enforcement	Voluntary Measures	Education and Outreach	Research and Technology	Technical Assistance	Recognition, Awards, and Certification
4-35	Develop international technology exchanges between companies to capture knowledge on how to successfully mass produce products using less toxic alternatives							X	
4-36	Encourage media publicity and engagement on toxics in products		X						X
4-37	Establish academic programs in product stewardship; develop and implement cradle-to-cradle design curriculum into multiple disciplines					X			
4-38	Develop a fact sheet on chemicals policy in the U.S. and post it on the Cal/EPA Green Chemistry Initiative website to educate the general public		X			X			
4-39	Develop layperson information on common chemicals in common commercial products					X			
4-40	Engage in culturally appropriate outreach to consumers to help them make informed choices and move toward greener products. Use television commercials (could feature Arnold Schwarzenegger), comic books, radio, and the Internet. Partner with Hollywood.					X			
4-41	Develop guidance on what citizens of California could do to move toward greener, sustainable living.		X			X			
4-42	Work with the U.C. system to develop a green chemistry curriculum for all chemistry and engineering majors.								
4-43	Work with other state agencies, including DGS, to develop information on green purchasing and disseminate this information to other government agencies, including county and city level, as well as private businesses		X			X			

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		Data Collection and Use (Information)	Economic Incentives	Statutory and Regulatory Requirements, Enforcement	Voluntary Measures	Education and Outreach	Research and Technology	Technical Assistance	Recognition, Awards, and Certification
4-44	Require responsible parties to report new factual information regarding adverse health effects of their products or of the individual constituents of their products to a centralized, publicly accessible database. The adverse effects reporting requirements for pesticides as set forth in Section 6 (a) (2) of the Federal Insecticide, Rodenticide, and Fungicide Act, could be used as a starting point.	X		X					
4-45	Responsible parties should be required to identify the individual constituents of their products or, if that information is considered to be confidential business information, to provide the appropriate health information on their products.	X		X		X			
4-46	Strengthen relevant liability law to provide greater incentive for consumer protection from toxics in products		X	X					
4-47	Require a certificate of analysis to ensure purity			X					
4-48	Communicate information on suppliers providing off-specification chemicals			X					
4-49	Require multi-layered assessment of products including: human and environmental impact, alternatives analysis, lifecycle analysis, multimedia impact.			X					
4-50	Require manufacturers to know what is going into products they produce	X		X					
4-51	Expand education in building a sustainable technology base					X			
4-52	Encourage that chemists should have university courses in Green Chemistry emphasizing toxicity and ecotoxicity					X			
4-53	Encourage universities to develop green business and law courses, etc.					X			
4-54	Require REACH-like analysis/reporting/removal of toxics in products.	X		X					
4-55	Expand State testing of products to detect hidden toxics in all products and to produce a level playing field internationally—police your laws.			X					

Reference Number	(4) Toxics by Accident: Identifying Toxics in Products by Accident Options	Category							
		Data Collection and Use (Information)	Economic Incentives	Statutory and Regulatory Requirements, Enforcement	Voluntary Measures	Education and Outreach	Research and Technology	Technical Assistance	Recognition, Awards, and Certification
4-56	Develop a process for rapid removal of products found to be toxic by new studies that is fair to industry—State subsidized transformations		X	X					
4-57	Encourage the use of existing environmental management systems (e.g., ISO 14000) and work with international standards setting organizations (e.g., International Organization for Standardization) to develop green chemistry technical standards			X		X		X	
4-58	Develop fast, effective screening technologies for toxics in products (e.g., XRF)						X		
4-59	Develop "demonstration projects" and workshops to address common green chemistry problems							X	
4-60	Establish green chemistry scholarships and international exchange programs for students and/or scientists (sponsored by California government and/or industry)		X			X			
4-61	Establish a centralized testing laboratory for toxics in products that would accept testing requests from the public			X			X		
4-62	Make a baseline assessment of chemical information that is already available to the State	X		X					
4-63	Develop legislation that would require new chemicals to be tested for toxicity prior to marketing in California. Toxicity testing would also be required for existing chemicals already being used and marketed in California. The set of required toxicity tests would be developed by a group of scientists with input from California government agencies and the public. California government agencies would evaluate the results of the toxicity testing and decide whether the chemical would be marketed (new chemicals) or whether the chemical would have to be removed from the market (existing chemicals). The criteria for deciding on this "up or down" vote on a chemical would be predetermined by the group of scientists who designed the toxicity test battery, along with input from California government agencies and the public.	X		X					

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		Data Collection and Use (Information)	Economic Incentives	Statutory and Regulatory Requirements, Enforcement	Voluntary Measures	Education and Outreach	Research and Technology	Technical Assistance	Recognition, Awards, and Certification
4-64	Expand the budget of OEHHA to speed the evaluation of toxicity test results and determination of whether particular chemicals pose an unacceptable risk	X		X					
4-65	Grant greater regulatory authority and flexibility to CARB to regulate whole consumer product types and establish regulations based on the characteristics of existing safer and greener alternatives (e.g., allow CARB to establish VOC limits for aerosol deodorant and antiperspirant products based on the low or no VOC content of existing roll-on substitutes, effectively forbidding the use of aerosol products when a roll-on alternative is available)			X					
4-66	Develop clear criteria for prioritizing chemicals by level of concern based on a range of factors including chemical production volume and uses, exposure criteria such as persistence and bioaccumulation, and toxicological characteristics. Follow through with safety assessment and appropriate action.	X		X					
4-67	Require the submission of safety data from chemical producers to address both hazard and use knowledge gaps. Start with lists already available to the state (e.g., Proposition 65 list) and set deadlines for data submission. Take action on substances of very high concern, including requiring permission for continued use of such chemicals. Include substitution planning to ensure movement toward safer and greener alternatives.			X					
4-68	Develop criteria for low, medium and high hazard chemicals. Publish lists of chemicals meeting these criteria to encourage movement away from high hazard chemicals and innovation toward low hazard chemicals.			X					
4-69	Create a map of chemical production and use in California. Show how chemicals flow into the state, who produces them and how they are used.	X	X	X				X	
4-70	Develop educational programs for consumers on the consequences of excessive consumption.					X			

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4-71	Create a list to be posted on the Internet of "bad actor" chemicals that have been found in products and the associated suppliers/manufacturers					X			
4-72	Increase the number of inspectors in the field for retail products and food			X					
4-73	Create "feeder" lists of chemicals to provide an early indication of potential chemicals of concern; such feeder lists would require a lower threshold of data than a list such as Proposition 65. Publish the lists on the Internet.		X			X			
4-74	Build technical capacity in state agencies such as OEHHA in the use of QSAR (quantitative structure activity relationship) models; review and consider how these methods can be applied in identifying chemicals of concern as well as safer alternatives	X		X					
4-75	Implement the policy that "no data means no market" meaning that chemicals for which safety data are not available are banned from sale or use.			X					
4-76	Review and implement new strategies for toxicity testing, such as "high through-put" assays, consistent with recommendations discussed in the National Academy of Sciences report on Toxicity Testing in the Twenty-first Century: A Vision and a Strategy.			X					
4-77	Review a case study to examine the factors that are useful and appropriate in determining what is "safer." For example, use flame retardants to evaluate how best to identify a safer alternative (e.g., safer chemical, alternative non-chemical technology, change in performance standards etc.). Develop a technical and a layperson document describing the results of the case study, and use this information for developing policy and doing education/outreach.					X		X	
4-78	Seek continuous improvement to achieve the "greenest" or "safest" possible results; link standards to the best, safest available technology/chemical.			X					

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4-79	Require companies operating in California to submit copies of the data/information that they submit to other jurisdictions, such as Canada pursuant to CEPA and the European Union pursuant to REACH.			X					
4-80	Set up a third party (could be a government agency) that could facilitate the sharing of technologies and data among industries while guaranteeing the confidentiality of that information.			X					
4-81	Negotiate a data sharing agreement between the state (likely through Cal/EPA) and the European Union so that the state can access the data submitted under REACH.			X					
4-82	Conduct a detailed assessment of data requirements under REACH to evaluate the type of information likely to be generated pursuant to that regulation. Target additional data requirements in California to any areas that are identified as not being adequately addressed under REACH.								
4-83	Evaluate whether the agencies that implement REACH and CEPA could be identified as authoritative bodies under Proposition 65 so that the information generated under these programs could be directly used by California to identify chemicals as known to cause cancer or reproductive/developmental toxicity.			X					
4-84	Create a unified database to capture toxicity and exposure data sources from around the world. Make the database public (on the Internet) and accessible to various types of users (chemical products users, consumers etc.) Review the OECD "E-Chem" portal as an example of this.					X			
4-85	Phase out chemicals that harm human health or the environment or whose impacts are unknown.			X					

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4-86	Impose fees on companies that either directly use toxics in their products and processes or use inputs or processes that result in toxics in products. Apply these fees over a specified period of time; at the end of that time take action to phase-out or restrict particular chemicals/processes.		X						
4-87	Support activities that increase the capacity of individuals and communities to act in their own interest to reduce exposure to toxic chemicals.					X			
4-88	Data requirements, analyses and decision making processes should: (a) incorporate new science demonstrating the importance of low doses, as well as the significance of background exposures, synergistic effects, and the timing of exposures during the lifecycle; (b) address the effects of cumulative exposures; (c) provide comprehensive protection, including protecting the most vulnerable populations, endangered species, and water quality; (d) consider environmental justice and worker impacts; and (e) be based on a full cost accounting including costs to communities.	X		X					
4-89	Assess chemicals based on intrinsic hazard, not risk (i.e., integration of toxicity and exposure).								
4-90	Continue to evaluate chemicals based on risk (i.e., integration of toxicity and exposure), not intrinsic hazard, which could amount to an approach comparable to "homeopathy" for chemicals.								
4-91	Decisions about chemical use should incorporate a precautionary approach to protect the public and environment when data are incomplete or uncertain, and therefore be based on the assumption that chemicals are unsafe unless reasonably demonstrated otherwise.			X					
4-92	Where safer alternatives exist for hazardous chemicals, use of these alternatives should be mandated.			X					

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4-93	Do not wait to take immediate action while developing a sound, long-term chemicals policy. Chemicals currently in use that are known to be unsafe should be restricted or eliminated.			X					
4-94	Develop a robust framework for regulating chemicals to accompany incentives for the development of greener chemicals and technologies; voluntary programs alone are not sufficient.			X	X				
4-95	Review the Consumer Specialty Products Association's Product Care program as a model stewardship program in which consumer and institutional specialty product companies have agreed to go beyond government regulations in emphasizing health.				X	X			
4-96	Carefully research and evaluate the possible unintended consequences of substituting one chemical for another.			X				X	
4-97	Review the ACC Responsible Care program as a model for reducing potential hazards which includes a rigorous EHS&S management system that is certified by third-party auditors.				X	X			
4-98	Consider a wide range of incentives to motivate changes in the behavior of industry and/or consumers: Production tax credits; Rebates to consumers or business; Investment tax credits; R&D tax credits; R&D grants; Equipment grants; Loans or loan guarantees; Public infrastructure development; Government support to deploy environmentally preferred products or technologies; Public/Private partnerships; Employee training and workforce development; CEQA exemption on qualified projects or other regulatory relief and special status once qualified (Fast track permits; Environmental Leaders programs) or other expedited permitting programs; Government preferred purchasing or government sponsored preferences; Government specified product standards; Use of consensus standards; Use of third party standards and certification; Product labeling programs; Web based consumer information		X		X				

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4-99	Construct incentives that: Foster innovation in the private sector and academia; Create markets; Facilitate increasing demand for the desired products and solutions; Periodically are reviewed to assess the ongoing need of the incentives change; Are as comprehensive and equitable as possible; Provide transparent and user friendly information to consumers		X			X			
4-100	In developing and implementing the use of life-cycle analysis be sure to: Understand that data reliability and quality will vary greatly and acknowledge this transparently; Clearly articulate the scale (e.g. global, local); Understand that uncertainty is everywhere – an LCA will be refined as more and better quality data is available; Understand that comparisons between life-cycle studies are difficult due to differing up front assumptions; Understand that no single, globally accepted method exists for LCA work; Consider guidelines developed by the Society of Environmental Toxicology and Chemistry (SETAC) for conducting LCAs by both governmental and private agencies	X							
4-101	In developing and implementing "eco-labeling" ensure that: The analysis of the product be credible and based on scientific study; The products meet agreed upon criteria and the eco-labels are not reliant on unsubstantiated claims by the producer; An independent third party audits the eco-label.			X		X			
4-102	Amend TSCA to correct the deficiencies that impede the timely and effective regulation of toxic chemicals.			X					
4-103	Assess opportunities to enhance the level of cooperation and coordination between Cal/EPA and U.S. EPA, and with international agencies.			X					
4-104	Promote private business sector sponsorship of training/education programs at all levels (including elementary, high school and university). Conflict of interest concerns could be avoided by using an independent third party to manage the funding.		X			X			

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4-105	When considering toxics in products, examine the entire environmental sustainability of the products, including health and environmental effects, transportation, use, disposal, efficacy, and potential benefits of use.			X					
4-106	Focus initial regulatory efforts on the 500 high priority substances identified in Canada's program; require producers of these priority chemicals to provide hazard and exposure information Chemicals of high concern should be allowed for targeted, low-exposure uses as determined in an open process. Include a means for adding and deleting priority chemicals based on unique California circumstances.			X					
4-107	Use the recently assembled U.S. Inventory Update Rule report to provide initial volume, use, and exposure information. Identify uses and user industries for the high priority chemicals that raise the greatest concern. Expect producers of priority chemicals and manufacturers with high concern uses to provide hazard and exposure information on those chemicals/uses to the program.	X							
4-108	Provide Cal/EPA with the statutory authority to establish restrictions on uses of priority chemicals.			X					
4-109	Facilitate informed substitution in moving to alternatives for restricted uses of priority chemicals. Although "toxics use reduction" is an admirable goal, failure to adequately assess the multimedia and lifecycle implications of forcing a shift to alternatives can result in significant unintended consequences.					X			

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4-110	California should expect and encourage manufacturers of consumer and commercial products sold in California to employ comprehensive product safety management systems that include: - Assessments to ensure the safety of products prior to marketing; - Rigorous control of production from raw material specifications, to formulation management, to process and quality control; - Safe operations that protect the health and environment of employees and the surrounding community; - Compliance with all applicable product safety, labeling and regulatory requirements including transportation, waste management and product disposal; - Constant vigilance in post market surveillance with rapid response to identified concerns; - Innovation that improves product performance, value and environmental quality based on life-cycle considerations; - Transparency in communicating information about safety management systems and products; and, - Ongoing evaluation and improvement of systems performance.			X					
4-111	Encourage or require manufacturers of products to communicate information about the ingredients in products, either on the package or on the Internet. Partner with the information technology sector (e.g., Internet search firms) to expand access to chemical information, support its local industry and raise awareness of chemical safety information currently available.		X	X					

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4-112	Develop an extension service through the UC system to promote successful green chemistry methods/processes.					X		X	
4-113	Avoid programs that require pre-market approval of chemicals or consumer products (i.e., modeled on programs used for pesticides and drugs) because these would be far too expensive.			X					
4-114	Engage the various segments of the supply chain to develop a workable system that provides consumers with the identification of the ingredients in products.								
4-115	Make the information that has been submitted to U.S. EPA under the HPV Chemical Testing Program publicly available.								
4-116	Promote consumer education and responsibility. For example, how consumers collectively handle chemical products has an enormous effect (for example, nail polish remover can be easily poured down a household sink which would not be allowed in the workplace). Further, consumers should read and follow label directions.					X			
4-117	Make raw materials hazard information available all along the manufacturing/supply chain.								
4-118	Make more information available though approaches such as adopting the ANSI standard for a 16 section MSDS (described by ANSI Standard Z400.1-2004). Other options, such as an MSDS addendum, should also be pursued.							X	
4-119	Establish a Green Chemistry Coordination Council to collect and promote the sharing of information and successful programs and to provide assistance to businesses lacking resources.							X	

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4-120	Catalog, and make easily available, information regarding best practice screening processes, green chemical design, collaborative efforts, international efforts, and examples of product development decisions and substitutions that have resulted in reduced waste produced and energy inputs.	X							
4-121	Cal/EPA should establish clear and consistent protocols for screening and testing of chemicals.								
4-122	Continue and enhance the current California Pollution Prevention program, while the various green chemistry initiatives are being implemented								
4-123	Green chemistry performance indicators and metrics should be developed and adopted with a commitment to transparency and proactive responses to new information. This would provide a method for evaluating the success of green chemistry measures and whether changes are needed.			X					
4-124	Make use of the Education and the Environment Initiative to incorporate green chemistry concepts into education.					X			
4-125	An indemnity or hold harmless provision should be established to enable responsible parties to test and recover products without the threat of punitive regulatory action.			X					
4-126	Reconsider the proposed bedding standard (TB 604), which may result in a large increase in the use of toxic flame retardants, in light of green chemistry principles. Evaluate the public health and environmental impacts of the increased use of toxic flame retardants.			X					
4-127	Ban the sale and use of certain products (e.g., toilet additives) that contain formaldehyde or other similar biocides and require the use of safer substitutes (e.g., bacterial or enzyme based additives).			X					

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4-128	Develop a technical center of excellence in green chemistry to provide technical assistance, lead development of a green chemistry curriculum for undergraduate and graduate programs and conduct state-of-the-art research on green chemistry innovations.					X	X	X	
4-129	Consider the Globally Harmonized System of Classification and Labeling of Chemicals (GHS) developed by the United Nations as a model for programs to ensure the safe use, transport and disposal of chemicals internationally.								
4-130	Banning should be avoided in the absence of safer alternatives, which should be technically feasible, improve health/safety/environmental profile, be of comparable or superior performance, cost-effective, and be capable of persistence. If safer alternatives are not available, resources should be devoted to R&D or incentives should be provided to develop cost-effective alternatives.			X			X	X	
4-131	Novel R&D chemicals, used in relatively tiny amounts in highly controlled settings, be excluded from any consideration of a restriction or mandate. Exemptions should also be allowed for select pilot demonstrations and testing.			X					
4-132	Based on the model collaboration between industry, state government, and a third party expert in identifying solvent substitutes under SB 14, take the following approach: 1) consider chemicals of top priority concern, 2) identify the specific applications or industry uses posing the greatest risk from those chemicals, and 3) apply a collaborative process of agency, industry and third-party experts to identify or develop viable alternatives that can maintain efficacy, but reduce risk in those targeted applications.			X	X				

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		Data Collection and Use (Information)	Economic Incentives	Statutory and Regulatory Requirements, Enforcement	Voluntary Measures	Education and Outreach	Research and Technology	Technical Assistance	Recognition, Awards, and Certification
4-133	Risk should be at the forefront of any deliberations on toxic chemicals and possible substitutes. The risk of any chemical, whether regarded as "green" or not, depends on the dose received from various types of exposures, deliberate or accidental. Non-toxic chemicals can be harmful at high doses (recall the Sacramento radio show contestant who died from water intoxication), and many highly toxic chemicals (pharmaceuticals for example) are extremely beneficial at low doses.								
4-134	If a significant risk is identified, consider a wide range of acceptable risk management options, including improving personal protective equipment and enhancing process technology controls to elimination of specific substances in favor of alternatives.			X					
4-135	Prioritize the evaluation and mitigation of toxic hazards in products that are widely used and already have known safer substitutes, such as commercial cleaning products.			X	X				
4-136	California should participate in the effort launched in August during the Security and Prosperity Partnership (SPP) with under the Montebello Agreement involving trilateral cooperation among the governments of Canada, the United States and Mexico to share chemical information and safety assessments.			X	X				
4-137	In implementing the green chemistry initiative, California should: look at the chemical information that is already available; make it clear that the Green Chemistry Initiative process will be governed by a risk-based science approach; support an understanding of both the benefits and the burdens of new regulatory proposals; consider process technology as part of a green chemistry program.			X					

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4-138	California should support work to better understand what is happening at low dose and thereby more reasonable setting of quantitative risk guidelines to which products can be designed. Current assumptions of multi-stage linear extrapolation from high dose toxicological testing may be causing undue concern and mis-direction of public health resources.								
4-139	In pursuing the objective of the Green Chemistry Initiative to expand toxicology information on chemicals, California should encourage the use of alternatives to animal testing and require testing only as a last resort. Cal/EPA and the UC university system could work with other experts to provide assistance on alternative screening methodologies that can be utilized to provide adequate toxicology information for recommendations and decisions about priority chemical uses			X					
4-140	Acknowledge that plastic is "downcyclable" not "recyclable." Plastic needs to be looked at with a cradle-to-cradle perspective, which requires a close look at what is happening overseas. California needs to develop closed-loop safe and just ways of handling our waste. The current model of exporting plastic to countries such as China needs to be stopped if California is serious about its Green Chemistry Initiative.			X					
4-141	Create a database on alternatives that compares a number of sustainability parameters: performance, price, human health and environmental (e.g., toxicity, bioaccumulation, persistence) including carbon footprint and source sustainability.	X		X				X	
4-142	In addressing toxics in products by accident, identify a few key product areas, and work with the affected industry sectors to either promote existing standards (and many such standards already exist) or develop new ones.			X					

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4-143	The chemical identity of an impurity is key in eliminating it. California should fund and improve research in new analytical methods for detection and quantification. Support for key process-related research could yield important new means to reduce the presence of unwanted toxics due to synthesis.				X		X		
4-144	In assessing toxics in products, cumulative risks associated with multiple exposures (through using or being in proximity to multiple products) should be considered.			X					

Conversation with California Forum and Journal Index to Comments

This document is an index of all comments submitted to the Conversation with California Journal (June 2007 through August 2007) and Forum (September 2007 through November 2007). Each comment was submitted in one of the four challenge areas below. From these comments, the Emerging Options Document was compiled which served as a basis for the development of the Green Chemistry Phase 1 Option Report. The intent of this document is to cross reference applicable journal and forum comments to the Report.

These options are organized into four groups known as challenge areas:

(1) Cradle to Cradle: Moving Towards a Cradle to Cradle Framework
(2) Green Chemistry: Stimulating Green Chemistry
(3) Toxics by Design: Identifying Toxics in Products by Design
(4) Toxics by Accident: Identifying Toxics in Products by Accident

Each option presented in this Record falls into one or more of the categories defined below:

Category		Types of Options Included (Definition)
Data Collection and Use (Information)	**D**	Identify and address information gaps; obtain and use better data. Establish mechanisms to expand and share information (about chemicals, toxicity, hazards, risks, life-cycle assessments, etc.). Develop a "chemical map of
Economic Incentives and Markets	**I**	Use market forces (incentives and disincentives). Encourage corporate responsibility and accountability. Establish funding mechanisms.
Statutory and Regulatory Requirements, Enforcement	**S**	Establish and harmonize laws and regulatory requirements; require disclosure, reporting, testing, or standards; prohibit uses or ban harmful chemicals; use or expand compliance and enforcement (regulatory system). More specifically, assess risks or hazards via a pre-market evaluation; consider life-cycle of a product; establish metrics to determine effectiveness of risk or hazard reduction strategies. Reduce or restrict use through reduction measures, standards, process or engineering changes, and product stewardship.
Voluntary Measures	**V**	Develop chemical data, reduce use, and find safer substitutes through voluntary measures. Encourage public-private partnerships. Identify and use non-regulatory models to stimulate green chemistry.
Education and Outreach	**E**	Increase public awareness. Enhance curriculum and academia programs. Provide clear and meaningful information to consumers. Foster training and workforce development in green chemistry.
Research and Technology	**R**	Conduct research on chemicals (risks and hazards), analytical methods, chemical designs and processes, and safer alternatives. Support increased research and development of green chemistry technologies establish laboratories and technical centers.
Technical Assistance	**T**	Provide technical assistance to businesses. Establish networks (between government, industry, academia, and the public) to promote green chemistry tools. Publish guidelines and methodologies.
Recognition, Awards, and Certification	**A**	Establish certification programs (for products, processes, and businesses). Recognize and award worthy achievements. Encourage innovation and change through preferred purchasing.

CRADLE TO CRADLE

Number	Name	Organization/Company	Date Posted	Topic	Category(ies)							
F-C2C-1	Catherine T. (Katie) Hunt, President		19-Nov-07	American Chemical Society Response		**I**	**S**					
F-C2C-2	Archie J. Beaton	Chlorine Free Products Assn.	19-Nov-07	Based Tools to Certify "Green" Cleaning	**D**		**S**					
F-C2C-3	Alastair Iles	Alastair Iles, UC Berkeley	16-Nov-07	Biomass chemistry						**R**		
F-C2C-4	Trudy Fisher		16-Nov-07	Comments - California Green Chemistry Initiative								
F-C2C-5	Leslie Tamminen		16-Nov-07	Education and the Environment Initiative			**S**		**E**			
F-C2C-6	RV Parks and Campgrounds		16-Nov-07	CalARVC's Comments			**S**					
F-C2C-7	Johnson & Johnson		16-Nov-07	Johnson & Johnson - Additional Comments		**I**	**S**	**V**	**E**	**R**		
F-C2C-8	Frank Teng		16-Nov-07	by Silicon Valley Leadership Group	**D**	**I**		**V**	**E**	**R**	**T**	**A**
F-C2C-9	Western States Petroleum Association		16-Nov-07	the California Green Chemistry Initiative								
F-C2C-10	Walter M. McClelland		16-Nov-07	Concerned About Safety of Products			**S**					
F-C2C-11	Diane Brodd		16-Nov-07	Chemistry Initiative - Comments			**S**					
F-C2C-12	Linda Blackwell		16-Nov-07	California Green Chemistry Initiative			**S**					
F-C2C-13	Andrew Hackman		16-Nov-07	Comments on the California Green	**D**	**I**	**S**	**V**	**E**	**R**		**A**
F-C2C-14	Mike Walls		16-Nov-07	the “Conversation with California”	**D**	**I**	**S**	**V**	**E**	**R**	**T**	**A**

CRADLE TO CRADLE

Number	Name	Organization/Company	Date Posted	Topic	Category(ies)							
F-C2C-15	Mike Walls		16-Nov-07	Actions Related to California Green	**D**	**I**	**S**		**E**	**R**		
F-C2C-16	Veronique Steukers		16-Nov-07	Feedback from Albemarle Europe	**D**							
F-C2C-17	Paul Noe		16-Nov-07	Industries on California Green Chemistry Initiative								
F-C2C-18	Lorraine Larsen-Hallock		16-Nov-07	tools to implement the Green Chemistry Initiative	**D**						**T**	
F-C2C-19	Fareed Ferhut		16-Nov-07	Extended Producer Responsibility								
F-C2C-20	Ray Dawson		16-Nov-07	Feedback from Albemarle Corporation				**V**				**A**
F-C2C-21	Paul No		16-Nov-07	Framework for Green Chemisty	**D**	**I**	**S**	**V**	**E**	**R**	**T**	**A**
F-C2C-22	J. Reed		16-Nov-07	the Green Chemistry Symposium III			**S**	**V**		**R**		**A**
F-C2C-23	Bayer MaterialScience LLC		15-Nov-07	Comments on California Green Chemistry Initiative	**D**	**I**	**S**	**V**		**R**		
F-C2C-24	Philip G. Lewis, M.D., M.P.H.		15-Nov-07	Comments from Rohm and Haas Company								
F-C2C-25	Pat Hayes		15-Nov-07	for Advancing California's Green Chemistry Initiative	**D**	**I**	**S**		**E**	**R**		**A**
F-C2C-26	Andy Peri		15-Nov-07	Green Chemistry Initiative Public Comments								
F-C2C-27	Paul DeLeo	The Soap and Detergent Association	15-Nov-07	Beyond: Sustainability, Safety and Continual	**D**	**I**	**S**		**E**	**R**	**T**	**A**
F-C2C-28	Ray Paulson, P.E.	Fleet Readiness Center Southwest North Island	14-Nov-07	Feedback - California Green Chemistry Initiative	**D**		**S**		**E**			

CRADLE TO CRADLE

Number	Name	Organization/Company	Date Posted	Topic	Category(ies)							
F-C2C-29	George R. Thompson, Ph.D., President, CCS		14-Nov-07	Green Chemistry Initiative Workable	**D**		**S**	**V**			**T**	
F-C2C-30	George Kopcsak		14-Nov-07	Measuring the Greeness of Products	**D**		**S**					
F-C2C-31	Dow Chemical Company		13-Nov-07	Comments on Chemical Management Systems	**D**		**S**	**V**				
F-C2C-32	Environmental Forum (BSEF)		13-Nov-07	BSEF's Chemical Policy Recommendations			**S**	**V**				
F-C2C-33	Kevin Lyons		12-Nov-07	Assessment of “Green” Chemicals, Products and	**D**		**S**	**V**				**A**
F-C2C-34	Dow Chemical Company		9-Nov-07	Comments on Educational Programs								
F-C2C-35	Andrew Hackman	Consumer Specialty Products Assoc	6-Nov-07	Framework for Green Chemistry					**E**			
F-C2C-36	Mike Walls	American Chemistry Council	3-Nov-07	Stimulating Green Chemistry	**D**	**I**			**E**	**R**	**T**	**A**
F-C2C-37	California Medical Association		2-Nov-07	A Modern Chemicals Policy For California								
F-C2C-38	Karen Oxenbøll		2-Nov-07	Novozymes Green Chemistry Thoughts	**D**							
F-C2C-39	jesse goldstien		3-Nov-07	conversion via enzymatic oxidation								
F-C2C-40	Sue Tracy		5-Nov-07	Options for Cradle to Cradle, Today		**I**				**R**		
F-C2C-41	Kimberly Schulz	Enviro. Health & Resource Center	1-Nov-07	Check out This Tool that Will Work!!!	**D**		**S**					
F-C2C-42	DTSC Regional Office Berkeley		5-Oct-07	Behalf of DTSC Regional Office Berkeley		**I**	**S**		**E**	**R**		**A**

CRADLE TO CRADLE

Number	Name	Organization/Company	Date Posted	Topic	Category(ies)							
F-C2C-43	John M. Batt	Airgas, Inc.	30-Oct-07	Innovation and Environmentally Friendly								
F-C2C-44	Mike Walls	American Chemistry Council	29-Oct-07	Thoughts About Substitution			**S**	**V**	**E**			
F-C2C-45	CHANGE		29-Oct-07	CHANGE's Perspective on a Successful Program	**D**	**I**	**S**	**V**	**E**	**R**	**T**	**A**
F-C2C-46	Dow Chemical Company		29-Oct-07	Dow Chemical's Green Chemistry Thoughts	**D**	**I**			**E**	**R**		
F-C2C-47	Richard Denison	Environmental Defense	25-Oct-07	Chemistry Council's comments	**D**			**V**	**E**			
F-C2C-48	Richard Denison	Environmental Defense	25-Oct-07	California can do to start advancing chemicals	**D**		**S**		**E**	**R**		
F-C2C-49	Richard Denison	Environmental Defense	25-Oct-07	Approaches to Chemical Prioritization	**D**							
F-C2C-50	Glenn Johnston		24-Oct-07	Director Regulatory Affairs								
F-C2C-51	jesse goldstien		24-Oct-07	super cool...i'd like that for my product								
F-C2C-52	Cayce Warf		22-Oct-07	Director, Environmental Sustainability Programs			**S**					
F-C2C-53	Mike Walls	American Chemistry Council	19-Oct-07	the One Approach that Makes Sense	**D**		**S**					
F-C2C-54	Wayne Brooks		25-Oct-07	working as a Chemical Enginner		**I**						
F-C2C-55	J. C. King		19-Oct-07	of "Green" Munitions and Chemicals of Concern	**D**		**S**					
F-C2C-56	Mike Walls	American Chemistry Council	15-Oct-07	Addressing the Data Gaps	**D**							

CRADLE TO CRADLE

Number	Name	Organization/Company	Date Posted	Topic	Category(ies)							
F-C2C-57	Georjean Adams		5-Oct-07	Green California		**I**	**S**		**E**	**R**		
F-C2C-58	Tyrone D. Nordquist		4-Oct-07	"Green" Munitions Analyses	**D**		**S**					
F-C2C-59	Mike Walls	American Chemistry Council	3-Oct-07	Green Chemistry & Product Stewardship		**I**		**V**				
F-C2C-60	Victor M. Chan		1-Oct-07	Very little retail packaging								
F-C2C-61	J. Reed		28-Sep-07	Expanding Manufacturer's Recycling Alternatives			**S**					
F-C2C-62	Mike Walls	American Chemistry Council	28-Sep-07	California's Green Chemistry Initiative	**D**		**S**	**V**				**A**
F-C2C-63	Raymond Paulson		27-Sep-07	Ranking and Report for All Chemicals	**D**		**S**					
F-C2C-64	Dr. Katy Wolf		2-Oct-07	Legislative Changes		**I**			**E**	**R**		
F-C2C-65	Bart Broome		25-Sep-07	Endocrine Disruption Must Be Evaluated								
F-C2C-66	Bart Broome		21-Sep-07	based prudent responses to hazards			**S**					
F-C2C-67	Terry Collins		21-Sep-07	Lord Professo of Chemistry			**S**			**R**		
F-C2C-68	Gabriele Windgasse		20-Sep-07	Similar approach as emission trading?				**V**				
F-C2C-69	Dr. nagaraj		17-Sep-07	Papros Inc.								

Green Chemistry

Number	Name	Organization/Company	Date Posted	Topic	Category(ies)							
F-GC-1	Catherine T. (Katie) Hunt, President		19-Nov-07	American Chemical Society Response		**I**	**S**			**R**		
F-GC-2	Archie J. Beaton	Chlorine Free Products Assn.	19-Nov-07	Use of Existing Web-Based Tools to Certify "Green" Cleaning Products	**D**		**S**					
F-GC-3	Nora Songcayauon - ED	Asian Service Organization	16-Nov-07	Green Chemsitry & Low Income Community			**S**					
F-GC-4	Andrew Ysiano		16-Nov-07	AB 706 & Green Chemistry			**S**					
F-GC-5	Brad Miller	BIFMA International	16-Nov-07	Green Chemistry in Office Furniture Products								
F-GC-6	Arlene Blum		16-Nov-07	California Bed Clothing Flammability Standard and Green Chemistry			**S**					
F-GC-7	Justin Augustine		16-Nov-07	Center for Biological Diversity Comments		**I**	**S**		**E**	**R**		
F-GC-8	Trudy Fisher			Comments - California Green Chemistry Initiative								
F-GC-9	Leslie Tamminen	Legislative Director/EEI Director Heal the Bay		Education and the Environment Initiative		**I**	**S**		**E**			
F-GC-10	Arthur H. Purcell, PhD			The Green Chemistry Matrix								
F-GC-11	California Association of RV Parks and Campgrounds			CalARVC's Comments			**S**					
F-GC-12	Johnson & Johnson			Johnson & Johnson - Additional Comments		**I**	**S**	**V**	**E**	**R**		
F-GC-13	Clif McFarland			Policy Options		**I**	**S**			**R**		
F-GC-14	Frank Teng			Policy Elements proposed by the Silicon Valley Leadership Group	**D**	**I**		**V**	**E**			
F-GC-15	Alastair Iles	UC Berkeley		An integrated green chemistry program		**I**	**S**		**E**	**R**		
F-GC-16	Mark Rohr	Albemarle Corporation		An Opportunity for Enhance Educational Partnerships		**I**		**V**	**E**	**R**		
F-GC-17	Western States Petroleum Association			WSPA's Comments on the California Green Chemistry Initiative								
F-GC-18	Walter M. McClelland			Concerned About Safety of Products			**S**					
F-GC-19	Diane Brodd			California Green Chemistry Initiative - Comments			**S**					
F-GC-20	Linda Blackwell			Comments on the California Green Chemistry Initiative		**I**	**S**					
F-GC-21	Andrew R Hackman	Manager, State Affairs Programs		CSPA Summary Comments on the California Green Chemistry Initiative	**D**	**I**	**S**		**E**	**R**		

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Number	Name	Organization/Company	Date Posted	Topic	Category(ies)							
F-GC-22	Amber Wise	Amber Wise, PhD student, UC Berkeley Chem Dept	16-Nov-07	Through Innovation, Education and Communication,we can improve our health and safety	D	I	S		E			
F-GC-23	Mike Walls		16-Nov-07	ACC Final Comments to the "Conversation with California"	D	I	S	V	E	R		
F-GC-24	Mike Walls		16-Nov-07	ACC Proposals for Future Actions Related to California Green Chemistry Initiative	D	I	S		E	R		
F-GC-25	David W. Owens	Director of Polymer Additives R&D Albemarle Corporation Baton Rouge, LA.	16-Nov-07	Sustainable Flame Retardant Design- Albemarle Corporation								
F-GC-26	Bromine Science and Environmental Forum		16-Nov-07	Some Principles for Consideration	D	I						
F-GC-27	Veronique Steukers		16-Nov-07	Feedback from Albemarle Europe					E			
F-GC-28	Paul Noe		16-Nov-07	Perspective of Affected Industries on California Green Chemistry Initiative								
F-GC-29	Lorraine Larsen-Hallock		16-Nov-07	Use of existing data and tools to implement the Green Chemistry Initiative	D	I	S		E			
F-GC-30	Ray Dawson		16-Nov-07	Comments from Albemarle Corporation	D	I		V				
F-GC-31	Amy D. Kyle, PhD MPH		16-Nov-07	Science base for moving to low hazard chemicals	D							
F-GC-32	Paul Noe		16-Nov-07	GMA's Perspective on a Framework for Green Chemistry	D	I	S	V	E	R	T	A
F-GC-33	Greg	Los Angeles, CA	16-Nov-07	Taking A Step Back								
F-GC-34	Len Sweet, PhD, MPH, MSc	Senior Health Scientist ChemRisk, Inc.	16-Nov-07	Senior Health Scientist, ChemRisk Inc.	D		S					
F-GC-35	Brenda K. Veronda	Manager, Corporate Communications Carus Corporation	16-Nov-07	Manager, Corporate Communications		I		V	E			A
F-GC-36	Jason Grev		16-Nov-07	Ecolab, Inc. Comments Regarding California's Green Chemistry Initiative	D	I	S				T	A
F-GC-37	ExxonMobil Chemical		15-Nov-07	ExxonMobil Chemical's Thoughts on California's Green Chemistry Initiative	D							
F-GC-38	Dr. Katy Wolf		15-Nov-07	First Steps in Green Chemistry					E			

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Number	Name	Organization/Company	Date Posted	Topic	Category(ies)							
F-GC-39	Martin Mulvihill	5th Year Graduate Student John Arnold and Peidong Yang Labs Department of Chemistry UC Berkeley	15-Nov-07	Educating the Chemists of Tomorrow: The Current State of Green Chemistry in Academia (POSTED 3X)		I		V	E	R		
F-GC-40	Bayer MaterialScience		15-Nov-07	Bayer MaterialScience's Comments on California Green Chemistry Initiative	D	I	S	V	E	R	T	A
F-GC-41	Philip G. Lewis, M.D., M.P.H.		15-Nov-07	Comments on Green Chemistry from Rohm and Haas Company		I	S			R		
F-GC-42	Philip G. Lewis, M.D., M.P.H.		15-Nov-07	Comments from Rohm and Haas Company		I	S			R		
F-GC-43	Andy Peri	Green Sangha	15-Nov-07	Green Chemistry Initiative Public Comments								
F-GC-44	Ahmad Khalifeh	Managing Director Albemarle Middle East & General Manager of Jordan Bromine Comapny, both affilaites of Albemarle Corporation.	15-Nov-07	Harmonization of Regulations			S		E			
F-GC-45	Thomas R. Jacob, DuPont		15-Nov-07	WHY ARE WE DOING THIS?			S		E			
F-GC-46	Edward Woodhouse		15-Nov-07	Professor of Political Science, Rensselaer Polytechnic Institute		I						
F-GC-47	Paul DeLeo	The Soap and Detergent Association	15-Nov-07	Green Chemistry and Beyond: Sustainability, Safety and Continual Improvement	D		S	V		R		A
F-GC-48	Dr. Yaseen Khayyat		15-Nov-07	Director General of the Jordan Instituation for Standards and Metrology			S					
F-GC-49	Amanda Hawes		15-Nov-07	Green Chemistry Should Incorporate an Alternatives Assessment Decision-Making Process								
F-GC-50	Dale Karen Silverman, CAE< SPHR		14-Nov-07	AWFS Comments on the Green Chemistry Initiative			S					
F-GC-51	Ray Paulson, P.E	Fleet Readiness Center Southwest North Island	14-Nov-07	Feedback - California Green Chemistry Initiative	D							
F-GC-52	Bob Lucas	CCEEB	14-Nov-07	The Green Chemistry Initiative Should Consider All Existing Programs That Regulate Toxicity, Risk Management and Reporting								
F-GC-53	George R. Thompson, Ph.D.	President, CCS	14-Nov-07	Making the California Green Chemistry Initiative Workable	D		S	V			T	
F-GC-54	George Kopcsak		14-Nov-07	Measuring the Greeness of Products	D		S					

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Number	Name	Organization/Company	Date Posted	Topic	Category(ies)							
F-GC-55	Dow Chemical Company		13-Nov-07	Dow Chemical's Comments on Chemical Management Systems	D		S	V				
F-GC-56	Bromine Science and Environmental Forum (BSEF)		13-Nov-07	BSEF's Chemical Policy Recommendations			S	V				
F-GC-57	Ufuk Senturk, PhD	Research and Development Manager	13-Nov-07	HIGHWAY MARKING PRODUCTS FROM CHINA: TOXICS IN PRODUCTS BY DESIGN								
F-GC-58	jesse goldstien		13-Nov-07	"near slavery"								
F-GC-59	JIP		12-Nov-07	Green chemistry is not regulation		I			E	R		
F-GC-60	Kevin Lyons, Ph.D.		12-Nov-07	Automated, Web-Based Assessment of “Green” Chemicals, Products and Processes for Procurement	D		S					A
F-GC-61	Davis Baltz	Commonweal	12-Nov-07	Public Participation in GCI Science Advisory Panel meetings								
F-GC-62	Dow Chemical Company		9-Nov-07	Dow Chemical's Comments on Educational Programs					E			
F-GC-63	Andrew Hackman	Consumer Specialty Products Assoc.	6-Nov-07	Thoughts on a Framework for Green Chemistry	D	I	S	V	E	R		A
F-GC-64	Mike Walls	American Chemistry Council	3-Nov-07	Stimulating Green Chemistry	D	I			E	R	T	A
F-GC-65	California Medical Association		2-Nov-07	A Modern Chemicals Policy For California			S					
F-GC-66	Kimberly Schulz	Enviro. Health & Resource Center	1-Nov-07	Check out This Tool that Will Work!!!	D		S					
F-GC-67	John M. Batt	Airgas, Inc.	30-Oct-07	Product Stewardship Innovation and Environmentally Friendly Technologies								
F-GC-68	Mike Walls	American Chemistry Council	29-Oct-07	Thoughts About Substitution			S	V	E			
F-GC-69	jesse goldstien		29-Oct-07	mike i actually agree with you on this one..								
F-GC-70	jesse goldstien		29-Oct-07	oh' and furthermore								
F-GC-71	CHANGE		29-Oct-07	CHANGE's Perspective on a Successful Program	D	I	S	V	E	R	T	A
F-GC-72	Dow Chemical Company		29-Oct-07	Dow Chemical's Green Chemistry Thoughts	D	I			E			A
F-GC-73	Leslie M. Millholin III		26-Oct-07	Time may not be on our side.. Green Chemestry Idea..								
F-GC-74	Mike Walls	American Chemistry Council	26-Oct-07	Chemistry is Essential To California								A
F-GC-75	jesse goldstien		27-Oct-07	American Chemistry Council President								
F-GC-76	jesse goldstien		28-Oct-07	The American Chemistry Council								
F-GC-77	Richard Denison	Environmental Defense	25-Oct-07	Some ideas for what California can do to start advancing chemicals policy	D							
F-GC-78	Richard Denison	Environmental Defense	25-Oct-07	Limitations to Risk-Driven Approaches to Chemical Prioritization								

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Number	Name	Organization/Company	Date Posted	Topic	Category(ies)							
F-GC-79	Ted Nickerson		25-Oct-07	I do not understand the message of this post.	D		S					
F-GC-80	Cayce Warf		22-Oct-07	Director, Environmental Sustainability Programs								
F-GC-81	jesse goldstien		22-Oct-07	lots of post's NO DIALOUGE								
F-GC-82	Joseph H. Guth, Ph.D., J.D.	Legal Director Science & Environmental Health Network	21-Oct-07	The Chemicals Market Cannot Generate Green Chemicals Unless the Data Gap is Closed	D	I	S	V		R		A
F-GC-83	jesse goldstien		22-Oct-07	the shift in the tide will occur when this happens.....								
F-GC-84	Mike Walls	American Chemistry Council	19-Oct-07	Risk-Based Evaluation – the One Approach that Makes Sense	D		S					
F-GC-85	Thomas W. Oakes		19-Oct-07	Green Clean Renewable Energy Generated On-Site								
F-GC-86	Risk Assessment Methodologies (RAM) Technical Committee		19-Oct-07	Risk Assessment Methodologies (RAM) Technical Committee	D							
F-GC-87	J. C. King		19-Oct-07	Quantitative Assessments of “Green” Munitions and Chemicals of Concern	D		S					
F-GC-88	Barbara	OEHHA	16-Oct-07	Consider Eco endpoints in green chemistry initiative	D							
F-GC-89	jesse goldstien		22-Oct-07	not good enough for me...								
F-GC-90	Bill Tomlinson & Joel Ross		11-Oct-07	Environmental Impact Database for Point-of-Purchase Access				V	E		T	A
F-GC-91	Linda Gianelli Pratt		11-Oct-07	How is this different from Design for the Environment?						R		A
F-GC-92	stan		26-Oct-07	Is this an evolution or renaming of a concept?						R		A
F-GC-93	Andria Ventura	Clean Water Action	9-Oct-07	Program Manager					E			
F-GC-94	Mike Walls	American Chemistry Council	3-Oct-07	Green Chemistry & Product Stewardship								
F-GC-95	Phillip Lo		1-Oct-07	Biomonitoring should be a part of the green chemistry policy		I				R	T	
F-GC-96	Tyrone D. Nordqui		28-Sep-07	Quantitative Web-based "Green" Munitions Analyses	D		S					
F-GC-97	Mike Walls	American Chemistry Council	28-Sep-07	ACC's Perspectives on California's Green Chemistry Initiative	D		S	V				A
F-GC-98	Raymond Paulson		27-Sep-07	Quantitative Green Ranking for All Chemicals	D		S					
F-GC-99	Michael Lipsett, M.D.		21-Sep-07	Green Chemistry Initiative should not be used to oppose efforts to reduce exposures to toxic chemicals		I	S					
F-GC-100	jesse goldstien		15-Oct-07	amen...								
F-GC-101	Terry Collins		21-Sep-07	Lord Professor of Chemistry		I		V	E	R	T	
F-GC-102	Green Chemistry team for Gary Polakovic		17-Sep-07	Summary of the Green Chemistry panel at the Society of Environmental Journalists National Conference		I	S		E	R	T	

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Number	Name	Organization/Company	Date Posted	Topic	Category(ies)							
F-GC-103	Green Chemistry Technologies Work Group		14-Sep-07	How to Stimulate Green Chemistry: Regulatory/Statutory Requirements								A
F-GC-104	Jennifer Bailey		19-Sep-07	Green Buildings/LEED Certification								A
F-GC-105	Dr. Katy Wolf		2-Oct-07	Legislative Changes		I	S		E	R	T	
F-GC-106	Green Chemistry Technologies Work Group		14-Sep-07	How to Stimulate Green Chemistry: Technical Assistance/Information Dissemination							T	
F-GC-107	Green Chemistry Technologies Work Group		14-Sep-07	How to Stimulate Green Chemistry: Awards/Recognition								A
F-GC-108	Jennifer Bailey		20-Sep-07	environental achievements								A
F-GC-109	Green Chemistry Technologies Work Group		14-Sep-07	How to Stimulate Green Chemistry: Green Chemistry Education					E			
F-GC-110	Green Chemistry Technologies Work Group		14-Sep-07	How to Stimulate Green Chemistry: Consumer Choice/Market Forces								A
F-GC-111	Karen Peabody O'Brien	Advancing Green Chemistry	17-Sep-07	Green Purchasing								A
F-GC-112	Jennifer Bailey		20-Sep-07	LEED Green Building Certification								A
F-GC-113	Nick Sleeth		17-Oct-07	"lead by example"			S		E			
F-GC-114	Green Chemistry Technologies Work Group		14-Sep-07	How to Stimulate Green Chemistry: Economic Incentives		I						
F-GC-115	Green Chemistry Technologies Work Group		14-Sep-07	How to Stimulate Green Chemistry: Research	D		S			R	T	
F-GC-116	jesse goldstien		15-Oct-07	"Are there specific areas of research that should be pursued by the State?"	D						T	
F-GC-117	Green Chemistry Technologies Work Group		14-Sep-07	How to Stimulate Green Chemistry: Existing Models								A
F-GC-118	Jennifer Bailey, CIH		13-Sep-07	Green logo on product packaging to identify green products					E	R		A
F-GC-119	Gabriele Windgasse		20-Sep-07	"the Blue Angel								A

Toxic By Design

Number	Name	Organization/Company	Date Posted	Topic	Category(ies)							
F-TD-1	Catherine T. (Katie) Hunt, President		19-Nov-07	American Chemical Society Response		I	S					
F-TD-2	Archie J. Beaton	Chlorine Free Products Assn.	19-Nov-07	Use of Existing Web-Based Tools to Certify "Green" Cleaning Products	D		S					
F-TD-3	Carl		19-Nov-07	Animal Testing Is Unnecessary and Cruel	D	I						
F-TD-4	Gretchen Lee		16-Nov-07	Fundamental change means managing chemicals, not managing risks	D	I						
F-TD-5	Vicky Tuorto		16-Nov-07	Protection of the environment	D							
F-TD-6	Clif McFarland		16-Nov-07	Ideas for a review panel			S					
F-TD-7	Justin Augustine		16-Nov-07	Center for Biological Diversity Comments			S					
F-TD-8	Leslie Tamminen		16-Nov-07	Education and Environment Initiative			S		E			
F-TD-9	Trudy Fisher		16-Nov-07	Comments - California Green Chemistry Initiative								
F-TD-10	Alastair Iles	UC Berkeley	16-Nov-07	Basic knowledge generation	D	I	S	V				
F-TD-11	California Association of RV Parks and Campgrounds		16-Nov-07	CalARVC's Comments			S					
F-TD-12	Johnson & Johnson		16-Nov-07	Johnson & Johnson - Additional Comments		I	S	V	E	R		
F-TD-13	Frank Teng		16-Nov-07	Policy Elements proposed by the Silicon Valley Leadership Group	D	I	S	V	E	R	T	A
F-TD-14	Western States Petroleum Association		16-Nov-07	WSPA's Comments on the California Green Chemistry Initiative								
F-TD-15	Walter M. McClelland		16-Nov-07	Concerned About Safety of Products			S					
F-TD-16	Diane Brodd		16-Nov-07	California Green Chemistry Initiative - Comments			S					
F-TD-17	Linda Blackwell		16-Nov-07	Comments on the California Green Chemistry Initiative			S					
F-TD-18	Andrew R Hackman	Manager, State Affairs Programs	16-Nov-07	CSPA Summary Comments on the California Green Chemistry Initiative	D	I	S	V	E	R		A
F-TD-19	Claudia Delman, MPH		16-Nov-07	Promote Green Chemistry	D		S					
F-TD-20	Amber Wise	PhD student, UC Berkeley Chem. Dept	16-Nov-07	Through innovation, education and communication, we can remove toxic substances from our products	D	I	S		E			
F-TD-21	Kristie Stoick and Kathy Guillermo		16-Nov-07	The solution to gaps in toxicity data is an evolution in the field of toxicology	D	I	S			R		
F-TD-22	Jennifer Bale		16-Nov-07	Cal EPA: Need Human-Focused Testing Methods	D							
F-TD-23	Mike Walls		16-Nov-07	High Production Volume (HPV) Challenge Program: A Landmark Program Making More Health and Environmental Data Publicly Available Than Ever Before	D			V		R		
F-TD-24	Veronique Steukers		16-Nov-07	Feedback fromAlbemarle Europe					E			
F-TD-25	Paul Noe		16-Nov-07	Perspective of Affected Industries on California Green Chemistry Initative								
F-TD-26	Lorraine Larsen-Hallock		16-Nov-07	Use of existing data and tools to implement the Green Chemistry Initiative	D	I	S	V	E		T	A
F-TD-27	Ray Dawson		16-Nov-07	Feedback from Albemarle Corporation	D	I		V		R		
F-TD-28	Paul Noe		16-Nov-07	GMA's Perspective on a Framework for Green Chemistry	D	I	S	V	E	R	T	A

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Number	Name	Organization/Company	Date Posted	Topic	Category(ies)							
F-TD-29	Susan Killian, M.S. Hom		16-Nov-07	chemicals??	D		S					
F-TD-30	Nora Hull		15-Nov-07	Help the Environment Without Hurting Animals!	D		S					
F-TD-31	Helen Lam		15-Nov-07	Green chemistry without animal testing	D		S					
F-TD-32	Nicole Dupas		15-Nov-07	Stop animal testing!!!	D		S					
F-TD-33	Bayer MaterialScienc		15-Nov-07	Bayer MaterialScience's Comments on California Green Chemistry Initiative	D	I	S	V	E	R	T	A
F-TD-34	Theresa		15-Nov-07	testing	D		S					
F-TD-35	Philip G. Lewis, M.D., M.P.H.		15-Nov-07	Comments from Rohm and Haas Company		I	S			R		
F-TD-36	Pat Hayes		15-Nov-07	P&G's Recommendations for Advancing California's Green Chemistry Initiative	D	I	S		E	R		A
F-TD-37	Andy Peri	Green Sangha	15-Nov-07	Green Chemistry Initiative Public Comments								
F-TD-38	amber		15-Nov-07	being green also includes protecting animals	D		S					
F-TD-39	Paul DeLeo	The Soap and Detergent Association	15-Nov-07	Green Chemistry and Beyond: Sustainability, Safety and Continual Improvement	D	I	S		E	R	T	A
F-TD-40	Amanda Johnson		14-Nov-07	Stop Testing On Animals!	D		S					
F-TD-41	nancy low		15-Nov-07	please end testing of chemicals on animals	D		S					
F-TD-42	Ray Paulson, P.E.	Fleet Readiness Center Southwest North Island	14-Nov-07	Feedback - California Green Chemistry Initiative	D		S		E			
F-TD-43	Andria Ventura	Clean Water Action	14-Nov-07	information is key	D		S					
F-TD-44	George R. Thompson, Ph.D	President, CCS	15-Nov-07	The CCS tools	D			V			T	
F-TD-45	Andria Ventura	Clean Water Action	14-Nov-07	The Green Chemistry Initiative Should Consider Risk Management and Net Benefit	D		S					
F-TD-46	George R. Thompson, Ph.D.	President, CCS		Making the California Green Chemistry Initiative Workable	D		S					
F-TD-47	Janet Girard		14-Nov-07	No animal testing!!	D		S					
F-TD-48	Devri Speaks		14-Nov-07	No Animal testing, please...	D		S					
F-TD-49	Justin Thind		14-Nov-07	VIVIsectVI (TWICE)	D		S					
F-TD-50	Charlotte Duncan		14-Nov-07	Are You Kidding Me?	D		S					
F-TD-51	George Kopcsak		14-Nov-07	Measuring the Greeness of Products	D		S					
F-TD-52	renee		13-Nov-07	Stop testing on animals	D		S					
F-TD-53	Hugo Schwyzer		13-Nov-07	To be green is also to be cruelty free	D		S					
F-TD-54	McKenzie		13-Nov-07	Be Green: Protecting the Environment Includes Animals	D		S					
F-TD-55	Dow Chemical Company		13-Nov-07	Dow Chemical's Comments on Chemical Management Systems	D		S		V			
F-TD-56	Rene		13-Nov-07	Ms	D	I	S					
F-TD-57	Bromine Science and Environmental Forum	(BSEF)	13-Nov-07	BSEF's Chemical Policy Recommendations			S		V			
F-TD-58	Jill West		13-Nov-07	A State with a Conscience Uses Non-Animal Testing	D		S					
F-TD-59	navid bayar		13-Nov-07	california should set a humane standard!	D		S					
F-TD-60	Jazz XB		13-Nov-07	Be Kind	D		S					

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Number	Name	Organization/Company	Date Posted	Topic	Category(ies)							
F-TD-61	Linda Hackett		13-Nov-07	Protecting the environment need NOT be at the expense of defenseless animals.	D	I	S					
F-TD-62	Sandra Sato		13-Nov-07	ANIMAL-BASED TOXICITY TESTING METHODS	D		S					
F-TD-63	Ari Solomon		13-Nov-07	Put an END to animal testing	D		S					
F-TD-64	kathy		14-Nov-07	animals suffer	D		S					
F-TD-65	Selina		13-Nov-07	NO ANIMAN TESTING!	D		S					
F-TD-66	Mikko Alanne		13-Nov-07	No more animal testing!	D		S					
F-TD-67	margaret rose rivera		13-Nov-07	animal testing is barbaric,immoral,wounds all of creation especially humankind (TWICE)	D		S					
F-TD-68	margaret rose rivera		13-Nov-07	animal testing is barbaric,immoral,wounds all of creation especially humankind	D		S					
F-TD-69	Al Bowin		13-Nov-07	FREEDOM FOR ALL LIVING CREATURES	D		S					
F-TD-70	Tamara		12-Nov-07	Stop testing on animals..please!	D		S					
F-TD-71	DEBORAH Y CHEW		12-Nov-07	Animal Testing is INHUMANE, UNNECESSARY, CRUEL, & SELFISH	D		S					
F-TD-72	JIP		12-Nov-07	Use existing testing programs	D		S					
F-TD-73	Kerry D.		12-Nov-07	Be kind to the environment and animals. Animal testing is deplorable, unethical, and unreliable at best.	D		S					
F-TD-74	Mya		12-Nov-07	Animal testing should be outlawed	D		S					
F-TD-75	Linda Roberts		12-Nov-07	RN	D		S					
F-TD-76	TAYLOR ANDERSON		12-Nov-07	SPARE THE ANIMALS !	D		S					
F-TD-77	Kevin Lyons, Ph.D.		12-Nov-07	Automated, Web-Based Assessment of “Green” Chemicals, Products and Processes for Procurement	D		S					A
F-TD-78	Polly Walton		12-Nov-07	Animal tests do not protect human health	D		S					
F-TD-79	michelle benson		12-Nov-07	Protect the Enviroment and Animals	D		S					
F-TD-80	Pat kramer		12-Nov-07	Don't use animals for experiments!	D		S					
F-TD-81	Sandra Todd		12-Nov-07	Green Chemistry policies	D		S					
F-TD-82	Ninetta Savino		12-Nov-07	Arcaic animal tests = cruel & unsatisfying results	D		S					
F-TD-83	sarah		12-Nov-07	STOP animal testing	D		S					
F-TD-84	Andrea Kraus		12-Nov-07	Animal Testing: Outdated, Cruel & Wasteful	D		S					
F-TD-85	Mauro		11-Nov-07	animal testing is dangerous and unethical	D		S					
F-TD-86	NICOLE SMITHSON		11-Nov-07	www.stopanimaltests.com	D		S					
F-TD-87	Gina		11-Nov-07	Animal Testing = Animal Abuse!	D		S					
F-TD-88	Julie		11-Nov-07	STOP ANIMAL TESTING!! Please!!	D		S					
F-TD-89	Niki		11-Nov-07	Please PROTECT the earth and all the beautiful creatures on it!	D		S					
F-TD-90	Bonnie Knight		11-Nov-07	Animal Testing is Cruel and Inaccurate	D		S					
F-TD-91	Kelly		11-Nov-07	Animals Are a Vital Link in the Balance of the Environment	D		S					
F-TD-92	Lorraine L		11-Nov-07	Animal Testing Is Unnecessary.	D		S					
F-TD-93	Judith Abeles		11-Nov-07	Animal testing is not scientifically valid	D		S					

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Number	Name	Organization/Company	Date Posted	Topic	Category(ies)							
F-TD-94	Marian Blum		11-Nov-07	Animal Experimentation is unethical	D		S					
F-TD-95	Devon		11-Nov-07	Please consider the alternative methods for testing	D		S					
F-TD-96	Sandra Malone		11-Nov-07	Non-Animal Testing Is a Win-Win Situation	D		S					
F-TD-97	Aurelia Dandrea		11-Nov-07	Redundant, innacurate, unethical	D		S					
F-TD-98	Jennifer Deming		11-Nov-07	Please leave animals alone!	D		S					
F-TD-99	Ann		11-Nov-07	There's no question we need to learn more about the toxins in our environment, but we need to do it in the most accurate, efficient, timely manners possible...	D		S					
F-TD-100	Sushmita Shrivastava		11-Nov-07	Animal Testing Cruel, Unethical & inaccurate	D		S					
F-TD-101	Maria Burman		11-Nov-07	A Green Program should be frendly to all, including animals!	D		S					
F-TD-102	Rache		11-Nov-07	Protect the Environment Accurately!!	D		S					
F-TD-103	Emily		10-Nov-07	Stop Cruel and Useless Animal Testing!!!	D		S					
F-TD-104	Darin Read		10-Nov-07	Animal testing is disgusting	D		S					
F-TD-105	R B		10-Nov-07	Animals Have Nervous Systems Just Like You	D		S					
F-TD-106	Scott Hexte		10-Nov-07	Don't Test On Animals -- They Aren't Predictive of Results on Humans	D		S					
F-TD-107	ds eva		10-Nov-07	The planet will die (& us with it) unless we change to green ways	D		S					
F-TD-108	Susan BSN, RN		10-Nov-07	Animal Toxicity testing does not extrapolate to humans; it wastes our precious taxpayer dollars!!!	D		S					
F-TD-109	Ilaria Accorsi		10-Nov-07	Animal testing cannot be the only option. Don't do it	D		S					
F-TD-110	Rebecca		10-Nov-07	No Animal Testing!	D		S					
F-TD-111	Renee Boteilho		10-Nov-07	Animals should never be used for this horrific inhumane testing	D		S					
F-TD-112	Roland R Houle		11-Nov-07	The traditional approach to gauging the potentially harmful effects	D		S					
F-TD-113	Joseph		10-Nov-07	Animal testing ..... ?	D		S					
F-TD-114	Renee Boteilho		10-Nov-07	Animal tests are cruel and useless	D		S					
F-TD-115	Arlen Stahlberg		10-Nov-07	end to crueil and painful treatment of animals	D		S					
F-TD-116	Dora Mitc		10-Nov-07	Californians want their state to be forward-thinking.	D		S					
F-TD-117	Naila M. Sanchez		10-Nov-07	Stop animal research... Cruel AND inaccurate!	D		S					
F-TD-118	Renee Boteilh		10-Nov-07	Animal testing is cruel and inhumane	D		S					
F-TD-119	Darla Brun		10-Nov-07	ANIMAL TESTS INHUMANE UNETHICAL AND NOT APPLICABLE TO HUMANS	D		S					
F-TD-120	Lori		10-Nov-07	No Animal Testing!	D		S					
F-TD-121	T. Maraine		10-Nov-07	Protect Humans, but Use Tests that Work and Don't Harm Animals	D		S					
F-TD-122	K Taylor		10-Nov-07	Pain and suffering cannot be justified	D		S					
F-TD-123	Renee Boteilh		10-Nov-07	LEAVE ANIMALS ALONE!	D		S					
F-TD-124	Ed kilduf		10-Nov-07	Painful Test to Animals	D		S					
F-TD-125	Nia Bias		10-Nov-07	Animal Testing	D		S					
F-TD-126	Robyn		10-Nov-07	No animal testing please, its not nessiscary	D		S					

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Number	Name	Organization/Company	Date Posted	Topic	Category(ies)							
F-TD-127	dominique mal		10-Nov-07	why animals	D		S					
F-TD-128	Sushmita Shrivastava		10-Nov-07	Animal-based toxicity testing methods are CRUEL & INACCURATE	D		S					
F-TD-129	THoa		10-Nov-07	End Useless Animal Testing	D		S					
F-TD-130	Cesar Chavez		10-Nov-07	Don't listen to human-hating animal rights nuts	D		S					
F-TD-131	Martha		10-Nov-07	GW not an excuse to waste $$ or lives	D		S					
F-TD-132	John T		10-Nov-07	Stop Toxicity Tests on Animals	D		S					
F-TD-133	Prakash Shrivastava		10-Nov-07	Mr	D		S					
F-TD-134	shira		10-Nov-07	ms	D		S					
F-TD-135	Rev. A. Reynolds		10-Nov-07	Animal torture is scientifically useless	D		S					
F-TD-136	Dave Kisor		10-Nov-07	If you must test, insist upon using the CEO of the company.	D		S					
F-TD-137	S Gordon		9-Nov-07	Let's get past medieval methods for toxicity testing	D		S					
F-TD-138	ed pilolla		9-Nov-07	no animals tests, please	D		S					
F-TD-139	Brienne DeJong		9-Nov-07	No Animal Tests	D		S					
F-TD-140	Sophia		9-Nov-07	Where do you draw the line?	D		S					
F-TD-141	Cheryl Toth		9-Nov-07	Animal tests are CRUEL and INACCURATE for HUMANS	D		S					
F-TD-142	Kris Gata		9-Nov-07	The preservation of our environment should go hand in hand with the preservation of life, not one for the other, otherwise it will ultimately defeat its purpose.	D		S					
F-TD-143	Tricia Philipson		9-Nov-07	Animal testing cannot be extrapolated to Homo Sapiens!	D		S					
F-TD-144	Tricia Philipson		9-Nov-07	The Importance Of Life	D		S					
F-TD-145	Mary Vincent		9-Nov-07	Stop useless animal testing	D		S					
F-TD-146	Karen Leyva		9-Nov-07	ANIMAL TESTING DOES NOT WORK !!	D		S					
F-TD-147	Will		9-Nov-07	Violence toward animals boomerangs as disease in humans	D		S					
F-TD-148	Sandra Villavicencio		9-Nov-07	Animal Testing is NOT Necessary in this Day and Age	D		S					
F-TD-149	shoshana anne simon		9-Nov-07	Animal tests are misleading and are torture	D		S					
F-TD-150	Rory Freedma		9-Nov-07	Testing on animals is not only cruel, it's dangerous.	D		S					
F-TD-151	M. Barbour		9-Nov-07	Is this 2007?	D		S					
F-TD-152	Gabriel T		9-Nov-07	mr.	D		S					
F-TD-153	Masha		9-Nov-07	Please don't use animals, I've heard them cry!	D		S					
F-TD-154	Annie		9-Nov-07	anti-animal testing reason	D		S					
F-TD-155	Annie		9-Nov-07	animal-testers	D		S					
F-TD-156	KRin		9-Nov-07	Why would any agency consider animal testing?	D		S					
F-TD-157	stacia brezlin		9-Nov-07	animal testing? are you kiding me?	D		S					
F-TD-158	CF		9-Nov-07	No More Animal Testing	D		S					
F-TD-159	Lauren Perez		9-Nov-07	Useless, outdated information.	D		S					
F-TD-160	Misha Havtik		9-Nov-07	Vioxx legacy	D		S					

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Number	Name	Organization/Company	Date Posted	Topic	Category(ies)							
F-TD-161	J.N. Petzak		9-Nov-07	NO MORE EXCUSES FOR BAD SCIENCE AND TAKING OF LIVES	D		S					
F-TD-162	virginia khan		9-Nov-07	animal testing	D		S					
F-TD-163	WT		9-Nov-07	END ANIMAL TESTING	D		S					
F-TD-164	Patricia Ryman		9-Nov-07	Stop Useless Animal Testing	D		S					
F-TD-165	NICOLE BLUME		9-Nov-07	No more animal tests	D		S					
F-TD-166	compassionate consumer		9-Nov-07	saving lives both animal and human a like	D		S					
F-TD-167	Barbara Gladfelter		9-Nov-07	Come out of the Dark Ages--stop animal testing.	D		S					
F-TD-168	Malcolm J Blue		9-Nov-07	Mr.	D		S					
F-TD-169	R. McDonough		9-Nov-07	If you wouldn't test it on your child, don't test it on an animal	D		S					
F-TD-170	Charlotte Wagner		9-Nov-07	Animal Tests Are Ineffective	D		S					
F-TD-171	Martine Faguy		9-Nov-07	The difference between a baby and an animal = nothing	D		S					
F-TD-172	Lynda Ballaban		9-Nov-07	Animals feel pain just as people do only they do not have a voice	D		S					
F-TD-173	Mary		9-Nov-07	Tell CalEPA to Stop Toxicity Tests on Animals and Use Instead Sound Alternative Methods	D		S					
F-TD-174	Athel Herman		9-Nov-07	It is time to stop testing on animals	D		S					
F-TD-175	Janet		9-Nov-07	Please Stop!	D		S					
F-TD-176	Scott Hurlbert		9-Nov-07	Do not use animals for testing	D		S					
F-TD-177	Patsy Henderson		9-Nov-07	truly barbaric	D		S					
F-TD-178	Anthony Montapert		9-Nov-07	Animal Testing is Unreliable	D		S					
F-TD-179	D. Halstead		9-Nov-07	Testing on Animals	D		S					
F-TD-180	Mark Mcclasky		9-Nov-07	Animal Testing ... Are you kidding me?	D		S					
F-TD-181	MIchael Prasad		9-Nov-07	No need for outdated science	D		S					
F-TD-182	JOAN CAREY		9-Nov-07	ANIMAL TESTS ARE CRUEL AND USELESS! PLS STOP!	D		S					
F-TD-183	William Kleinbauer		9-Nov-07	Do not do Animal Testing!	D		S					
F-TD-184	Tammy		9-Nov-07	NO ANIMAL TESTING	D		S					
F-TD-185	Candi Ausman		9-Nov-07	Ms.	D		S					
F-TD-186	V.Belt		9-Nov-07	No Animal Testing	D		S					
F-TD-187	Barbara Weith		9-Nov-07	Intelligent Humane Testing is the Way to Go	D		S					
F-TD-188	Jane Bock		9-Nov-07	Please use human-focused testing methods to keeps CA healthy!	D		S					
F-TD-189	Lydia		9-Nov-07	Please stop animal testing	D		S					
F-TD-190	Mark F		9-Nov-07	ALTERNATIVE METHODS..NO ANIMAL KILLING (TWICE)	D		S					
F-TD-191	MCarter		9-Nov-07	Abandon animal-based toxicity testing	D		S					
F-TD-192	Ruth Feldman		9-Nov-07	Ms	D		S					
F-TD-193	T.J. Mercer		9-Nov-07	Abandon Unnecessary and Cruel Animal Testing	D		S					
F-TD-194	Shelb		9-Nov-07	Stop the Testing on Animals	D		S					
F-TD-195	Diane Weingroff		9-Nov-07	No Animal Testing	D		S					

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Number	Name	Organization/Company	Date Posted	Topic	Category(ies)							
F-TD-196	Valerie Dodson		9-Nov-07	Please do not allow more animals to be used for needless testing!!	D		S					
F-TD-197	Dow Chemical Company		9-Nov-07	Dow Chemical's Comments on Educational Programs						E		
F-TD-198	Adrienne Guy		9-Nov-07	Step Testing on Animals	D		S					
F-TD-199	Rhea Damon		9-Nov-07	sad legacy (TWICE)	D		S					
F-TD-200	Pat Bryan		9-Nov-07	Ms	D		S					
F-TD-201	Nancy Wang		9-Nov-07	No more animal cruelty with testing	D		S					
F-TD-202	Giamonet		9-Nov-07	Please don't test on animals.	D		S					
F-TD-203	Crystal McKinney		9-Nov-07	Stop animal testing	D		S					
F-TD-204	Karen Stanley		9-Nov-07	stop testing on animals and use alternative methods	D		S					
F-TD-205	Ro		9-Nov-07	Please! Be Humane!	D		S					
F-TD-206	by: Alfredo Kuba		9-Nov-07	WASTEFUL, CRUEL AND UNETHICAL	D		S					
F-TD-207	Lar		9-Nov-07	No more animal testing	D		S					
F-TD-208	L. Doris		9-Nov-07	Stop unnecessary & cruel animal testing, NOW!	D		S					
F-TD-209	SEPIDA SAZGAR		9-Nov-07	please stop	D		S					
F-TD-210	Carolyn Sinclair		9-Nov-07	Stop Animal testing	D		S					
F-TD-211	Shannon Hunter		9-Nov-07	Stop Animal Testing	D		S					
F-TD-212	Mike Walls	American Chemistry Council	9-Nov-07	Toxics In Products By Design			S					
F-TD-213	Tracy Maguire		9-Nov-07	No more testing on animals	D		S					
F-TD-214	pcrm (pb: leslie atlan)		9-Nov-07	toxicity testing on animals	D		S					
F-TD-215	Mike Walls	American Chemistry Council	9-Nov-07	Understanding TSCA Sections 4 and 6	D		S					
F-TD-216	Richard Denison	Environmental Defense	16-Nov-07	Mike Walls of the American Chemistry Council (ACC) omits or glosses over key aspects of what EPA must do to use these authorities.			S					
F-TD-217	Raina L		9-Nov-07	Stop Toxicity Tests on Animals	D		S					
F-TD-218	Jessica Davis-Stein		9-Nov-07	Testing toxicity on animals is unethical, wasteful and counter-productive	D		S					
F-TD-219	LTurner		9-Nov-07	Create a Priority List	D		S					
F-TD-220	Rhonda Myers		9-Nov-07	Dr.	D		S					
F-TD-221	Susan Watts-Rosenfeld		9-Nov-07	Toxicity testing on animals	D		S					
F-TD-222	Kathlene Henry-Gorman		9-Nov-07	California need to lead the way for the environment	D		S					
F-TD-223	Denise		9-Nov-07	CalEPA- recommendations on protect human health w/o to cruel lab. tests on animals.	D		S					
F-TD-224	kim bauer		9-Nov-07	mr	D		S					
F-TD-225	Gary M Flashner, MS, MD		9-Nov-07	Chemical Testing: Use Only Cell & Tissue Assays	D		S					
F-TD-226	Kelly Kramer		9-Nov-07	Science Without Sadistics	D		S					
F-TD-227	John Guislin		9-Nov-07	No animal testing: both a scientific and moral imperative	D		S					
F-TD-228	Jimy Uranwala	Pleasanton CA	9-Nov-07	Going green does not require testing on animals	D		S					
F-TD-229	D. Snedden		9-Nov-07	No animal testing	D		S					
F-TD-230	Sarosh Kumana		9-Nov-07	Sustainability - the jigsaw puzzle								
F-TD-231	JM		9-Nov-07	Animal Testing is wrong and unnecessary	D		S					

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Number	Name	Organization/Company	Date Posted	Topic	Category(ies)							
F-TD-232	Alicia Snow		9-Nov-07	No more animal testing!	D		S					
F-TD-233	Vasu Murti		9-Nov-07	abolish animal testing and research	D		S					
F-TD-234	Wendy		9-Nov-07	California needs to be smart, not cruel ...	D		S					
F-TD-235	Dusti		9-Nov-07	STOP DOING CRUEL TOXICITY TESTS ON ANIMALS	D		S					
F-TD-236	Carol Simone		9-Nov-07	Please stop all toxicity tests on animals	D		S					
F-TD-237	Carol Simone		9-Nov-07	Stop all toxicity tests on animals NOW!	D		S					
F-TD-238	zoe		9-Nov-07	please stop all animal testing	D		S					
F-TD-239	Andrew Hackman	Consumer Specialty Products Assoc	6-Nov-07	Thoughts on Fostering Product Stewardship	D	I	S	V	E	R	T	A
F-TD-240	Mike Walls	American Chemistry Council	3-Nov-07	Stimulating Green Chemistry	D	I			E	R	T	A
F-TD-241	California Medical Association	California Medical Association	2-Nov-07	A Modern Chemicals Policy For California			S					
F-TD-242	Kimberly Schulz	Enviro. Health & Resource Center	1-Nov-07	Check out This Tool that Will Work!!!	D		S					
F-TD-243	Kimberly Schulz	Enviro. Health & Resource Center	1-Nov-07	Ch	D		S					
F-TD-244	Rob Brushia		30-Oct-07	Total lifecycle evaluation	D			V				
F-TD-245	Rob Brushia		30-Oct-07	Green Energy and Renewable Resources		I		V		R		A
F-TD-246	Mike Walls	American Chemistry Council	29-Oct-07	Thoughts About Substitution			S	V	E			
F-TD-247	CHANGE		29-Oct-07	CHANGE's Perspective on a Successful Program	D	I	S	V	E	R	T	A
F-TD-248	Dow Chemical Company		29-Oct-07	Dow Chemical's Green Chemistry Thoughts	D	I			E			A
F-TD-249	Mike Walls	American Chemistry Council	26-Oct-07	Chemistry is Essential to California								A
F-TD-250	Richard Denison	Environmental Defense	25-Oct-07	Have EPA programs really closed the data gap?	D			V	E			
F-TD-251	Richard Denison	Environmental Defense	25-Oct-07	Some ideas for what California can do to start advancing chemicals policy	D		S		E	R		
F-TD-252	Richard Denison	Environmental Defense	25-Oct-07	Limitations to Risk-Drive Approaches to Chemical Prioritization	D	I	S	V			T	
F-TD-253	Laura M. Plunkett, Ph.D., DABT	Integrative Biostrategies LLC	22-Oct-07	The Dose –Response Principle is Key to a Science-Based Program	D							
F-TD-254	Ted Nickerson		25-Oct-07	Very informative.								
F-TD-255	Cayce Warf		22-Oct-07	Director Environmental Sustainability Programs	D		S					
F-TD-256	Mike Walls	American Chemistry Council	19-Oct-07	Risk-Based Evaluation – the One Approach that Makes Sense	D		S					
F-TD-257	J. C. King		19-Oct-07	Quantitative Assessments of “Green” Munitions and Chemicals of Concern	D		S					
F-TD-258	Mike Walls	American Chemistry Council	15-Oct-07	Addressing the Data Gaps	D							
F-TD-259	Mike Walls	American Chemistry Council	15-Oct-07	Innovation and Regulation		I	S	V	E	R	T	
F-TD-260	Tyrone D. Nordquist		4-Oct-07	Quantitative Web-based "Green" Munitions Analyses	D		S					
F-TD-261	Mike Walls	American Chemistry Council	3-Oct-07	Green Chemistry & Product Stewardship		I	S					
F-TD-262	Phillip Lo		1-Oct-07	Info on federal legislation on Green Chemistry from Chemistry and Engineering News, 9/17		I	S			R	T	

Toxic By Design

Number	Name	Organization/Company	Date Posted	Topic	Category(ies)							
F-TD-263	Mike Walls	American Chemistry Council	28-Sep-07	ACC's Perspectives on California's Green Chemistry Initiative	D		S	V				A
F-TD-264	Raymond Paulson		27-Sep-07	Quantitative Green Ranking for All Chemicals	D		S					
F-TD-265	on behalf of DTSC Berkeley Regional Staff		25-Sep-07	Require Legislation			S					
F-TD-266	walt davie		25-Sep-07	health hazards of jet fumes								
F-TD-267	Dr. Katy Wolf		2-Oct-07	Legislative Changes		I	S	V	E			
F-TD-268	Eileen Hughes		21-Sep-07	Pharmaceuticals and Personal Care Products (PPCPs)	D	I	S			R		
F-TD-269	Terry Collins		21-Sep-07	Lord Professor of Chemistry								
F-TD-270	Rupali Das, MD, MPH		20-Sep-07	Worker health impacts should be part of cost-benefit decisions								
F-TD-271	Bruce Klafter	Sr. Director, EHS, Applied Material	17-Sep-07	Avoid one size fits all approaches								
F-TD-272	Robert Balisdell, Ph.D.		14-Sep-07	Senior Toxicologist, Office of Environmental Health Hazard Assessment								
F-TD-273	Dr. Nagaraj		17-Sep-07	California should certainly lead in this field.								

Toxic By Accident

Number	Name	Organization/ Company	Date Posted	Topic	Category(ies)							
F-TA-1	Catherine T. (Katie) Hunt, President		19-Nov-07	American Chemical Society Response		I	S					
F-TA-2	Archie J. Beaton	Chlorine Free Products Assn.	19-Nov-07	Use of Existing Web-Based Tools to Certify "Green" Cleaning Products	D		S					
F-TA-3	Susan Foerster		16-Nov-07	Practical Issues for Identification and Management of Common Consumer Items by Public Agencies	D	I	S	V	E	R	T	A
F-TA-4	Arlene Blum		16-Nov-07	The California Bed Clothing Flammability Standard and Green Chemistry			S					
F-TA-5	Leslie Tamminen		16-Nov-07	Education and the Environment Initiative			S		E			
F-TA-6	Trudy Fisher		16-Nov-07	Comments - California Green Chemistry Initiative								
F-TA-7	California Association of RV Parks and Campgrounds		16-Nov-07	CalARVC's Comments			S					
F-TA-8	Johnson & Johnson		16-Nov-07	Johnson & Johnson - Additional Comments		I	S	V	E	R		
F-TA-9	Frank Teng		16-Nov-07	Policy Elements proposed by the Silicon Valley Leadership Group	D	I	S	V	E	R	T	A
F-TA-10	Western States Petroleum Association		16-Nov-07	Green Chemistry Initiative								
F-TA-11	Walter M. McClelland		16-Nov-07	Concerned About Safety of Products			S					
F-TA-12	Diane Brodd		16-Nov-07	California Green Chemistry Initiative - Comments			S					
F-TA-13	Linda Blackwell		16-Nov-07	Comments on the California Green Chemistry Initiative		I	S					
F-TA-14	Andrew Hackman	Consumer Specialty Products Assoc	16-Nov-07	CSPA Summary Comments on the California Green Chemistry Initiative		I	S	V	E	R		A
F-TA-15	Mike Walls		16-Nov-07	High Production Volume (HPV) Challenge Program: A Landmark Program Making More Health and Environmental Data Publicly Available Than Ever Before	D			V		R		
F-TA-16	Paul Noe		16-Nov-07	Perspective of Affected Industries on California Green Chemistry Initiative		I						
F-TA-17	Lorraine Larsen-Hallock		16-Nov-07	Use of existing data and tools to implement the Green Chemistry Initiative	D						T	
F-TA-18	Ray Dawson		16-Nov-07	Feedback from Albemarle Corporation								
F-TA-19	Paul Noe		16-Nov-07	GMA's Perspective on a Framework for Green Chemistry	D	I	S	V	E	R		A
F-TA-20	Bayer MaterialScience		15-Nov-07	Bayer MaterialScience's Comments on California Green Chemistry Initiative	D	I	S	V	E	R	T	A
F-TA-21	Philip G. Lewis, M.D., M.P.H.		15-Nov-07	Comments from Rohm and Haas Company		I				R		
F-TA-22	Pat Hayes		15-Nov-07	P&G's Recommendations for Advancing California's Green Chemistry Initiative	D	I	S		E	R		A

Toxic By Accident

Number	Name	Organization/ Company	Date Posted	Topic	Category(ies)							
F-TA-23	Andy Peri		15-Nov-07	Green Chemistry Initiative Public Comments								
F-TA-24	Paul DeLeo	The Soap and Detergent Association	15-Nov-07	Green Chemistry and Beyond: Sustainability, Safety and Continual Improvement	D	I	S		E	R	T	A
F-TA-25	Bob Lucas	CCEEB	14-Nov-07	The Green Chemistry Initiative Should Consider Voluntary Programs and the Concepts of Sustainable Chemistry		I		V				
F-TA-26	George R. Thompson, Ph.D	President, CCS	14-Nov-07	Making the California Green Chemistry Initiative Workable	D		S	V			T	
F-TA-27	George Kopcsak		14-Nov-07	Measuring the Greeness of Products	D		S					
F-TA-28	Dow Chemical Company		13-Nov-07	Dow Chemical's Comments on Chemical Management Systems	D		S	V				
F-TA-29	Bromine Science and Environmental Forum (BSEF)		13-Nov-07	BSEF's Chemical Policy Recommendations			S	V				
F-TA-30	JIP		12-Nov-07	Real risk			S					
F-TA-31	Kevin Lyons, Ph.D.		12-Nov-07	Automated, Web-Based Assessment of “Green” Chemicals, Products and Processes for Procurement	D		S	V			T	
F-TA-32	Dow Chemical Company		9-Nov-07	Dow Chemical's Comments on Educational Programs					E			
F-TA-33	Mike Walls	American Chemistry Council	9-Nov-07	Understanding TSCA Sections 4 and 6	D		S					
F-TA-34	Richard Denison	Environmental Defense	16-Nov-07	Mike Walls of the American Chemistry Council (ACC) omits or glosses over key aspects of what EPA must do to use these authorities.			S					
F-TA-35	Mike Walls	American Chemistry Council	9-Nov-07	Toxics In Products By Accident		I	S			R		
F-TA-36	Andrew Hackman	Consumer Specialty Products Assoc.	6-Nov-07	Thoughts on Fostering Product Stewardship	D	I	S	V	E	R	T	A
F-TA-37	Mike Walls	American Chemistry Council	3-Nov-07	Stimulating Green Chemistry								
F-TA-38	California Medical Association		2-Nov-07	A Modern Chemicals Policy For California			S					
F-TA-39	anonymous		2-Nov-07	How did it get there?								
F-TA-40	Kimberly Schulz	Enviro. Health & Resource Center	1-Nov-07	Check out This Tool that Will Work!!!	D		S					
F-TA-41	Mike Walls	American Chemistry Council	29-Oct-07	Thoughts About Substitution			S	V	E			
F-TA-42	CHANGE		29-Oct-07	CHANGE's Perspective on a Successful Program	D	I	S	V	E	R	T	A
F-TA-43	Dow Chemical Company		29-Oct-07	Dow Chemical's Green Chemistry Thoughts	D	I			E			A
F-TA-44	Richard Denison	Environmental Defense	25-Oct-07	Have EPA programs really closed the data gap?	D			V	E			
F-TA-45	Richard Denison	Environmental Defense	25-Oct-07	Some ideas for what California can do to start advancing chemicals policy	D		S		E	R		

Toxic By Accident

Number	Name	Organization/ Company	Date Posted	Topic	Category(ies)							
F-TA-46	Richard Denison	Environmental Defense	25-Oct-07	Limitations to Risk-Driven Approaches to Chemical Prioritization	D	I	S	V			T	
F-TA-47	Laura M. Plunkett, Ph.D., DABT		22-Oct-07	The Dose –Response Principle is Key to a Science-Based Program	D							
F-TA-48	Cayce Warf		22-Oct-07	Director, Environmental Sustainability Programs	D		S					
F-TA-49	Mike Walls	American Chemistry Council	19-Oct-07	Risk-Based Evaluation – the One Approach that Makes Sense	D		S		E			
F-TA-50	J. C. King		19-Oct-07	Quantitative Assessments of “Green” Munitions and Chemicals of Concern	D		S					
F-TA-51	Mike Walls	American Chemistry Council	15-Oct-07	Addressing the Data Gaps	D							
F-TA-52	Mike Walls	American Chemistry Council	15-Oct-07	Innovation and Regulation		I	S	V	E	R	T	
F-TA-53	Tyrone D. Nordquist		4-Oct-07	Quantitative Web-based "Green" Munitions Analyses	D		S					
F-TA-54	Mike Walls	American Chemistry Council	28-Sep-07	ACC's Perspectives on California's Green Chemistry Initiative	D		S	V				A
F-TA-55	Raymond Paulson		27-Sep-07	Quantitative Green Ranking for All Chemicals	D		S					
F-TA-56	DTSC Berkeley Regional Staff		27-Sep-07	Government test all new products.			S					
F-TA-57	Dr. Katy Wolf		2-Oct-07	Legislative Changes		I	S		E	R		
F-TA-58	Terry Collins		21-Sep-07	Lord Professor of Chemistry	D		S		E			

Cradle to Cradle

Number	Name	Organization/Company	Date Posted	Topic	Category(ies)							
J-C2C-1	**Mike Vivas**	Department of Toxic Substances Control Northern California Central Cleanup Operations Branch	14-Jun-07	Ethanol from green plant material				V				
J-C2C-2	**Amy Kyle**	Associate Research Scientist and Lecturer Project on Science and Policy for Health and Environment School of Public Health, University of California, Berkeley	15-Jun-07	The tools and approaches now in use are too piecemeal and not producing fundamental solutions.	D					R		
J-C2C-3	**Allan Griff**	Consulting Engineer	15-Jun-07	Please don't lose sight of the environmental advantages provided by plastics.								
J-C2C-4	**Tom Jacob**	DuPont, Sacramento	19-Jun-07	DuPont has been among the largest chemical producers, globally.	D	I	S			R		
J-C2C-5	**George**		19-Jun-07	I'm trying to think of something in my life that government doesn't regulate, tax, or restrict and I'm having trouble finding something.			S					
J-C2C-6	**Mark Lively, P.E.**		19-Jun-07	Some jurisdictions have the reputation of exporting their industrial wastes								
J-C2C-7	**F. Krieger**		19-Jun-07	If we tighten controls here we need to implement equally tight controls or restrictions on imports.								
J-C2C-8	**Scott Lesnet**		20-Jun-07	Knowing what needs to be changed and not having viable alternatives is frustrating.			S					
J-C2C-9	**Robert**		20-Jun-07	Grorge your right on.	D		S					
J-C2C-10	**LT**		20-Jun-07	By changing the process of development from chemically-based to an earth-friendly product will solve the problem only partially.		I			E			
J-C2C-11	**mike**		20-Jun-07	This all sounds good								
J-C2C-12	**Andy Cano**		20-Jun-07	I learned a tremendous amount but have some questions, comments and potential solutions.		I	S			R		
J-C2C-13	**Jeff Henderson**		20-Jun-07	SPAP COMPANY LLC								
J-C2C-14	**Nilmini Silva-Send**		21-Jun-07	Special Report by Michael Wilson	D					R		
J-C2C-15	**Tom Forsythe**		22-Jun-07	Before California wastes any time on this initiative								A

Cradle to Cradle

Number	Name	Organization/Company	Date Posted	Topic	Category(ies)							
J-C2C-16	**Sandy McDonald**	CEO, Managing Partner, GreenHouse Partners An early stage startup focused on rapid commercialization of green technologies and green chemistry. MS Degree, Polymer Science, BS Degree, Chemistry	23-Jun-07	YES!!! Let's get started.								
J-C2C-17	**John Goodrich**		23-Jun-07	If Calilfornia installs Plasma Reactors at waste managements site								
J-C2C-18	**Frank Teng**		26-Jun-07	Silicon Valley Leadership Group					E			
J-C2C-19	**Suzanne Hagen**		27-Jun-07	There appears to be a complete disregard for TSCA	D							
J-C2C-20	**Steven Levine**		12-Jul-07	Excellent Packaging & Supply								
J-C2C-21	**Andria Ventura**	Clean Water Action	16-Jul-07	I am a bit disappointed by the degree of cynicism expressed on this Blog	D	I	S	V				
J-C2C-22	**Michael Cox**	New Almaden, CA	23-Jul-07	The post from Mr. Tom Jacob – DuPont, Sacramento, is one that should be read carefully			S	V				
J-C2C-23	**Nick Sleeth**		25-Jul-07	I believe the Green Chemistry Initiative to be our one, best chance								
J-C2C-24	**Merob Shimeles**	DTSC	26-Jul-07	Dear Director Gorsen								
J-C2C-25	**Nick Sleeth**		28-Jul-07	I had neglected to mention								
J-C2C-26	**Peggy Harris**	Team Leader, Cradle to Cradle Team	14-Aug-07	Existing Chemicals	D		S					
J-C2C-27	**Green Chemistry Team**		30-Aug-07	The Green Chemistry Initiative held a public stakeholder meeting	D	I	S	V	E	R		

Green Chemistry

Number	Name	Organization/Company	Date Posted	Topic	Category(ies)							
J-GC-1	Joe Lyou	California Environmental Rights Alliance www.EnviroRights.org	14-Jun-07	my initial comments on your Green Chemistry Initiative	D		S		E			
J-GC-2	Robert J. Brushia	Senior Scientist California Environmental Protection Agency's Department of Toxic Substances Control Hazardous Waste Management Program Regulatory and Programs Development Division	14-Jun-07	DTSC, and Cal/EPA ought to strongly consider forming a partnership with the UC. In Mass	D			V		R	T	
J-GC-3	Michael Wilson	Assistant Research Scientist Center for Occupational and Environmental Health School of Public Health University of California, Berkeley	15-Jun-07	Green Chemistry in California: points to the problems of the Data, Safety, and Technology Gaps	D	I	S	V			T	
J-GC-4	Amy Kyle	Associate Research Scientist and Lecturer Project on Science and Policy for Health and Environment School of Public Health, University of California, Berkeley	15-Jun-07	Dear Director Gorsen	D					R		
J-GC-5	Ken Wiener, MS		19-Jun-07	comment on the Green Chemistry Initiative						R		
J-GC-6	Robert Johnson	Industry Environmental Specialist	19-Jun-07	California Chemical List of Lists	D							
J-GC-7	Thomas W. Oakes, PhD	Solar Hydrogen Co	20-Jun-07	to create energy with no harmful chemistry to California.								
J-GC-8	Keith Winkler		20-Jun-07	REACH	D							
J-GC-9	Doug Schoon		21-Jun-07	properly define "toxic" and "non-toxic"					E			
J-GC-10	Jim Bell		25-Jun-07	Precautionary principal and Law	D	I	S					
J-GC-11	Kathleen Richter		25-Jun-07	There are two ways I believe we could solve this problem:		I						
J-GC-12	Michael Folkins		25-Jun-07	non-toxic is over stated								
J-GC-13	Frank Teng		26-Jun-07	The Silicon Valley Leadership Group	D	I	S	V	E		T	A
J-GC-14	Olof Hansen		27-Jun-07	a green product is a better product								
J-GC-15	Joe Gannon		30-Jun-07	chemicals used for water treatment		I	S					A

Green Chemistry

Number	Name	Organization/Company	Date Posted	Topic	Category(ies)							
J-GC-16	Claudette L. Main		2-Jul-07	to be green in using all biodegradable cleaning products								
J-GC-17	Randy Fischback	Public & Government Affairs	3-Jul-07	California Environmental Protection Agency's Green Chemistry Initiative	D	I			E			
J-GC-18	Bob Rawson	President, International Wastewater Solutions Corp. iws@sonic.net	11-Jul-07	emphasize strict labeling of contents					E			
J-GC-19	Robert M. Hafner, ASP	Safety Manager	19-Jul-07	The end result is a greater risk of exposure for the company and the communities.								
J-GC-20	Sarojini Balachandra PhD	DTSC	20-Jul-07	An Idea to be Included in to K- 12 Education					E			
J-GC-21	Merob Shimeles	DTSC	26-Jul-07	Research Council of the National Academies' report					E			
J-GC-22	Jeff Henderson		28-Jul-07	our state's ability to compete, let alone lead and influence		I						
J-GC-23	Sam Bell	Water Quality Committee Chairman Metal Finishing Association of Southern California	1-Aug-07	CYANIDE IS GREEN					E			
J-GC-24	Micheal Wadas		3-Aug-07	We already know what materials work, and what don't			S					
J-GC-25	Farrell F. Neeley, PhD		5-Aug-07	re-formulations and re-engineering of chemical processes		I						
J-GC-26	Green Chemistry Team		30-Aug-07	The Green Chemistry Initiative held a public stakeholder meeting	D	I			E	R	T	A
J-GC-27	John Farley		11-Sep-07	restriction of chemicals should only apply to formulators/ manufacturers	D		S					

Toxic By Design

Number	Name	Organization/Company	Date Posted	Topic	Category(ies)							
J-TD-1	**Allan L. Griff**	Consulting Engineer	15-Jun-07	"Please don't lose sight of the environmental advantages provided by plastics."								
J-TD-2	**tahoegreen**		19-Jun-07	PEX plumbing			S					
J-TD-3	**Kurt Neutgens**		20-Jun-07	Elimination of chemicals in our lawns and gardens…			S					
J-TD-4	**anon**		20-Jun-07	LA area			S					
J-TD-5	**Doug Schoon**		21-Jun-07	Properly define "toxic" and "non-toxic"…					E			
J-TD-6	**Lyle Vander Velde**		25-Jun-07	While pondering this question I found myself separating it into two parts.		I	S	V				A
J-TD-7	**Frank Teng**		26-Jun-07	The Silicon Valley Leadership Group								
J-TD-8	**Robert Brushia**		2-Jul-07	Huge data gathering and database development effort	D			V		R		
J-TD-9	**Loni Adams**		3-Jul-07	The City of San Clemente			S					
J-TD-10	**Claudette L. Main**		3-Jul-07	Drinking water distribution companies								
J-TD-11	**Rob Brushia**		16-Jul-07	Environmentally friendly electroplating technologies.			S					
J-TD-12	**Michael Cox**	New Almaden, CA	8-Aug-07	I agree with Robert Brushia	D			V			T	
J-TD-13	**Michael Kirschner**		14-Aug-07	Recall related to toxic materials								
J-TD-14	**Michael Kirschner**		14-Aug-07	Regarding Rob Brushia's post								
J-TD-15	**B. Massey**		15-Aug-07	Would such a policy create incentives for companies…			S					
J-TD-16	**Andria Ventura**	Clean Water Action	15-Aug-07	Mattel recall	D							
J-TD-17	**Beverly Karplus Hartline**		16-Aug-07	It is great to see California taking the lead on this issue.	D	I	S			R		
J-TD-18	**Green Chemistry Team**		30-Aug-07	Public stakeholder meeting on August 17th in San Jose.	D	I	S	V	E	R	T	A
J-TD-19	**Andria Ventura**	Clean Water Action	30-Aug-07	If a toxin in a product is intentional or accidental.			S	V				
J-TD-20	**Michael Kirschner**		30-Aug-07	Manufacturers must be responsible			S					
J-TD-21	**B. Carter**		7-Sep-07	Ban the sale of toxics in products by design in California			S					
J-TD-22	**Aron**		7-Sep-07	Basic (good) public policy: Tax what you don't want.		I				R		

Toxic By Design

Number	Name	Organization/Company	Date Posted	Topic	Category(ies)							
J-TD-23	Ken S		10-Sep-07	Use of toxic (perc) de-greasers		I						
J-TD-24	Jay Schreider		10-Sep-07	submit the following ideas to be considered as options	D		S		E		T	
J-TD-25	Rob Brushia		12-Sep-07	The U.S. EPA has partnered with various stakeholders and industry groups	D	I	S	V	E	R	T	A
J-TD-26	Robert Balisdell, Ph.D		17-Sep-07	Clearly some other States have done more to address these issues	D		S					

Toxics By Accident

Number	Name	Organization/Cor	Date Posted	Topic	Category(ies)							
J-TA-1	**Allan Griff**	Consulting Engineer	15-Jun-07	environmental advantages provided by plastics								
J-TA-2	**Ann**		20-Jun-07	We are killing ourselves with too many chemicals in combination.								
J-TA-3	**Doug Schoon**		21-Jun-07	properly define "toxic" and "non-toxic"					E			
J-TA-4	**Frank Teng**		26-Jun-07	The Silicon Valley Leadership Group			S	V	E			
J-TA-5	**Scott Harvey**		27-Jun-07	Executive Order S-20-04				V			T	
J-TA-6	**Heather Gladney**		27-Jun-07	I agree strongly with Frank Teng's comments here		I	S	V	E	R		
J-TA-7	**Sue Tracy**		29-Jun-07	Green Chemistry Initiative Stakeholder Meeting that caught my attention.								
J-TA-8	**Art Unger**		15-Jul-07	fee to cosmetics, batteries, medicines etc.			S					
J-TA-9	**Rachael Paulson**		18-Jul-07	connection to the earth and land and really do care.					E			
J-TA-10	**Martin Lott**		22-Aug-07	The tools are out there	D			V			T	A
J-TA-11	**Green Chemistry Team**		30-Aug-07	The Green Chemistry Initiative held a public stakeholder meeting	D	I	S	V	E	R	T	A
J-TA-12	**Jay Schreider**		10-Sep-07	I submit the following ideas to be considered as options	D		S		E		T	

CRADLE TO CRADLE (FORUM)	
Number	**Full Comment**
F-C2C-1	Cradle to Cradle: Through product design and industrial innovation, produce products that reduce the use of harmful chemicals, thus generating fewer emissions and less waste. How do you think California should move to a Cradle to Cradle framework? California needs to carefully review and identify with stakeholders the current significant barriers that impede investment in, and adoption of, sustainable technologies. Although the long-term economic benefits of sustainable technologies, such as reduced regulatory and waste disposal costs, can be significant, businesses can be placed at a near-term competitive disadvantage because of potentially prohibitive, up-front costs. Regulations need to be revised to allow flexibility for the superior environmental performance obtained when clean technologies are employed. To effectively address this dilemma, ACS believes that governments should provide incentives for the implementation of sustainable technologies, as explained further by our answer to the green chemistry question.
F-C2C-2	Industrial cleaning product constituent chemicals have a wide spectrum of potential effects on human health and the environment. Manufacturer employee, product user, and cleaned building resident exposures potentially encompass both acute and chronic health risks. Selected products and processes also manifest safety risks (e.g., fire, explosion, incompatibilities). Constituents may additionally pollute air, water and soil. Everyone gains when historic industrial and household cleaners are cost effectively replaced with “green” products and manufacturing processes that have passed quantitative, objective, and comprehensive assessments. Customization of the Chemical Compliance Systems, Inc. (CCS) “Green” Process Compliance Analytical System (G-PACS) and their “Green” Product Compliance Analytical System (GP-CAS) enables the Chlorine Free Products Association (CFPA) to utilize the “Green” Cleaning Product Process Analytical Compliance System (GCP-PACS) in conjunction with the third party accountability services of our Sustainable Manufacturing Initiative (SMI) on-site audits. Those facilities that complete the SMI with GCP-PACS are then offered access to the on-line, automated “Green” Cleaning Product Compliance Analytical System (GCP-CAS) to provide a complete, comprehensive, cleaning product assessment within 5-10 seconds. Both systems utilize over 40 ecological, health and safety criteria for each chemical constituent. The process, or product, is quantitatively rated on a scale of 0 (worst green) to 100 (best green) for easy manufacturing, or acquisition, assessment against pass/fail criteria, or comparison of competitor products. Compromising product hazards and offending constituents are also quantitatively identified. Both GCP-PACS and GCP-CAS include alternative constitutent databases in their process/product Design modes that greatly streamline selection of less hazardous constituents to replace more harmful ingredients. This latter feature greatly facilitates “green” cleaning product and process research and development by rapidly calculating product, or process, “green” ratings as alternative constituents are theoretically inserted for compromising ingredients. Cleaning product or process constitutent impacts on over 100 state, federal, international and other third party regulations are simultaneously assessed. GCP-CAS and GCP-PACS represent the first standardized, Web-based analytical compliance capabilities for quantitatively certifying the “greenness” of industrial cleaning products and processes by an independent third party. CFPA recommends that California consider these CCS capabilities as options for achieving the objectives of the California Green Chemistry Initiative.
F-C2C-3	In developing a cradle to cradle system, biomass chemistry will obviously be important. The State of California needs to invest in a research program to identify how biomass resources – ranging from agricultural products like corn to cellulosic matter – may be used in chemistry. In many ways, biomass chemistry may be more feasible than using biofuels on a large scale to provide transportation fuels, because of the much smaller volumes of feedstock needed. Yet, all the societal, ecological, and policy problems associated with biofuel production will apply to biomass chemistry. The State of California needs to take a precautionary approach and begin developing policies to address the impacts of biomass chemistry.

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F-C2C-4	Thank you for soliciting input from California residents concerning the Green Chemistry Initiative. I am currently writing a book-length narrative about environmental illness (including one fictional character based on Dr. John Balmes, who was extremely helpful to me when I first became chemically sensitive), and I would love to contribute my insights to your project. The REACH program currently underway in the E. U. would be a wonderful model for California. In addition to this, however, we need to zero in on those toxins to which the general public is being heavily exposed on a daily basis. At the top of this list is secondhand cigarette smoke. Twenty-one years ago, Surgeon General C. Everett Koop concluded that secondhand smoke causes disease. Twenty years later, Surgeon General Richard Carmona called secondhand smoke an alarming public health threat, "a serious health hazard at any level" One and a half years ago, the State of California's Air Resources Board defined secondhand smoke as "toxic." So what are we waiting for?Who are we afraid of? …more on behalf of Trudy Fisher
F-C2C-5	November 16, 2007 Maureen Gorsen Director Department of Toxics Substances Control PO Box 806 Sacramento CA 95812-0806 Dear Ms. Gorsen- On behalf of my environmental organization Heal the Bay, and the public-private partnership of the Education and the Environment Initiative, I express strong support for the Green Chemistry Initiative. Clearly, the current structure by which we regulate chemicals in California is not sustainable. Given that California has serious pollution, ecosystem degradation, and natural resource scarcity concerns, it is imperative that the state develop a more cradle-to-cradle approach. The Department of Toxics Substances Control's (DTSC's) leadership is essential to create such a new policy and regulatory framework. Green Chemistry will better enable California to protect people, and the environment, as well as economically keep pace with changes worldwide, and here at home. Educate about the environment is fundamentally critical to any such new Green Chemistry policy and attendant programs. Education is necessary in order to scientifically inform such a policy, practically and efficiently implement it, and also to disseminate information about it to future generations. Luckily, California is currently poised to lead the nation in environmental literacy: the Education and the Environment Initiative (EEI) is a landmark environmental education law that requires the development and implementation of multi-disciplinary environmental education curricula in all disciplines (science, history/social science, English/language arts, and mathematics) for all K-12 grade students in state public schools. The EEI was co-authored by environmental organization Heal the Bay and signed into law in 2003 by former California Governor Gray Davis. In 2005, Governor Schwarzenegger allocated state funds over two years for environmental education curricula development under the EEI. A national model, the EEI will ultimately allow six million California school children each year to have the information they need to make informed decisions about protecting their health and our precious natural resources. As currently being developed, the EEI will necessarily include information that touches on green chemistry specifically. For example, EEI statutory mandates specifically call for the EEI curricula to address topic areas such as "toxics and hazardous waste," "public health and the environment," "pollution prevention," and "environmental sustainability." Obviously, there is significant overlap between the educational mandate of the EEI and the subject matter and goals of any state Green Chemistry Policy. We therefore encourage DTSC to make sure there is full integration between the EEI curricula development and its implementation, and the Green

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	Chemistry policy and program development (including, but not, limited to K-12, post-secondary, and vocational educational efforts associated with Green Chemistry.) To date, DTSC has been very supportive of the EEI effort, and we gratefully applaud their leadership in this regard. We hope that as the Green Chemistry policy unfolds, that DTSC will continue to closely coordinate with the EEI and share Green Chemistry educational content, potential outreach opportunities, and other resources. Together, we can help children learn about environmental issues and make informed decisions about their individual impact on the environment. Sincerely, Leslie Tamminen Legislative Director/EEI Director Heal the Bay
F-C2C-6	The California Association of RV Parks and Campgrounds (CalARVC) requests that the Department of Toxic Substance Control prohibit the import, sale, or use of certain RV toilet additives as part of the California Green Chemistry Initiative. Many of these products are detrimental to onsite septic systems and often cause systems to fail and pollute surrounding soil and groundwater. CalARVC, which is comprised mainly of hundreds of small "mom and pop" RV parks and campgrounds from all over the state, has been seeking a solution for this problem to several years. CalARVC believes the best solution is to ban the sale and use of deleterious products that contain formaldehyde or similar biocides. Most of the toilet additive products sold and used in California contain formaldehyde or a derivative of formaldehyde. These products help dissolve toilet paper and bio-solids and are used by RV owners to prevent odors and blockages in their toilet systems. However, the chemicals in these products that help dissolve toilet paper and bio-solids also kill natural biological organisms used in many onsite wastewater systems. Many onsite wastewater treatment systems use natural organism to breakdown bio-solids and toilet paper. Thus, when RV holding tanks containing certain RV toilet additives are dumped into an onsite wastewater system, which is a common everyday occurrence at RV parks, the chemicals designed to eliminate odors and dissolve toilet waste also kill off the natural organisms causing the onsite septic systems to fail....more on behalf of California Association of RV Parks and Campgrounds
F-C2C-7	On behalf of Johnson & Johnson and its family of companies, I appreciate the opportunity to provide additional comments on the California Green Chemistry Initiative. Johnson & Johnson has identified a number of key policy points regarding green chemistry that we believe are important guidelines that will lead to the overall success of California's Green Chemistry Initiative. Johnson & Johnson recommends specific policy points should be structured around the following policy goals and objectives: on behalf of Johnson & Johnson
F-C2C-8	Green Chemistry in California – Initial Policy Elements Proposed by the Silicon Valley Leadership Group (These comments have been posted to all four discussion forums in the same form, due to overlap in topics.) The Silicon Valley Leadership Group advocates a comprehensive, integrated approach to expanding Green Chemistry in California. By highlighting leaders in the corporate environmental practices and encouraging those who are further behind, we can all move ahead. We envision Green Chemistry as an interactive, evolving partnership with industry, government and consumers working together to protect human health and promote a cleaner, safer environment. Leadership Group members involved in crafting these initial suggestions include those from the electronics, biotechnology, pharmaceutical, chemical manufacturing, and supporting sectors. For more information about the Leadership Group please visit www.svlg.net.

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	The Leadership Group proposes the following policy elements to further Green Chemistry in California: 1. Strengthen the recognition and pursuit of Green Chemistry processes and products by establishing clear criteria and voluntary certification based on comprehensive lifecycle considerations. Equally important, consumers need to be educated about responsible choices and practices. 2. Explore models other than, or building upon, the current Materials Safety Data Sheet (MSDS) system to provide needed chemical hazard data throughout the supply chain. 3. Establish a Green Chemistry Coordination Council to collect and promote the sharing of information, highlight businesses with green practices, provide assistance to businesses lacking resources, and educate consumers. 4. Prioritize chemicals for screening, testing and appropriate restrictions. We suggest building upon the model of Canada's analysis and prioritization as well as the Proposition 65 review process conducted by OEHHA. Chemicals of high concern should be allowed for targeted, low-exposure uses as determined in an open process by DTSC. 5. Greater investment in pollution prevention in the short term as well as extension of the current CA Pollution Prevention model to downstream chemical users as an element of the long term Green Chemistry strategy. 6. Continue the Conversation with California to sustain progress in Green Chemistry. The dialogue between DTSC and stakeholders has been very helpful and will result in more well-developed, effective policy. IN MORE DETAIL: 1) Issue: Our market economy and the innovations that it engenders, environmental and otherwise, are driven by the relationship between industry and consumers. In order for industry to offer products that are environmentally-sound, and for consumers to recognize them, clear and stakeholder-driven criteria are necessary. Proposal: The Leadership Group proposes we strengthen the recognition and pursuit of Green Chemistry processes and products by establishing clear criteria and voluntary certification based on comprehensive lifecycle considerations. Equally important, consumers need to be educated about responsible choices and practices. While the focus of the Initiative has been on chemical safety, green chemistry in the broader sense should incorporate an accounting of embedded energy, C02 impact, water usage, packaging, recyclability and so forth. Industry on the whole is already moving toward a greater consideration of these factors in our practices. The difficulty of quantifying and ascribing relative importance to these factors points to the need for commonly-held practices or industry standards. A voluntary certification program for green chemistry processes and products will clarify goals for industry members while empowering consumers with the information they need to make informed choices. As green chemistry practices evolve, according to the green chemistry principles we are so well aware of, so should the criteria - we should build flexibility into the system. It is important to note that a voluntary system is more pragmatic than standards at this point, given the innovative and often resource intensive approaches that will be required, the longer timeline necessary for industry transformation, and the need for consumers to have choices. As with organic food, not every consumer wants the environmentally-sensitive approach, if it costs more. The International Standards Organization (ISO) 14001 process certification and ACC's Responsible Care Management Practices are good examples to build upon. It is also important to note that potential green chemistry certification should be a recognition of process in addition to the product. As many experts in the DTSC Symposia have remarked, we are not only trying to improve products, but the entire system that goes into making that product. And we should realize that perfection will not be immediate, but evolve over time. In order to motivate voluntary certification some type of incentive, especially market mechanism such as rebate, tax incentive, or fee refund, should be explored. We understand very well that the consumer wants environmental accountability. As consumers gain in accountability, though, so should they gain in

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	responsibility. This is in no way a proposal to allow industry to abdicate its responsibility for the safer use of chemicals, but rather to acknowledge that in a market-based society, corporate and consumer responsibility must closely intertwine to be successful. Beyond making informed purchases, we can best protect the environment when consumers understand Green Chemistry applies to them as well. How they collectively handle chemical products has an enormous effect (for example, nail polish remover can be easily poured down a household sink which would not be allowed in the workplace). The Green Chemistry Coordination Council described in the third point below could assist in consumer education. 2) Issue: The MSDS provides insufficient data on chemical hazards to those downstream in the supply chain. Proposal: The Leadership Group proposes the DTSC explore models other than, or building upon, the current Materials Safety Data Sheet (MSDS) system to provide needed chemical hazard data throughout the supply chain. Our members often find the data included on the Material Safety Data Sheet (MSDS) to be insufficient for determining chemical hazards. Many times important information is addressed in a superficial, boiler-plate fashion or missing altogether. The same raw material from different suppliers may have divergent information. This is in part due to some government regulations requiring that an MSDS be obtained directly from the manufacturer. While we recognize that confidential business information needs to be protected, best possible data on hazard and ecological effects should be made readily available to the supply chain and other stakeholders. In order to meet customer information requirements on chemicals in products, some electronics manufacturers currently must request additional information from upstream suppliers. Instead of doing this on a case by case basis, and in some cases taking the costly approach of reverse-engineering products to determine content, it would be more cost-effective to make raw materials hazard information available further upstream. One approach that could facilitate the sharing of information could be to use the existing MSDS system as a vehicle. More uniform information availability, through approaches such as the ANSI standard for a 16-section MSDS or the IPC 1752 could be an improvement. However, since the MSDS was originally intended to provide more immediate emergency response and use information, it might be best to explore other options such as an MSDS addendum, focused on hazard data. As both REACH and industry efforts such as the Global Product Stewardship initiative make available this data over a 4-10 year timeframe, it is important to recognize that generating this hazard data will take time. A voluntary certification process, with recognition for particularly thorough MSDS's, could also improve the quality of information while allowing chemicals manufacturers to differentiate their products. The Global Harmonization System for the Classification and Labeling of Chemicals (GHS) should be considered, as well. Any model chosen should include the appropriate ecological as well as toxicological information. We also recommend that early stage R&D chemicals be exempted due to their limited use and limited exposures. Worker exposure issues involving recognized hazards (mostly in small/medium enterprises) during the Conversation with California suggests that incorporating MSDS information into real-life practices may be an issue, aside from content. Technical Assistance for those less familiar with critical MSDS information is included as part of the Green Chemistry Coordination Council described below. 3) Issue: Some companies and industries have already made much progress in achieving the aims of Green Chemistry while others lag behind. Green Chemistry involves myriad innovations and the collection and processing of much information. We do not have an adequate way of sharing Green Chemistry practices nor have we made the investment to encourage and reward green efforts. Proposal: The Leadership Group proposes the establishment of a Green Chemistry Coordination Council to collect and promote the sharing of information, highlight businesses with green practices, provide assistance to businesses lacking resources, and educate consumers. The information presented by the speakers, panelists, and stakeholders during the past year of effort on this Initiative has been incredibly thorough, enlightening, and inspiring for all stakeholders. We suggest the DTSC catalog and make easily available information regarding best practice screening processes, green chemical design, collaborative efforts such as the ACS Green Chemistry Institute, and international efforts such as the Global

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	Harmonization System. All stakeholders still have a lot to learn in this dynamic area, and everyone stands to gain from continued information sharing. DTSC's leadership in this area should be continued by establishing it as a central clearinghouse of information for the state and beyond. Many medium and small companies are lacking in appropriate knowledge and resources, and will need assistance in taking advantage of Green Chemistry practices. Providing incentives for the sharing of data and best practices will help all companies. We further suggest building upon and making readily available the information provided by existing efforts: ACS Green Chemistry Institute, Cleangredients, U.S. EPA's Design for Environment Program, Performance Track, the chemical industry's HPV testing program, eChemPortal, EPEAT, and DTSC Technical Resource Center. 4) Issue: California has limited resources to evaluate chemicals for restriction. Chemical safety is a measure of exposure as well as toxicity. While we need to carefully assess and restrict the use of chemicals of concern, complete bans fail to allow for appropriate and beneficial uses. Proposal: The Leadership Group proposes the DTSC prioritize chemicals for screening, testing and appropriate restrictions. We suggest building upon the model of Canada's analysis and prioritization as well as the Proposition 65 review process conducted by OEHHA. Chemicals of high concern should be allowed for targeted, low-exposure uses as determined in an open process by DTSC. The DTSC, together with other relevant State agencies, needs to establish clear and consistent science-based protocols for screening and testing. These should include determination of endpoints of concern and modes of action, where scientific and methodological questions are sufficiently advanced to enable consistently sound science-based judgments of potential risk. The use of a transparent and rigorous process to evaluate risk factors as indicated by toxicological, epidemiological, and exposure data will allow us to compare the relative importance and safety of chemicals as well as determine whether any restrictions or substitutions are appropriate. A scientific panel of experts with a range of theoretical and applied chemicals experience can best establish and oversee a process acceptable to all stakeholders. The Proposition 65 review process may offer a starting point for development of a thorough, scientific process to meet these broader needs. Government entities around the world have been or are in the process of revamping their chemicals use policies. Although the DTSC will need to analyze the individual needs of our state through such means as chemical mapping, we should coordinate with the chemicals policies of other countries to minimize confusion, cost and competitive impacts. Starting with the thorough screening done by Canada's Environmental Policy Act (CEPA) would allow us to build upon their scientific knowledge base and mitigate the burden of data gathering. Any proposed restrictions or mandates should be targeted and include careful evaluation of alternatives. This targeted approach will allow us to concentrate our resources where most needed. Furthermore, any mandates should be harmonized with systems in other countries as much as possible. While we wish it were not necessary to use chemicals determined by such scientific protocols to be of high concern, many times they are needed to promote human health or advance ground-breaking research. This is the uncomfortable irony with which we will have to live until we find better alternatives. In the meantime, targeted use of these chemicals under highly controlled and low-exposure scenarios should be allowed by DTSC, after an open, scientifically based stakeholder process. In the absence of safer alternatives, which should be technically feasible, improve health/safety/environmental profile, be of comparable or superior performance, cost-effective, and be capable of persistence, banning should be avoided. In that case, resources should be devoted to R&D or incentives should be provided to develop cost-effective alternatives. Our goal should be a marketplace where informed decision making at both the manufacturing and consumer levels is consistently delivering changes/substitutions that advance our collective interests along the dimensions outlined above. We recommend that novel R&D chemicals, used in relatively tiny amounts in highly controlled settings, be excluded from any consideration of a restriction or mandate. There are rarely, if ever, exposures outside of the laboratory. Government oversight of these chemicals would not be cost-effective and would be counterproductive to the aims of Green Chemistry. Flexibility in this type of research chemical use promotes the innovation of safer chemicals and processes. Both CEPA and REACH exempt these chemical uses. Exemptions should also be allowed for select pilot demonstrations and testing.

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	5) Issue: It will take a significant amount of time for industry and consumers to move to Greener Chemistry and we need to address pollution concerns in the meantime. Existing efforts at pollution prevention in the state utilize a collaborative model that has proven effective, but has been limited by its modest resource commitment and its narrow manufacturing focus. Proposal: The Leadership Group proposes greater investment in pollution prevention in the short term as well as extension of the current CA Pollution Prevention model to downstream chemical users as an element of the long term Green Chemistry strategy. Pollution prevention programs and policies such as SB 14 have been promoted for quite some time, yet they never receive anywhere near adequate funding and attention. We need to increase our investment in pollution prevention assistance, especially for medium and small businesses that either lack the resources or motivation to tackle the problem on their own. Since pollution prevention has led to demonstrated improvements and optimization of chemical processes, it is a critical, complementary approach to Green Chemistry's goals of better chemical design. The model of collaboration between companies, the DTSC and third party experts (in the case of the SB 14 program, from the University of California), may also offer a model applicable to a broader Green Chemistry strategy. The impressive accomplishments of the Institute for Research and Technical Assistance in enabling development of substitutes for problem solvents in various applications suggest that such targeted 3rd party collaboration may pay dividends in products/product use as well as in manufacturing. This suggests the possibility of 1) taking chemicals of top priority concern, 2) identifying the specific applications or industry uses posing the greatest risk from those chemicals, and 3) applying a collaborative process of agency, industry and third-party experts to identify or develop viable alternatives that can maintain efficacy, but reduce risk in those targeted applications. 6) Issue: The stakeholder process for developing Green Chemistry has provided much more comprehensive progress than could have been achieved otherwise. Proposal: The Leadership Group proposes we continue the Conversation with California to sustain Green Chemistry progress. The dialogue between DTSC and stakeholders has been very helpful and will result in more well-developed, effective policy. We commend the DTSC for encouraging creativity in finding safer alternatives and providing opportunities for open-ended discussion. There remains, though, a very real need for extensive further discussion by the stakeholders in this Green Chemistry Initiative. We hope that the inclusive nature of this process is not at an end. There are so many pieces to Green Chemistry and as the focus narrows to various subtopics, meaningful stakeholder participation will be essential. We have all built personal relationships and broadened our understanding of the various points of view. It would be a shame to toss this hard-won experience aside.
F-C2C-9	The Western States Petroleum Association (WSPA) is pleased to offer the following comments on policy options being considered in the context of Cal-EPA's Green Chemistry Initiative. Many of the comments submitted to DTSC to date and debated in public forums refer to the need for California to supplement the requirements of the Federal Toxic Substances Control Act (TSCA). Prior to immediately moving in this direction, WSPA believes that DTSC must evaluate what regulations and information are currently available and whether these tools are being appropriately implemented and applied prior to developing new programs. Indeed, we expect this analysis is already underway, pursuant to the mandate to conduct a "baseline assessment" of existing programs and information described in the April 20 memorandum from Cal-EPA Secretary Linda Adams announcing the Green Chemistry Initiative. We further expect that this analysis will be presented to Initiative stakeholders for review and comment along with the policy options that flow from it, to ensure that all relevant information has been considered, including information obtained from national and international programs. We are optimistic that this approach will lead to meaningful improvements in existing state programs. on behalf of Western States Petroleum Association

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F-C2C-10	I am a resident of OJai, California, and am concerned about the safety of many of the products we use from toxic chemicals in them - mostly food, but also pharmaceuticals, cleaners, etc. I have learned about the Green Chemistry Initiative which provides an opportunity to protect California by acting to restrict or eliminate especially dangerous substances and by mandating safer alternatives. This is a wonderful idea and I heartily endorse it. However, I really encourage you to ensure that in addition to incentive programs, the Initiative implements protective regulations, including restrictions and bans of chemicals for which the weight of evidence demonstrates a severe hazard to human health and/or the environment. Many thanks for considering this suggestion. on behalf of Walter M. McClelland
F-C2C-11	I am in support of the Green Chemistry Initiative to restrict or eliminate dangerous substances in California. We are being exposed to far too many chemicals in our daily environment and many of us are getting sick. It is especially necessary to get them out of commercial cleaning products that are used everywhere, from stores to doctor's offices and even hospitals! We need some strict regulation on use of harmful chemicals that in many cases can simply be replaced by less or non toxic ones. This is a critical situation which requires regulations to test chemicals and ban those shown to be a hazard to our health and well being. Please reply too: Diane Brodd on behalf of Diane Brodd
F-C2C-12	I would like to add my support of the Green Chemistry Initiative to restrict or eliminate dangerous substances in California I would like to see this initiative include the problem of chemicals being used in our daily lives that have not been tested for neurotoxicity in children. I urge you to include restrictions and bans on chemicals that demonstrate a hazard to our health and/or environment. This is a critical situation that requires immediate attention by not only providing incentive programs but requiring restrictions and bans on those chemicals that are potentially dangerous. Please reply too: Linda Blackwell on behalf of Linda Blackwell
F-C2C-13	Dear Director Gorsen: The Consumer Specialty Products Association (CSPA) has appreciated your continual efforts to include us in the discussions and stakeholder input on the Department of Toxic Substances Control (DTSC) California Green Chemistry Initiative. We also appreciate this opportunity to provide supplemental comments in addition to the information that we have provided on the “Conversation with California” website. CSPA is a national nonprofit trade association that represents more than 260 companies engaged in the formulation, manufacture, distribution and sale of consumer, institutional and commercial products. CSPA member companies manufacture and market a wide range of products, including: cleaning products, disinfectants and sanitizers, candles and air care products, household pesticide products, automotive products used to clean and maintain vehicles, and polishes and floor maintenance products. CSPA members are committed to manufacturing and marketing safe products which are protective of human health and the environment while providing essential benefits to consumers. CSPA and our members support the broad goals of the Green Chemistry Initiative and look forward to

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	working with DTSC and other stakeholders in the state to help spur green chemical innovation and ensure that products are safe. I. Background CSPA member products improve the quality of human life and are necessary to protect the public health against dangerous diseases, infestation, and unsanitary conditions. CSPA members are committed to providing products that are thoroughly evaluated for human and environmental safety and go through rigorous safety-based assessments before they are brought to market. CSPA members are also committed to clear and meaningful labeling on consumer products, i.e., label instructions are written to ensure that consumers use products in accordance with label instructions. Finally, CSPA members are committed to the development of green products that are safe for human health and the environment. In addition, CSPA members routinely apply green chemistry and green engineering principles in their operations and have been honored with awards for their efforts. The consumer products industry develops products that meet or exceed safety requirements of all state and federal agencies in the United States and Canada charged with regulating those products, including the California Department of Pesticide Regulation, the California Air resources Board, and other state agencies, U.S. Consumer Product Safety Commission (CPSC), the U.S. Environmental Protection Agency (EPA), the Occupational Safety and Health Administration (OSHA), the U.S. Food and Drug Administration (FDA), Health Canada, and Environment Canada. While we support the California Green Chemistry Initiative and believe there is much that can be done to address and spur the development of green chemical technology, CSPA believes that regulation of our members' products under current federal and state regulatory authorities provides safety and protection to consumers. Below is a short summary of the various regulatory authorities that ensure the safety of consumer products and their ingredients. While it is not an exhaustive list of the regulatory requirements these products undergo, it illustrates the extensive oversight that already surrounds the manufacturing and marketing of consumer specialty products. II. Toxic Substances Control Act (TSCA) The Toxic Substances Control Act (TSCA) gives EPA the authority to regulate chemicals produced or imported into the United States. EPA repeatedly screens these chemicals and can require reporting, testing or a complete ban of those that may pose an environmental or human-health hazard. Any person intending to manufacture or import a chemical substance first must determine whether the substance is listed on the TSCA Inventory. If it is not listed, the prospective manufacturer or importer must satisfy premanufacturing notice (PMN) requirements before commencing production or importation of the substance. In filing a PMN, the manufacturer or importer must give their identity, specific chemical identity, product volume, use, exposures (worker, user and consumer), and environmental fate. Additionally, any test data relating to environmental or health effects of manufacturing, processing, distributing, using, or disposing of the new chemical substance must also be submitted. The PMN must be filed at least 90 days prior to the commencement of commercial production or importation of a new chemical substance. EPA's review of a PMN consists of seven major stages designed to ensure that EPA examines all aspects of a new chemical, including its physical and chemical properties, potential toxicity, exposure of workers, users and consumers, and economic benefits. EPA has the authority to prevent, delay, or limit manufacture after the initial PMN review period ends. EPA can issue an administrative order regulating a new chemical substance if the Agency finds that there is insufficient information to reasonably evaluate the risk and either the chemical may present an unreasonable risk to health or the environment or it will be produced in substantial quantities with the result that either substantial quantities will enter the environment or there will be substantial or significant human exposure to the substance. While EPA does not require a designated set of toxicity testing to be included in the PMN submissions, it has identified several categories of chemicals and the concerns areas where it has required such tests. Under these requirements a company must provide information addressing these risk concerns or face restrictions based on default assumptions. EPA has broad authority to regulate the existing chemicals in commerce as well. If a chemical presents unreasonable risks to health or the environment, EPA must initiate a rule-making to regulate the chemical. As of 2007, EPA has issued over 1300 Significant New Use Rules, which restrict the manufacture, import, or processing of a substance . EPA can prohibit or limit the manufacture, processing, distribution, commercial use or disposal of the chemical; prohibit or limit the use of the chemical

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	in a concentration above a specified level; require adequate warnings and instructions with respect to the chemical's use, distribution in commerce or disposal; require record-keeping; prohibit or regulate disposal of the chemical; and require notification to the purchasers or the general public about the risks involved and to replace or repurchase a chemical substance or mixture if requested. EPA also has the authority under TSCA to require manufacturers of substances to develop safety and environmental data. III. Consumer Product Safety Act (CPSA) The Consumer Product Safety Act (CPSA) provides that when the Consumer Products Safety Commission (CPSC) finds an unreasonable risk of injury associated with a consumer product it can develop a standard to reduce or eliminate the risk. The CPSA also provides the authority to ban a product if there is no feasible standard, and it gives CPSC authority to pursue recalls for products that present a substantial product hazard. The CPSC is authorized to set safety standards as to consumer product performance, composition, contents, design, construction, finish, packaging and labeling. In general, the manufacturer of a consumer product subject to regulation must issue a certificate announcing compliance with the applicable standards, and must label the product with the date and place of manufacture, the identity of the manufacturer, a certification of compliance with any applicable rule, and a brief description of such rule. Manufacturers are required to immediately notify the CPSC if it obtains information which reasonably supports the conclusion that a product: (1) fails to comply with a consumer product safety standard or banning regulation or a voluntary consumer product safety standard upon which the CPSC has relied upon; (2) contains a defect which could create a substantial product hazard described in the CPSA; or (3) creates an unreasonable risk of serious injury or death. In the last ten years, CPSC obtained 472 voluntary recalls involving 110 million product units. During this time, CPSC obtained 1031 corrective actions (including recalls and other actions to keep unsafe products from consumers). IV. Federal Hazardous Substances Act (FHSA) The Federal Hazardous Substances Act (FHSA) requires labeling of hazardous substances sold to households. It prohibits the sale or introduction into interstate commerce any product which does not comply with the regulations. FHSA regulations provide specific guidelines to determine potential risks specific to the entire formulation and package. Product risk assessments are the basis for label decisions and precautionary label text to protect consumers and children. At a minimum, labels must include hazard signal word, affirmative statement of hazards, the name of each component that contributes to the hazard, and precautionary measures to be taken to avoid risk, required or appropriate instruction for first aid treatment, handling instructions, storage instructions, and "Keep out of reach of children." V. Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) The Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) provides the basis for regulation, sale, distribution and use of pesticides in the U.S. FIFRA authorizes EPA to review and register pesticides for the specified use which a registrant applies for. Before registering a new pesticide or new use for a registered pesticide, EPA must first ensure that the pesticide, when used according to label directions, can be used with a reasonable certainty of no harm to human health and without posing unreasonable risks to the environment. To make such determinations, EPA requires more than 100 different scientific studies and tests for active ingredients. In fact, EPA has banned and severely restricted 64 pesticides in the United States. When EPA registers a pesticide, it approves the product's label, which includes (among other things) directions for use, hazard warnings, and precautions. It is a violation of FIFRA for any person to use a pesticide in a manner inconsistent with its EPA-approved labeling. EPA also has the authority to suspend or cancel the registration of a pesticide if subsequent information shows that continued use would pose unreasonable risks to health or the environment. EPA may decide to remove a pesticide from the market based on information from a variety of sources: new studies conducted by the registrant, the Government, or a third party; incident information submitted by a registrant; or results of the EPA's periodic review of pesticides and tolerances.

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	EPA is currently completing a review of those pesticides registered before November 1984 to ensure that they meet current scientific and regulatory standards. This process, called reregistration, considers the human health and ecological effects of pesticides and results in actions to reduce risks that are of concern. Concurrently, EPA has begun a registration review process for those products registered subsequent to 1984 and for those pesticides that were review under the reregistration process previously. These ongoing review processes assure the continual reexamination of the safety and environmental profile of pesticides. EPA and the states enforce FIFRA primarily through stop sale, use, and removal orders, civil penalties, or a combination of the two. Unlawful acts under FIFRA include: selling an unregistered or misbranded pesticide; selling a pesticide whose composition differs from the one described in the pesticide's registration application, violating EPA's labeling requirements, failing to file annual production reports, and violating FIFRA's export requirements. VI. Recommendations for Product Stewardship & Safety-based Assessments As stated in our November 6 "Conversation with California" entry, CSPA supports company performed safety-based assessments of consumer products prior to the marketing of a product, that take into consideration all of the phases of a product's life-cycle. CSPA also supports appropriate use-restrictions for chemical ingredients when scientific safety-based assessments indicate that they cannot be used safely in a consumer product or use application. CSPA and our members believe that every responsible company should be performing these types of safety-based assessments and supports initiatives that recognize companies for these types of procedures. In fact, CSPA has demonstrated our industry's commitment to manufacturing and marketing safe products which are protective of human health and the environment while providing essential benefits to consumers, when we initiated our Product Care program in 2001. CSPA's Product Care program is a stewardship program for the consumer and institutional specialty products industry where participating companies have agreed to go beyond government regulations in emphasizing health, safety and environmental concerns by carefully designing products, purchasing raw material and packaging, operating safe manufacturing facilities, promoting safe storage and distribution, providing useful product information, answering consumers questions and anticipating product disposal needs. CSPA believes that these types of product stewardship programs should be considered as frameworks for programs developed under the Green Chemistry Initiative. Product Care provides a framework for companies to identify and commit to stewardship principles, share ideas and information and benchmark better performance. Participating companies have pledged to develop management principles for each of seven areas in a product's life cycle from development in a research facility through product use and disposal. Through this program Companies Must Commit to Evaluate: 1. Product Design 2. Raw Material, Package and Service Supply 3. Manufacture and Production Site Management 4. Product Storage and Distribution 5. In-market Support, Incident Evaluation and Follow-up 6. Consumer Education and Outreach 7. Product Disposal Stewardship did not begin when CSPA's Product Care program was initiated in 2001. Responsible companies have long followed policies promoting safe products that provide important health benefits while not adversely affecting the environment. CSPA believes it is vital that these types of product stewardship programs and companies that participate in these programs be recognized and fostered through any program developed under the Green Chemistry Initiative. In particular, CSPA believes that DTSC and California can leverage and recognize programs like Product Care as a way of encouraging companies to establish robust procedures to ensure product safety and environmental safety. VII. Recommendations for Chemical Data Development Initiatives

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	Chemical data development efforts should build on existing statutory and regulatory structures, voluntary initiatives, and data development efforts. CSPA does not support California-specific data development requirements and pre-market approval process for chemicals or consumer products. However, CSPA supports collaboration by DTSC and California in ongoing work by other government agencies to assess chemicals and consumer products. Specifically, California and DTSC could leverage efforts by Health and Environment Canada in addressing priority chemicals in the Chemicals Management Plan. DTSC and California could collaborate with these agencies on their high priority list and avoid needless duplication of current data development and prioritization efforts. DTSC and California could also participate in the effort launched in August during the Security and Prosperity Partnership (SPP) with under the Montebello Agreement involving trilateral cooperation among the governments of Canada, the United States and Mexico to share chemical information and safety assessments. In addition if DTSC and California move forward with efforts to establish chemical priorities the process should be collaborative and should include scientific experts in toxicity and exposure, chemical manufacturers, consumer product manufacturers, and nongovernmental organizations. CSPA believes inclusion of manufacturers of the chemicals and consumer products could provide toxicity and exposure/use data to determine whether the uses of “priority chemicals” are safe or should be restricted. As referenced above, CSPA does not support pre-market approval of chemicals or consumer products, because this would be an incredibly burdensome and expensive process for the State of California and would unnecessarily slow down the development of products. For example, the Department of Pesticide Regulation registers approximately 12,000 pesticide products sold in the State and in 2005-06 it cost the agency over $17.5 million to review and approve these products . To require pre-market approval for the hundreds of thousands of chemicals and consumer products in commerce would be cost-prohibitive. VIII. Support for Appropriate Ingredient Disclosure Throughout Green Chemistry discussions and in recent market research consumers and others have expressed a desire to know what ingredients are in the products they use in their everyday life. These consumers are interested in having this knowledge in order to make informed product choices. It may appear that product ingredient information may not be readily available to consumers; however, our members willingly provide information to meet consumer needs. While some organizations have expressed concerns about ingredients in consumer products, much of this information is inaccurate. This is primarily due to the reliance on outdated resources that are dependant on old technologies or on assumptions made by sources that are not well versed in specific product chemistries. CSPA and our members support an appropriate approach to providing accurate information to consumers through ingredient communication. Our industry stands behind the safety of our products and the appropriate use of chemical ingredients in those products. We would like to work with DTSC and the State of California to implement a means of ingredient communication that would provide consumers with the information they can use to make informed decisions regarding the products they use in their homes. IX. Essential Principles for Green Chemistry Initiatives As any Green Chemistry program moves forward, CSPA believes, that in order for the effort to be credible and have a positive impact it must be structured in a way that includes all stakeholders and provides a sound scientific basis for the program. Specifically, Green Chemistry should ensure the safety of chemicals and consumer products through the use of sound science in the decision-making process. Additionally, green chemistry programs should be designed to ensure that products remain technologically and commercially feasible to produce; and that product efficacy, performance, and usability are not compromised or undermined. As such, Green Chemistry must foster innovation and not limit the development of new chemistry technologies. X. Support for Initiatives to Spur Green Innovation Stimulating green chemical innovation has been a core concept of the Green Chemistry Initiative, and discussion of this topic has shown the promise that new technologies have for improving the standard of life in California and reducing environmental impacts. CSPA supports collaborative efforts to

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	encourage public and private partnerships with the goal of developing “greener” products and “environmentally responsible” ingredients rather than mandatory and voluntary state labeling programs that endorse green products or programs that stipulate a single third-party certification of green products. CSPA supports initiatives that provide incentives for companies that innovate and develop technologically and commercially feasible products using green chemistry. CSPA also supports recognition for companies that develop sustainable business operations, processes, and/or products. We also believe there are unique opportunities in California for research that identifies areas for the use of green chemistry in consumer products. Essential elements to ensuring that these technologies become widespread are implementing State policies that are designed to overcome barriers to commercial application of green chemistry research and development efforts. XI. Conclusion Once again, CSPA has appreciated DTSC’s efforts to include all stakeholders in the discussions during the California Green Chemistry Initiative. CSPA believes that the Green Chemistry Initiative holds incredible promise for helping spur green innovation in California. We also believe that the Initiative can leverage ongoing chemical data development initiatives in setting chemical priorities. Further, CSPA believes that DTSC should recognize and encourage the current product stewardship procedures and safety-based assessments that companies perform prior to marketing a consumer product. CSPA would also look forward to working with DTSC and the State of California on an appropriate ingredient information system to help inform consumers when making their purchasing decisions. CSPA looks forward to continuing to work with DTSC through the Green Chemistry Initiative, as recommendations are developed, and CSPA hopes that our continued participation in this discussion will provide meaningful help to the endeavor. Please feel free to contact me directly at (202) 833-7328, or CSPA’s in-state representation, Laurie Nelson at (916) 446-1111 if you have any questions about these comments. Respectfully Submitted, Andrew R Hackman Manager, State Affairs Programs
F-C2C-14	The American Chemistry Council (ACC) is pleased to provide these comments as a final submission to the “Conversation with California” on the Department of Toxic Substances Control’s (DTSC) Green Chemistry Initiative (CGCI). These comments supplement another ACC blog entry today that presents a proposal for DTSC’s consideration (“ACC Proposals for Future Actions Related to California Green Chemistry Initiative”). The CGCI has attempted to address a wide range of issues and approaches to promoting “green chemistry” in California. As we understand it, the input received by DTSC will be used to assess the options that can be presented to “establish the blueprint for keeping California in the forefront of protecting health and the environment in a robust economy. . . [and show that] California is leading the effort to fundamentally change the way it deals with its chemicals and waste.” ACC believes that the overriding objective of the CGCI – “protecting health and the environment in a robust economy” – properly acknowledges that encouraging and sustaining a sound commercial economy is an important basis for “green chemistry.” Indeed, ACC believes that “green chemistry” must be considered first and foremost a way of doing business, not a government mandate. As numerous commentators on green chemistry have acknowledged, green chemistry cannot be legislated, although both green chemistry and green engineering can be promoted and enhanced by appropriate policy decisions. Clearly proposals for additional regulatory requirements and for additional legislative authority may be part of the recommendations made by DTSC to CalEPA by mid-2008. Those proposals, however, should be based on a clear understanding of their objective, the likelihood that the proposals will achieve the objective, the time frame in which they can reasonably be implemented, and the likely positive and negative impact on California, including health, environment, and the economy.

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	ACC believes that the largest single challenge for DTSC is bringing coherence to the hundreds of suggestions the Agency has received through the "Conversation with California" and the stakeholder meetings. The volume and breadth of the recommendations reflected in the "emerging options" paper does not, in our view, lead to any clear conclusions. Our comments below on each of the major categories reflected in the "emerging options" document are intended to focus on policy and program options that can be practically and pragmatically implemented, while achieving the overall objective of the CGCI. I. Policy Options The DTSC's recommendations to CalEPA should be built around a core set of reasonable policy options. A few recommendations have been made that California should adopt a "substitution" policy – a stated policy of forcing the substitution of hazardous chemicals for "less hazardous" alternatives. ACC believes that a substitution policy is impractical at best, and a negative disincentive for technological progress and innovation. "Green Chemistry" is not just about substitution of one hazard for another; it is ultimately about the reduction of risks to health and the environment that are otherwise unmanaged. Indeed, a risk reduction policy seems to ACC to be a much better approach to accounting for the economic, social, health, and environmental dimensions of green chemistry, particularly because by definition it will address not only inherent toxicity (hazard), but potential exposures as well. Perhaps most importantly, a risk reduction policy (one that addresses both hazard and exposure) correlates very well with the pollution prevention policies that have been at the heart of many existing DTSC programs, and can serve as a meaningful focal point in encouraging the development of sustainable chemistry, green engineering, and products that improve the lives of Californians and the State environment. The successful implementation of a risk reduction policy requires a clear articulation of the objective, the various options for reflecting that objective in regulation, legislation, and programs, and the consequences and expected benefits of such a policy. Such an approach would suggest that DTSC needs to define success in this initiative, identify the problems that are in need of a solution, and assess the resources, tools, information, and mechanisms necessary to achieve those goals. ACC believes that California's primary objective should be the reduction of risks to health and the environment that are otherwise unmanaged or unacceptably under-managed. And to succeed in that objective, California must establish a process by which state-wide priorities can be identified, where existing and new risk reduction measures – spanning the entire spectrum from research and financial incentives to regulation – can be appropriately assessed, and where the relative benefits and impacts of the approach can be evaluated. In short, a risk reduction policy provides an important and appropriate organizing principle for DTSC's "Green Chemistry" recommendations. II. Legislation/Regulation Any legislative or regulatory proposals emerging from the Green Chemistry Initiative should be oriented toward proposals that support the underlying policy objective of risk reduction. As a practical matter, ACC agrees that chemical specific legislation may not be a practical way of using the State's resources to address critical risk related issues. For this reason, ACC believes that if DTSC determines that it needs a program specific to California, the key component of the DTSC's recommendations should be a proposal for a regulatory process that allows DTSC to identify key priorities and take appropriate action on those priorities. We want to be clear – ACC is not recommending that DTSC adopt a comprehensive chemical regulatory program. We believe that there are practical, pragmatic options for California far short of a California version of the federal Toxic Substances Control Act (TSCA), a California version of Europe's Registration, Evaluation and Authorization of Chemicals (REACH) program, or a California version of Canada's Chemical Management Plan. Each of those programs has or will produce information that is or will be useful to the State in identifying priority chemical risks that warrant reduction actions, without requiring the significant administrative infrastructure, costs, and burdens associated with a comprehensive chemical regulatory regime. DTSC has an important opportunity to consider how it can promote "green chemistry" by leveraging the significant work already done by many different organizations related to chemicals in commerce. ACC believes that in the vast majority of cases, information on particular chemicals, uses, or exposures is or can be readily available from a number of sources. Well-conceived options for additional regulatory authority should address how

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	California can identify priority risks, appropriate information on manufacturing, import and use, and information on available risk reduction measures. We also want to be clear that if DTSC determines that it needs its own regulatory program specific to California, ACC is recommending that DTSC suggest narrowly drawn regulatory authority that assures that appropriate risk reduction strategies are developed and implemented for key chemical priorities. For example, a number of commentators to the "Conversation with California" have suggested that California needs to have a complete record of all chemicals in California commerce, whether manufactured or imported as discrete chemicals or as components of preparations or articles. ACC believes that such an approach is unrealistic and impractical, particularly given the relative benefit of such a system compared to its costs. Other commentators have made the simplistic suggestion that California should adopt Europe's REACH system. Those suggestions are made with little knowledge of the REACH legislation and its likely impacts. Few understand that REACH does not begin to operate until June 2008, and that the registration component will not be completed for 11 years. Few understand that the estimated costs of simple registrations and the use-specific licensing component of REACH (authorization) are now three times higher than they were when REACH was first being negotiated. Few understand that REACH does not result in a complete evaluation of all chemicals in commerce. And fewer still comprehend fully just how complex an 850 page regulation, and its more than 4,000 pages of guidance, really is. DTSC must fully understand REACH before it commits to proposing such a regulatory system for the State. On the basis of the "Conversation with California", however, the debate over REACH in California has been long on rhetoric but short on detail, and it would be premature at best for DTSC to include a REACH recommendation in its options. As ACC has noted in prior submissions, Canada, Mexico, and the United States agreed in August 2007 on a cooperative program to accelerate screening level risk management decisions for chemicals in commerce in North America. The program, commonly referred to as the Montebello Agreement, will result in decisions on a faster pace than REACH. The Montebello commitment is to complete the work by 2012. More importantly, that effort should produce information that California can access and use as the State reviews priority chemicals. III. Compliance and Enforcement DTSC's "emerging options" document contains several recommendations aimed at compliance and enforcement issues. In general, it will be difficult to enforce broad concepts of "green chemistry," largely because what constitutes "green chemistry" (or green engineering) will differ depending on the product, process, company, or industry involved. To the extent that regulatory actions are recommended by DTSC, appropriate enforcement measures will likely need to be considered. It is critical that those enforcement measures be capable of uniform application. In addition, ACC believes that California should address what steps might be necessary to deter false claims of "green-ness" that mislead consumers and distort the market. IV. Data/Information As ACC has noted in other "Conversation with California" submissions, California does not need information on each and every chemical in commerce, it needs information on chemicals considered priorities by the State. A number of sources for supporting information already exist, and we urge DTSC to rely on existing information as a first, but necessary, step. Only when potential data gaps are understood can approaches to filling specific data needs be addressed. Many of those sources are already being linked in broader web-based portals, by institutions such as the Organization for Economic Cooperation and Development (OECD). Moreover, those information sources are complemented by data and information provided by industry in programs like the High Production Volume (HPV) Challenge, and the Voluntary Children's Chemical Evaluation Program (VCCEP). In submissions to the "Conversation with California," some have suggested requiring extensive new laboratory animal testing, while others have opposed testing altogether. ACC encourages the use of alternatives to animal testing when these alternatives are scientifically valid and predictive and acceptable to regulatory bodies. Furthermore, experience has shown that arraying toxicity tests in a tiered framework, drawing upon standardized study protocols to develop data on toxicologically relevant endpoints for assessing human health hazards, applying this information to groups or series of similar chemical substances provides scientific rigor and at the same time provides flexibility to account for differing chemical toxicities and to address specific concerns associated with existing or anticipated exposures to specific chemicals. In this manner, tiered testing focuses efforts to collect data

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	where it is most needed, promotes screening of the greatest number of prioritized chemicals (or classes of chemicals) and, where indicated by specific toxicity results, indicates which substances pose a particular concern and points to the specific, more complex test that should be considered. Thus, tiered-testing and risk-based approaches are both efficient and effective in protecting human health. ACC also believes that the Montebello Agreement recently concluded by Canada, Mexico, and the United States deserves considerable attention by DTSC. Under the Agreement, the U.S. Environmental Protection Agency has committed to completing screening level risk management decisions on nearly all chemicals in commerce. More importantly, the commitment is to complete those reviews by 2012, thereby providing a basis for identifying chemicals that pose priority health or environmental risks. That information will include both hazard and exposure related information, and will be an important data source that California should rely on. ACC believes that DTSC should not wait for the conclusion of the CGCI to engage in discussions with U.S. EPA and the Canadian government on how the State can coordinate with and leverage those programs in support of the CGCI. Several options outlined in the “emerging options” document suggest that California should adopt a “no data, no market” approach. While the approach may initially seem attractive, the scope of the requirement will obviously determine its potential utility and impact. ACC believes such a requirement implies that California wants all information on all chemicals, and as we have stated earlier, there are significant resource implications from that approach. Perhaps more to the point, for the vast majority of chemicals, such a requirement will have little or no marginal benefit for health and environmental protection. Under the Canadian Chemical Management Program (CMP), for example, some 19,000 chemicals did not meet the criteria used for categorization and do not need further action at this time. A simplistic approach to a “no data, no market” requirement has the potential to require a significant duplication of effort for both the State and the regulated community. V. Education/Outreach ACC concurs with many of the comments reflected in the “emerging options” document on education and outreach about “green chemistry.” There are several dimensions to the education and outreach issues. First, there is a need for education that the broad scope of “green chemistry” includes “green engineering,” and that it is not limited to simplistic hazard substitution. Moreover, a concerted effort to disseminate appropriate information on the accomplishments, best practices, costs, and benefits of “green chemistry” would help assure that all interested stakeholders understand the concept and limitations of the approach. ACC believes that suggestions to require that manufacturers publicly disclose the chemical content of their products could be considered in circumstances where it is clear that proprietary information is not compromised. We have made clear in other submissions to the “Conversation with California” that ACC members believe health and safety information should never be considered proprietary or confidential information. Second, there have been a number of excellent recommendations for enhancing academic curricula, particularly at the post-secondary level, to cover topics related to green chemistry. Expanded training opportunities in toxicology (both human and environmental), exposure assessment, life cycle analysis, and risk assessment make sense. Third, ACC agrees that one option to establish California as a locus of “green chemistry” may be the creation of a separate organization, perhaps one affiliated with the University of California system or other academic institution. However, it should be recognized that a number of similar institutions already exist throughout the world, and California should have a complete understanding of the purpose and objectives of such an institution before recommending its creation. VI. Incentives ACC also agrees that a series of well-conceived and well-executed incentive programs can help create a better understanding of and commitment to “green chemistry.” Many of the options discussed through the “Conversation with California” warrant additional consideration. For example, there have been several suggestions that California should subsidize the market for “green” chemical products. While notionally attractive, ACC believes that there needs to be clear criteria for what constitutes a product or process that qualifies for support, and clear criteria for assessing

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	whether there are market failures that such support can remedy. Suggestions for fee rebates appear to be based on an assumption that industry will be paying fees, although for what remains little understood. Other options, such as low interest loans, or grants, or tax incentives (like tax "holidays") may also be appropriate. ACC disagrees that it is necessary to strengthen product liability law to provide a greater incentive for consumer protection from potentially harmful toxic exposures. California (and indeed the United States in general) already has a robust civil liability system that provides significant incentives to manufacturers (not just those located in California) to take steps to protect consumers from potential exposures to harmful chemicals. VII. Research/Technology One of the most exciting components of the Green Chemistry Initiative is the potential to greatly expand research and development. As California no doubt recognizes, the chemical industry invests billions of dollars each year in fundamental research and development. One out of every four U.S. patents are related to chemistry, an indication of just how robust R&D is in the field – and an indication that the business of chemistry is in fact the Nation's most innovative business segment. ACC believes that a set of clear criteria and objectives for partnerships with California (either businesses or academia), and an understanding of how California would approach the ownership of the intellectual property associated with such research, would help assure that companies are aware of the opportunities for support for R&D activities. VIII. Voluntary Measures ACC believes that any regulatory or legislative proposals suggested by DTSC should include an explicit acknowledgement of the value of voluntary programs – and an explicit compliance exemption for companies that comply with programs that meet certain criteria. In particular, California should explicitly recognize those industry-wide programs that have credible, publicly-reported performance metrics, and credible, third-party assessment and certification requirements. In some cases, compliance is a requirement of membership in an industry association or organization. Programs like these include management system approaches that address chemical product evaluations, including assessments of manufacturing processes and intended uses, among others. Explicit recognition of these systems will provide an important incentive for companies to demonstrate their performance in compliance, and would leverage scarce resources in both California and throughout the industry. IX. Funding ACC understood many of the comments in this category of the "emerging options" document to be directed at the question of how the State of California will fund their activities under a Green Chemistry Initiative, including regulation, compliance, and training programs, rather than funding incentives for cooperative research and development. ACC does not support the imposition of fees to support a Green Chemistry Initiative in the abstract. Similarly, ACC does not support the imposition of a surcharge on chemicals, or products made with chemicals, to fund activities to address long term environmental impacts. ACC believes the basis of a surcharge is problematic. For example, is the surcharge to be assessed on the first use of a chemical (or the use of virgin materials), or for the possible consequences of use of the product? Other suggestions in this area included fees on the mere use of toxic substances, which would then be used to fund government toxics use reduction activities, including data analysis and the provision of technical assistance. ACC believes that, should California believe there are general benefits to be obtained from government agency activities in "green chemistry," those activities should be funded by general tax revenue. * * * * * * * * Finally, ACC believes that given the broad range of public input solicited and gathered by DTSC throughout the "Conversation with California", the Department should consider providing an opportunity for public comment on its proposed recommendations to CalEPA and Governor Schwartzenegger. Publication of the proposed recommendations will provide a critical insight into how DTSC views the Green Chemistry Initiative and the opportunities to take short and long term action in the arena.

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F-C2C-15	The American Chemistry Council (ACC) is pleased to provide the proposals and rationale for those proposals outlined below for consideration by California as it moves forward with the Green Chemistry Initiative. PROPOSAL: INFORMATION ON CHEMICAL EVALUATION APPROACHES A company that manufactures chemicals in and/or imports chemicals into California should have a publicly available overview of the approach it uses for chemical evaluation and assessment. Companies should affirm to the state that the chemical evaluation and assessment approach is publicly available. RATIONALE: Responsible companies conduct systematic and rigorous evaluations of their chemical products to assure that these products deliver their intended benefits, while protecting public health and the environment. These evaluations should include characterizations of risk associated with the use of the chemical products and a determination of any risk management precautions and activities needed to address that risk. California public stakeholders would benefit from a greater understanding of how product safety and management decisions are made. Implementing this recommendation would have a minimal cost-impact to the State. PROPOSAL: MANAGEMENT SYSTEMS A company that manufactures chemicals in and/or imports chemicals into California should have a management system that includes process and product safety elements. Company systems should be subject to third party certification by representatives of a nationally recognized auditing Board (e.g., Board of Environment, Health and Safety Auditor Certifications or ANSI-ASQ-National Accreditation Board). Companies should affirm to the state that the management systems are in place and that third party certification has occurred. RATIONALE: Industry and government experience in applying management system principles to safety and environmental issues has shown that this organizational approach is both prudent and effective. A management system is a recognized business management practice that allows an organization to strategically address its environmental, health and safety matters. System implementation reflects accepted quality management principles based on the “Plan, Do, Check, Act,” model using a standard process to identify goals, implement them, determine progress, and make improvements to ensure continual improvement. Properly implemented, a management system not only improves environmental and health and safety performance, but also increases overall efficiency and accountability. Implementing this recommendation would have a minimal cost-impact to the State. PROPOSAL: STATE RESEARCH & DEVELOPMENT CENTERS The state of California should establish research and development centers focused on sustainable chemistry and/or sustainable engineering within its University of California system, such as Centers for Excellence in Sustainable Chemistry at leading University of California campuses that are networked to address major sustainability opportunities and issues. RATIONALE: California should utilize its well-known and respected university system and professional associations in efforts to promote innovation through research programs in sustainability. These programs could include non-proprietary or pre-competitive work. PROPOSAL: CURRICULUM FOR CHEMISTRY DEGREES California should make risk assessment, including toxicology and life cycle thinking, part of the required curriculum for chemistry and/or chemistry related degrees conferred by State institutions. RATIONALE: California could be a leader in promoting appropriate and necessary curriculum for future chemists. This curriculum would ensure that as future chemists develop new products, they fully appreciate the potential impacts of such products on health and the environment. Dr. John Warner’s Green Chemistry graduate curriculum at the University of Massachusetts – Lowell is a possible example for consideration. PROPOSAL: FINANCIAL INCENTIVE AND RECOGNITION AWARD PROGRAM California should establish an awards program to provide financial incentive and recognition for innovations. This program should be open to all sectors

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	of the chemistry enterprise – including manufacturers, users, academic and government entities. Options for such a program could include grants, licensing fees or other income to researchers who develop innovations in non-proprietary or pre-competitive work. RATIONALE: Innovation results should be encouraged through financial incentives and recognitions. PROPOSAL: VALUE CHAIN COMMUNICATION California should encourage companies in important value chain sectors to identify information needs of the value chain's members (upstream and downstream companies) and to establish communication processes to meet those information needs RATIONALE: By facilitating the flow of hazard and safe handling information along the value chain, California will enable companies within a value chain sector to access and apply risk information for its own operations and for its own products PROPOSAL: REGULATORY PROGRAM BUILT ON LEVERAGED INFORMATION If DTSC determines that it needs its own regulatory program specific to California, it should adopt the output of the Canadian Chemical Management Plan (based on Canada's categorization and prioritization of the existing chemical inventory) as a solid, scientifically sound foundation. The program should also leverage information that will be generated under the August 2007 Montebello Agreement between Canada, the United States and Mexico. If needed DTSC could establish a California-specific chemical evaluation process to address circumstances in which DTSC identifies uses of concern for priority chemicals that were not on the original CEPA categorization process or that will not be addressed under the Montebello Agreement in the timeframe required by DTSC. The process should utilize a tiered approach, in which chemicals and their uses are prioritized for further evaluation. The process should also utilize risk-based screening and should focus on potential "data needs" versus "data gaps". Producers and users of identified priorities should be engaged in a collaborative process to bring hazard, use and exposure information to improve decision-making. As DTSC proceeds with its process, it should leverage information already generated or that will be generated under regulatory or voluntary chemical evaluation programs. DTSC must be transparent in the processes used to make risk evaluation and risk management decisions. RATIONALE: In order for DTSC to conduct evaluation work in a timely manner, it cannot afford to work in isolation. Establishing an entirely new prioritization program would take years of development before implementation could even begin. Instead, DTSC will need to build from the foundation of an established process and to leverage evaluation work generated by other parties. Stakeholders in California have publicly supported the Canadian Chemical Management Plan based on Canada's categorization and prioritization of the existing chemical inventory. California's collaboration with Canada on this process will accelerate progress in both geographies. The August 2007 Montebello Agreement between the US, Canada, and Mexico will result in significant chemical evaluation work being completed in a relatively short timeframe. DTSC should take advantage of the upcoming work to be conducted by the US, Canada, and Mexico. This would clearly allow DTSC to save time and resources, while advancing the protection of health and the environment. It would also allow DTSC to be viewed as a global leader in integrating the Montebello evaluation outcomes into its own process. If DTSC intends to move forward in the most time-effective manner possible, it must also recognize that a prioritization of chemicals is essential. A set program, with a specific list of chemicals and uses to address in a tiered fashion will provide the structure needed to make progress. If everything is a priority, then nothing is a priority – and nothing gets accomplished in a timely manner. Recognizing time limitations, as well as stakeholder concerns with un-necessary animal testing, DTSC must be pragmatic in leveraging existing information that support the DTSC's overall program. This could include data submitted under regulatory programs, such as the 2006 Inventory Update Rule data that could be used to develop an initial understanding of volume, use and exposure and to assist in identifying uses of that raise the greatest concern. It should also include information generated under voluntary chemical evaluation programs, such as the High Production Volume Challenge.

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F-C2C-16	Cradle through cradle Moving towards a cradle through cradle approach goes much beyond the current approach of simply looking at chemical properties & toxicity. Objective criteria need to be developed that do not only address toxicity, volume used or reduction in use, & long term health & environmental impacts, but also energy use regarding mining of raw materials, service life including the role of the substance, end-of-life potential with respect to re-use, recycling etc... Furthermore product stewardship initiatives addressing management with respect to specific substance properties should be integrated in a LCA approach, especially if such programs are designed towards a sustainable & long-term minimisation of the impact of the substance. This is in line with the SAICM approach where the management is central as it allows for better understanding & hence sustainable development in the use of chemical substances. This is an essential part of what constitutes a green approach to chemistry.
F-C2C-17	The below listed organizations appreciate the opportunity to provide comments on the California Environmental Protection Agency's (CalEPA) Green Chemistry Initiative. Our organizations represent many of California's and the nation's leading industries and employers. We fully support science and risk based chemicals management policies which protect health and the environment while assuring product safety and efficacy and promoting innovation in the marketplace in California. Chemistry is at the foundation of a wide range of industries. The science of chemistry helps to make the lives of Californians and others throughout the world safer, healthier, and more productive. Chemistry goes into modern materials used to make insulation, weatherization equipment, firefighting and other emergency response equipment, lightweight vehicle parts, coatings, lubricants, and energy-efficient appliances. Just a few of the many industries that use chemical or chemical-derived products include farming, new residential construction, emergency response services, plastic bottle manufacturing, electronics and high-technology, consumer products manufacturing, upholstered furniture manufacturing, dry cleaning services, building services and health care. We support the statement of CalEPA Secretary Linda Adams that this "…strategy, and the policy it champions, must have at its core and be governed by sound science." Advancements in science make possible product innovations that meet consumer needs, while increasing knowledge about the safety of chemical products and protecting the environment. A science-based assessment that evaluates human health and environmental considerations, performance, and cost and feasibility must include an examination of traditional and alternative technologies, materials and processes. Incentive-based approaches can allow companies to more easily and effectively share this knowledge, best management practices, and opportunities. Our industries and employees appreciate California's leadership in undertaking a comprehensive, scientific and risk based approach to this complex issue. Adhesive and Sealant Council American Chemistry Council AeA (American Electronics Association) American Sportfishing Association Association of Woodworking and Furnishings Suppliers California Chamber of Commerce California Circuits Association California Manufacturers and Technology Association California Paint Council Chemical Industry Council of California Consumer Specialty Products Association Flavor and Extract Manufacturers Association

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	Fragrance Materials Association Grocery Manufacturers Association Independent Lubricant Manufacturers Association International Association of Color Manufacturers International Sleep Products Association IPC – The Association Connecting Electronics Industries National Association of Home Builders National Paint and Coatings Association NFIB – California Soap and Detergent Association Society of American Florists U.S. Chamber of Commerce
F-C2C-18	DTSC should look at the procurement and / or contractual use of existing data and software tools to implement the Green Chemistry Initiatives for the short-term and long-term program needs. Previous posts have indicated various available existing chemical data systems and tools, including Chemical Compliance Systems, the Canadian efforts, and the European REACH program. Use of these types of tools could facilitate implementation of voluntary and/or regulatory programs in the near future as a beginning effort and establishment of a foundation, to be built upon in future developments, meeting the Green Chemistry initiative goals and objectives. One example of a potential use of existing tools is the establishment of a product "green" certification program which would allow consumers to readily identify green products. This type of program is already available via use of Chemical Compliance Systems data tools that can provide an automated "Green" assessment of chemical products which can be readily tailored for use in California. The use of such existing programs can provide efficiency through the avoidance of "re-inventing the wheel" and expanding on proven technologies and / or approaches. Through the procurement and / or contractual use of existing data and software tools, DTSC should establish programs and/or partnerships by which these types of tools and data can be made available to other stakeholders (such as product manufactures, business and private consumers, other government agencies, etc.) on a free or lower-cost basis for the purpose of meeting or promoting the Green Chemistry Initiative goals and objectives.
F-C2C-19	It is important that producers assume responsibility for the safe stewardship of their materials in order to promote environmental sustainability. Producers should be responsible for collection through processing/disposal, financially and operationally, with no cost to local government. Extended producer responsibility (EPR) will shift the responsibility for the end-of-life management of discarded materials from local government to private industry producers, thereby incorporating the costs of product collection, recycling, and/or disposal into product price, and encouraging product design that has a reduced impact on the environment and human health. The end results are products and product chains that have a reduced impact on the environment and that costs associated with a product's impact are paid by those manufacturing or using the product, rather than general taxpayers. Extended producer responsibility is the extension of the responsibility of producers, and all entities involved in the product chain, to reduce the cradle-to-cradle impacts of a product and its packaging. The greatest responsibility lies with the producer, or brand owner, who makes design and marketing decisions. Cradle-to-cradle impacts include energy, water, and materials use; greenhouse gas and other air emissions; toxic and hazardous substances; materials recovery and waste disposal; and worker safety. EPR is a comprehensive, rather than single-attribute approach, and consequently, is more likely to result in the best environmental solution. EPR will reduce the volume of solid waste disposal and provide an incentive for producers to incorporate environmental considerations into product design; shift the responsibility for end of life products upstream to the producer and away from municipalities; and promote social and technological

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	changes toward establishing a sound material-cycle society in which resources are more effectively used by following the “3Rs” (reduce, reuse, recycle) principle. EPR will achieve a more equitable distribution of costs that reduces the burden on ratepayers and local jurisdictions and transfers waste-related costs to producers and consumers of products.
F-C2C-20	Cradle to Cradle The risks associated with a particular application area of a chemical need to be evaluated on the basis of a full life cycle assessment (LCA). Risk should be understood to take into account the inherent hazard possessed by a given chemical and the exposure that humans or the environment have to the chemical through the life cycle of its application. It is feasible that hazardous materials can continue to be used as long as the risks associated with their use are acceptable. As an example, Swedish LCA assessment of televisions containing flame retardants compared with televisions containing no flame retardants showed that the FR containing televisions put less burden overall on the environment than televisions with no flame retardant. This was because the higher rate of fires, and any environmental impact of those fires more than offset the environmental burden from the flame retardant. A second example, might be that a chemical that allows ready recycling is to be preferred over one that does not, even though in isolation the eco-tox profile of the first chemical appears less attractive than the second. Even when risks are judged acceptable, there should be ongoing programs to minimize the risk. Fundamentally the goal is to drive risk to zero. This is achieved by a combination of hazard reduction and exposure reduction. At Albemarle Corporation we have programs in place with the goal of achieving zero emissions of chemicals from our production facilities and those involving our products at our customers. Green procurement policies at state and municipality level can be used to give the incentive to drive best practices to minimize risk. A major element in evaluating life cycle impact is end of life disposal of finished goods, and policy should drive and reward effective recycling. A major challenge facing us today is the how to deal with electronic waste. We believe that an integral part of the green chemistry initiative should address electronic waste disposal and the applicability of a product to recycle. To this end we believe that the opportunity for a collaborative industry / state initiative to develop solutions such as an in-state smelting facility should be explored. The technology exists for recovery of valuable metals, other chemical starting materials, and energy in the safe disposal of electronic waste.
F-C2C-21	GMA’s Perspective on a Framework for Green Chemistry The Grocery Manufacturers Association (GMA) represents the world’s leading food, beverage and consumer products companies. The association promotes sound public policy, champions initiatives that increase productivity and growth and helps to protect the safety and security of consumer packaged goods through scientific excellence. The GMA board of directors is comprised of chief executive officers from the Association’s member companies. The $2.1 trillion consumer packaged goods industry employs 14 million workers and contributes over $1 trillion in added value to the nation’s economy. GMA appreciates the opportunity to participate in a dialogue on California’s Green Chemistry Initiative with California’s Environmental Protection Agency (CalEPA) and other interested parties. Our membership includes leading consumer products companies that produce safe consumer products that are protective of human health and the environment while improving the quality of life and protecting the public health against dangerous diseases, infestation, and unsanitary conditions. Green chemistry is sustainable innovation. It is built upon a foundation of companies using hazard and exposure analysis to address safety prior to

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	marketing. It is about moving toward products with improved environmental quality that also improve performance and consumer value to better meet all consumer needs. It uses analytic tools such as life cycle assessment to guide real product improvement and to protect against burden shifting or regrettable substitution with unintended adverse consequences, such as occurred with MTBE. Background Our members are committed to thoroughly evaluating their products for human and environmental safety through rigorous safety-based assessments before they are marketed. Our members provide clear and meaningful labeling on consumer products to ensure that consumers use products in accordance with label instructions. Our members routinely apply green chemistry and green engineering principles in their operations and have been honored with awards for their efforts. The consumer products industry develops products that meet or exceed the safety requirements of all state and federal agencies in the United States and Canada charged with regulating those products, including the California Department of Pesticide Regulation, the California Air Resources Board, other state agencies, the U.S. Consumer Product Safety Commission, the U.S. Environmental Protection Agency, the U.S. Occupational Safety and Health Administration, the U.S. Food and Drug Administration, Health Canada, and Environment Canada. GMA supports initiatives that continue to foster innovation and encourage universities, educational institutions, and industry to partner in developing effective “greener” ingredients that reduce environmental impact. We support company performed safety-based assessments of consumer products prior to the marketing of a product, considering all phases of the lifecycle of a product. Any chemicals management program must be based on sound scientific risk assessment to protect public health and the environment, and we support appropriate use-restrictions for chemical ingredients when those scientific safety-based assessments indicate they cannot be used safely in consumer product or use application. We support initiatives by companies, government and interested parties to promote consumer awareness of the importance of reading and following label instructions for safe product use, storage and disposal. We applaud collaborative efforts to encourage public and private partnerships, with a goal of developing greener products and environmentally responsible ingredients based on life cycle considerations, rather than mandatory and voluntary state labeling programs that endorse green products or programs that stipulate a single third-party certification of green products or numerical ranking. We encourage research that shows opportunities for the use of green chemistry in consumer products, as well as policies designed to overcome barriers to commercial application of green chemistry research and development efforts. We support initiatives that create incentives for innovative companies that develop greener products that are technologically and commercially feasible, and we encourage recognition for companies that develop sustainable business operations, processes and/or products. General Principles We believe that the Green Chemistry Initiative should ensure the safety of consumer products through the use of sound science in the decision-making process. It must foster innovation and encourage the development of new chemistry technologies. The Initiative should be designed to promote products that are technologically and commercially feasible to produce without compromising product efficacy, performance and usability. It should build on existing statutory and regulatory structures, voluntary initiatives and data development efforts. Finally, CalEPA should seek guidance from all stakeholder interests. Key Elements for the Green Chemistry Initiative We respectfully submit that the framework for the Green Chemistry Initiative should include the following elements: (1) A Systematic, Collaborative Process to Address Priority Chemicals: We support California’s initiative to move beyond a chemical-by-chemical approach and build a more systematic, scientific and collaborative process to address priority chemicals. As Governor Schwarzenegger recently stated: “I strongly believe there needs to be a systematic way to address these types of concerns where California’s scientists can work together with experts throughout the world to evaluate the health effects of chemicals, assess the risks they pose, and ensure that the safety of possible alternatives receives the same consideration.”

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	It is eminently sensible for California's collaborative effort to proceed in tandem with ongoing work by other government agencies assessing chemicals. The Canadian Government announced their Chemicals Management Plan on December 9, 2006. Numerous substances that have been in commerce for more than 20 years were assessed against rigorous scientific criteria. As a result of that process, Health and Environment Canada are now addressing priority chemicals as part of the Industry Challenge Program within the Chemicals Management Plan. Since Canada is undertaking this proactive approach for existing substances against the most modern science, we respectfully suggest that CalEPA collaborate with the Canadian government not only on the priority list of chemicals but the program in general. In our opinion, this collaboration would avoid needless duplication, inefficiencies and burdens, as well as take advantage of credible, high-quality scientific work already completed. This will help the government of California to meet its goals in a faster, more cost-effective way. Working with the Canadians and the Plan undoubtedly would foster greater results for the regulatory cooperation agreement for chemicals announced by the President and the leaders of Canada and Mexico this past summer. As part of the agreement signed in Montebello, the three countries agreed to share data, information and safety assessments so that all North Americans would have continued access to safe and effective products with improved sustainability and environmental quality profiles. With California's expertise at the table, collaborating with the agencies involved could accelerate the benefits of this effort across the North American region. As indicated in Governor Schwarzenegger's comment, it is important that California proceed with a science-based approach that focuses on key information, including toxicity and exposure of chemicals and possible alternatives, so that sound safety decisions can be made in the context of scientific risk assessment. This process must be the tool for focusing resources and attention on a limited number of chemicals that are important to evaluate. The process should be collaborative and should include scientific experts in toxicity and exposure from academia, chemical manufacturers, product formulators, and nongovernmental organizations. The manufacturers of the chemicals and consumer products could provide toxicity and exposure/use data to determine whether the uses of "priority chemicals" are safe or should be restricted. (2) Ingredient Communication: Some consumers have expressed a desire to know what ingredients are in the products they use in their everyday life. These consumers are interested in having this knowledge in order to make informed product choices. We support providing accurate information to consumers through ingredient communication. Manufacturers of essentially every name-brand product have programs to respond to the information requests and needs of consumers. For example, we actively work with consumers who call our toll-free numbers or send emails. We are always looking for better ways to communicate. Some third party assessments and information available on the Internet or through literature searches can be inaccurate due to the reliance on sources or on assumptions that may not be as current as the information provided by the manufacturers or industry groups representing the products. Industry has the obligation and continues to improve the methods it uses to communicate product information to consumers, especially in its efforts to ensure the safe and appropriate use of the products. We would like to work with California to implement a means of ingredient communication that would provide consumers with the information they can use to make even better informed decisions regarding the products they use in their homes. (3) Product Safety Assessments: Our members are committed to thoroughly evaluating their products for human and environmental safety through rigorous safety-based assessments before they are marketed. We support the continual improvement of safety assessments and methodologies including conducting life cycle assessments to help understand the health and environmental footprint of products and possible alternatives through their lifecycle. Our members have staff that includes experts in toxicology and environmental science to work on these assessments. CalEPA could work with scientific experts to examine best practices and to develop a toolkit for safety assessment programs and for safety assessments. Companies also could make a description of their safety assessment process available on the Internet. This could help provide context

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	for product ingredient communication. In addition to product safety assessments, companies could adopt programs to ensure the safety of raw materials and packaging, operations, storage and distribution, and the use and disposal of products. (4) Supporting Innovation: The Green Chemistry report argues that there is a need to close the “technology gap” through market-based incentives to support green chemistry. This could include funding for university research grants, scholarships, and similar programs, as well as awards for innovation, tax credits, low-interest loans, and other incentives. These positive incentives should be open to all companies that are innovators and sell products in California -- not simply be limited to companies located in California. * * * * * Chemicals are useful and essential ingredients for many products that protect public health and improve the quality of our lives. We appreciate the importance of a scientific approach based on an evaluation of hazard and exposure information to determine the safety of these products that improve the well-being of the public.
F-C2C-22	1. There are numerous opportunities to reclaim other process streams that may require refining (i.e. distillation, filtration, etc) prior to re-using that material back into the same process. Industry needs to work with DTSC on implementing regulations to allow more flexibility for generators to reclaim streams onsite without a tiered or Part B Permit. 2. DTSC should recognize pollution prevention and continuous improvement projects as integral components to the Green Chemistry Initiative (GCI) to encourage companies to implement these activities. 3. Chemicals should be regulated based on risk of exposure from the use in a product not a raw material or substance outright. For example, no lead in paint or toys, but allow lead as a raw material for other non-risk products, such as, lead-acid batteries. 4. The Pharmaceutical Industry should retain its TSCA exemption status from GCI. The EU Reach program currently exempts pharmaceuticals, since they recognize that the Pharmaceutical Industry is heavily regulated by FDA-like government agencies and there may be product quality concerns if there are modifications to the registered formulations.
F-C2C-23	At Bayer MaterialScience we share society’s values of developing, producing and putting into the marketplace products that are both beneficial and safe for humans and the environment. We respect and support the objectives of Responsible Care® along with sustainable development as a commitment for management and as a responsibility shared by each employee. We at Bayer continue to address green chemistry objectives through innovation and product stewardship. Innovation is essential to driving green chemistry and sustainability in markets such as automotive, green building and alternative energy. Products and their uses are evaluated to help assure intended benefits to society while also protecting public health and the environment. We follow the American Chemistry Council's Responsible Care® program, with a management system that is certified by third-party auditors. We integrate knowledge of potential hazards of chemicals with an understanding of potential use and exposure in our risk management programs. We appreciate the California Green Chemistry Initiative's request for comments on the program and support an approach that addresses the following points: • Look at the chemical information that is already available to California. • Make it clear that the Green Chemistry Initiative process will be governed by a risk-based science approach. • Support an understanding of both the benefits and the burdens of new regulatory proposals. • Consider process technology as part of a green chemistry program. Look at the chemical information that is already available to California: We believe that California should consider existing data and information already available to California and the public before making judgments on

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	additional chemical specific data and information needs. There are existing programs such as the High Production Volume (HPV) Challenge Program and the Extended HPV Program, which have provided valuable toxicology and exposure information that is publicly available. Hazard information from such sources can be used in light of exposure scenarios to evaluate potential risk and ensure appropriate risk management. In addition, the information from the recent evaluation and categorization of chemicals on the Canadian Domestic Substance List (DSL), Canada, should be considered by California. Make it clear that the Green Chemistry Initiative process will be governed by science with a risk-based approach: We believe that the Green Chemistry Initiative must be based on sound science with a risk-based and weight-of-evidence based approach. Objective and reproducible scientific methodologies are the keystones upon which regulatory policy should be based. Everything can be toxic at some level; the key is to minimize potential risks (risk = hazard x exposure). The Green Chemistry Initiative should be based on the principles of risk. That is, minimizing the use of toxics in light of the exposure scenarios, along with considerations of efficiency and economics. Support an understanding of both the burdens and the benefits of new regulatory proposals: To most efficiently use resources, we believe that consideration should be given to existing chemical management systems. Many existing regulatory and voluntary programs promote innovation and advances in chemical technology, govern areas of product life-cyle, and also promote pollution prevention and research into the use of less hazardous substances. We believe that the Toxic Substance Control Act (TSCA) is a comprehensive chemical management statute. Criticisms of the TSCA to protect human health and the environment often overlook the real need for resources to properly administer the statute. Without the proper staffing and financial resources, any regulatory program will have limited effectiveness. Innovation is critical to green chemistry. Rather than imposing regulatory burdens, innovation through green chemistry can be promoted with positive incentives and partnerships. Green Chemistry should be encouraged through the sharing of expertise, financial support for research, information exchange, and public education. Incentives could be offered for companies to pursue and foster Green Chemistry and Green Engineering. Consider process technology as part of a green chemistry program: Green chemistry is an important consideration in efforts that lead to sustainable development, but it is only part of a potential solution. In a broader sense, green chemistry programs should include process technology considerations as alternative chemistry is being evaluated. This technology can have a significant impact on minimizing potential adverse health or environmental effects of a chemical substance. Process technology can reduce both human and environmental exposures to chemicals, for example, through enclosed systems, recycling of by-products, and controlling potential environmental releases. Use of these process technologies can eliminate the need for substitution of critical raw materials. In conclusion, we believe that a green chemistry initiative must be based on sound science, be risk-based, leverage validated existing health and environmental information, and consider engineering and processing technology. We feel that innovation and partnership with industry should be encouraged. Industry should be brought in as a critical stakeholder in this Initiative as it develops. On behalf of Bayer MaterialScience LLC
F-C2C-24	As a member company of ACC, Rohm and Haas Company has committed to Responsible Care®. Responsible Care® is the chemical industry's initiative to demonstrate continuous improvement in heatlth, safety, environment and security performance processes and products. Responsible Care® provides the framework which helps to manage and evaluate chemicals along the supply chain and the framework to implement systems which help manage risks associated with chemical products. Responsible Care® requires companies to take a proactive approach to the needs of the public all along the life of a product. Rohm and Haas Company's environmental, health, safety and sustainable development values reflect our respect for the environment. We seek to

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	improve the quality of life through our products and services.
F-C2C-25	Procter & Gamble Suggestions The California Green Chemistry Initiative holds a lot of promise for expanding the principles of Green Chemistry, accelerating innovation and creating important health, environmental, social and economic benefits. Through the Conversation with California—workshops, symposia and Blog contributions—it's clear that there is broad interest and excitement about moving the state forward, both in improving protections for the environment and the health of Californians, and in creating a more sustainable future. P&G supports the State's objectives. Here are some ideas that California can consider to advance GCI. Priority Chemicals—California should establish a program to identify, assess and manage priority chemicals based on an evaluation of hazard and potential for exposure - Move quickly by leveraging priorities identified in the Canadian Chemical Management Plan. Create a collaborative effort between California and Canada to accelerate progress in both geographies. - Include a means for adding and deleting priority chemicals based on unique California circumstances. - Leverage the recently assembled U.S. Inventory Update report to provide initial volume, use and exposure information. Identify uses and user industries for the high priority chemicals that raise the greatest concern. Expect producers of priority chemicals and manufacturers with high concern uses to provide hazard and exposure information on those chemicals/uses to the program. - Provide the agency with authority and a due process to establish restrictions for uses of priority chemicals that have unacceptable risks. - Facilitate informed substitution in moving to alternatives for restricted uses of priority chemicals - Organize this overall effort in a collaborative approach involving chemical producers, targeted users/industries, the agency and appropriate academic and other 3rd party experts. - Engage with US EPA and the recently announced Canada-US-Mexico Montebello Agreement to avoid duplication and expedite action on priority chemicals in California and throughout North America. Product Safety Management Systems—California should expect and encourage manufacturers of consumer and commercial products sold in California to employ comprehensive product safety management systems that include: - Assessments to ensure the safety of products prior to marketing; - Rigorous control of production from raw material specifications, to formulation management, to process and quality control; - Safe operations that protect the health and environment of employees and the surrounding community; - Compliance with all applicable product safety, labeling and regulatory requirements including transportation, waste management and product disposal; - Constant vigilance in post market surveillance with rapid response to identified concerns; - Innovation that improves product performance, value and environmental quality based on life-cycle considerations; - Transparency in communicating information about safety management systems and products; and, - Ongoing evaluation and improvement of systems performance. Animal Welfare—In pursuing the objective of the Green Chemistry Initiative to expand toxicology information on chemicals, California should encourage the use of alternatives to animal testing and require testing only as a last resort. - The agency and UC university system could work with other experts to provide assistance on alternative screening methodologies that can be utilized to provide adequate toxicology information for recommendations and decisions about priority chemical uses. Transparency—California should take the lead in expanding the amount and ease of accessing Information on chemicals and product safety. - Expect and encourage manufacturers of consumer products to communicate information about the ingredients in products, either on the package or on the internet at the manufacturer's discretion and with appropriate provisions for protection of Confidential Business Information.

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	- Expect and encourage chemical and product manufacturers to update their MSDS's to the new 16-section ANSI standard and to reflect the latest hazard information from voluntary (e.g. HPV) and regulatory (e.g. Canada CMP) programs. - Encourage companies in important value chain sectors to work together to identify "beyond MSDS" information needs both upstream and downstream and to establish processes for communication to meet those needs. - Leverage California's capability and interest to assemble a chemical information system on hazard, use and exposure from global sources. Stimulate Green Chemistry Innovation—California should prime the pump to initiate early and significant advancements in Green Chemistry and to recognize and reward success. - Provide economic incentives for business innovation in green chemistry. - Provide economic support and incentives for innovation at California's University system: scholarships, research funds, technology licenses, etc. - Focus the above programs on development and commercialization of alternatives for restricted priority chemicals, including for small business application and on innovations that create breakthroughs in performance, value and environmental quality. - Develop a registry in which all stakeholders can document Green Chemistry successes - Develop an extension service through the UC university system to expand reapplication of successes across the potential user community. - Establish an Annual Green Chemistry Recognition program for new chemicals, products and processes and for advances in research, analytical and toxicological methods that best exemplify the objectives of GCI, - Continue the Conversation with California via ongoing workshops, symposia, and other communication approaches to maintain and build on the momentum established in the program to date. November 15, 2007 Contacts: Bill Greggs, greggs.wj@pg.com Pat Hayes, hayes.pl.1@pg.com
F-C2C-26	Fossil-fuel-based plastic use in our society continues to grow at an exponential rate, creating a plethora of environmental impacts for California, the oceans and, increasingly places like Lianjiao, China (see http://news.sky.com/skynews/video/videoplayer/0,,31200-greenbritain_china_p222,00.html). The State of California has one of the most impressive recycling mandates in the country but I am very concerned about where our recycling, especially our plastic, is going. Most consumers believe that their fossil-based plastic, once placed on the curbside for recycling has been taken care of in a way that renders any potential problems with plastic waste solved. Myself and my colleagues at Green Sangha have been working over the past 2.5 years educating the public regarding plastic waste issues including pollution in the ocean. The central Pacific Gyre contains a plastic waste mass that has been measured to be larger than the state of Texas. Because plastic does not biodegrade, plastic entering the oceans remain there unless it is deposited on a distant beach. Fossil fuel-based plastic has entered the marine food web at many trophic levels impacting countless marine species (birds, salps, marine mammals, etc…please see: http://www.algalita.org/pelagic_plastic_mov.html) Small bits of plastic in the central Pacific Gyre outweighs zooplankton at a ratio of 6:1 (six pound of plastic for every pound of plankton!), according to research published by the Algalita Marine Foundation. Of greatest concern for my organization and me right now is what is happening to our plastic waste once it leaves the US shores not as litter but as commerce.

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	At the link, http://news.sky.com/skynews/video/videoplayer/0,,31200-greenbritain_china_p222,00.html please find some news footage shot by Sky News in the UK. This news story highlights the situation that Californians don't know about and never see. It is the story of the dark side of plastic downcycling that all policy makers need to see, we believe. This short news piece is of great importance regarding plastic policy here in California. The plastic industry continues to repeat the mantra that plastic is fine; we must continue to use it but we need to do a better job recycling. I'd like the Green Chemistry Initiative to first acknowledge that fossil plastic is downcyclable not recyclable. And that most of our fossil plastic waste is being shipped overseas and being handled under conditions that are harming water, air, public health and the land surrounding so-called recycling facilities. In the video workers are exposed to mountains of unsanitary plastic waste. They melt it down and/or burn it; smoke and ash fills the air. Untreated polluted water runs into local streams turning them dark grey; they too are littered with plastic and ash. Workers are subjected to toxic fumes and heavy metals where PVC is downcycled without any idea that their work is dangerous…. Needless to say, there are no health or environmental standards in places such as Lianjiao, China. Our continued embrace of plastic needs to be looked at with a cradle-to-cradle perspective, which requires a close look at what is happening overseas. The Green Chemistry Initiative is for California, but for the initiative to have integrity in cannot be part of exporting waste that is causing great harm overseas. We in California need to develop closed-loop safe and just ways of handling our waste. The current model of exporting plastic to countries such as China needs to be stopped if California is serious about its Green Chemistry Initiative. Andy Peri Green Sangha Further information provided: a link to the short online version of the video described above and some articles regarding waste exports to China. on behalf of Andy Peri
F-C2C-27	GREEN CHEMISTRY AND BEYOND: SUSTAINABILITY, SAFETY AND CONTINUAL IMPROVEMENT INTRODUCTION Earlier this year, California kicked off its Green Chemistry Initiative with the stated goal of taking a collaborative approach to significantly reduce the impact of toxic chemicals on public health and the environment. The Soap and Detergent Association provides the following comments on behalf of its members so that California may consider new ways to manage chemicals towards the continual improvement of public and environmental health. The Soap and Detergent Association (SDA) is the non-profit trade association representing manufacturers of household, industrial, and institutional cleaning products, their ingredients and finished packaging; oleochemical producers; and chemical distributors to the cleaning product industry (http://www.cleaning101.com/). SDA members produce more than 90 percent of the cleaning products marketed in the U.S. SDA members strive to meet the commitments of a sustainable industry: 1) advancement of social well-being, 2) advancement of human health and environmental quality, and 3) economic growth. Cleaning products have been an integral part of the dramatic advancements in public health and longevity, and the decline of communicable diseases throughout the world over the past two centuries. SDA and its members have been at the forefront of research on the environmental and human-health safety of their products for the past 50 years, and a culture of innovation and continuous improvement among its members has resulted in a robust industry that is a leading contributor to the public health across the country. SUSTAINABILITY

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	Social Sustainability SDA members are committed to contributing to a better quality of life for our consumers, business partners, employees and the communities in which we operate, and to maintaining a high level of product stewardship throughout the chain of commerce. As such, we believe that decisions of preferability and substitution should be based on the comparative life cycle impacts of a chemical and its potential substitute. While a safety-based characterization scheme may focus on toxicity, persistence and bioaccumulation, there are a number of other parameters which are relevant to the sustainable use of a particular chemical in a formulation such as raw material sourcing and carbon footprint. All relevant aspects of sustainability should be taken into consideration for a potential substitution decision. Similarly, any plan to consider substitution of chemicals should require that the efficacy and benefits of that compound be considered as any diminution of efficacy may negatively impact public health and well-being through reduced hygiene and sanitation. Environmental Sustainability Cleaning products are chemical formulations, and generally each ingredient in a formulation will have some measurable toxicity. However, the use of cleaning products generally is well understood, leading to sound characterizations of exposures and risks. SDA members are committed to the enhancement of human health and quality of life through the responsible formulation, production and sale of cleaning products and ingredients, and their proper use. SDA members only market products that have been shown to be safe for humans and the environment, through careful consideration of the potential health and environmental effects, exposures and releases that will be associated with their production, transportation, use and disposal. In determining the safety of cleaning products, toxicity of ingredients to humans and wildlife is studied. Economic Sustainability The cleaning products industry is an important component of this nation's public health infrastructure and a contributor to the nation's economic well being. As such, it is important that the Green Chemistry Initiative not compromise this industry. SDA members are committed to innovating to improve products both in terms of performance and environmental impact. The Green Chemistry Initiative must ensure that product efficacy, performance, and usability are not undermined, and that the ability to innovate is not compromised. In fact, California is uniquely well positioned to foster innovation in Green Chemistry and product formulation. With a strong educational system including world-class research university and a robust high technology sector, California has the means to lead the world in developing and commercializing alternatives to high priority chemicals of concern. The Green Chemistry Initiative should include a significant component related to research and development of alternatives for high priority chemicals which leverages California's intellectual resource. Through such efforts, California could facilitate the development and application of chemicals that will reduce negative impacts to the citizens of California. SUGGESTIONS FOR CALIFORNIA Confirming the Baseline Safety of Chemicals in Commerce In order to affect the impact of toxic chemicals on public health and the environment, the inherent hazards and potential for exposure should be integrated into a risk framework, and risks should be managed appropriately. Currently, there are several national and international programs designed to evaluate and manage the risks of chemicals. California should leverage existing efforts and customize results to meet their needs. For example, in Canada, Environment Canada completed a prioritization exercise of 23,000 chemicals on their Domestic Substances List (DSL) in 2006. Using information from Canadian industry, academic research and other countries' data, Government of Canada scientists worked with partners in applying a set of rigorous tools to the 23,000 chemical substances on the DSL. They were categorized to identify those that were: inherently toxic to humans or to the environment and that might be persistent and/or bioaccumulative, and substances to which people might have greatest potential for exposure. From this exercise there were over 4,000 chemical substances identified as needing further attention, and about 19,000 (over 80% of the total) were set aside as not needing further action based on their hazard and exposure profiles. Among the chemicals needing further attention, 500 were high priority, 2600

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	were medium priority and 1200 were low priority, and most of the low priority chemicals were eliminated from consideration. Additionally, about 150 of the high priority chemicals were determined to not be used in Canada and were restricted from further use without an evaluation. In the end, Canada has moved forward to consider about 350 high priority chemicals and 2700 medium priority chemicals. California could focus on the 500 high priority substances identified in Canada's program. To address unique circumstances that might exist in California, the State could have a process to add substances to the high priority list, as necessary, based on hazards, uses and exposures to workers and consumers in California. Once the high priority chemicals are identified, use and exposure should be considered to determine whether there are impacts on human health and/or the environment. The State could work in coordination with other North American initiatives (e.g., Canadian Domestic Substances List prioritization, EPA and OECD High Production Volume Chemical programs, Security and Prosperity Partnership (SPP) of North America Regulatory Cooperation Framework) in order to assess the risks of the highest priority chemicals. In undertaking such programs, SDA urges the State to proceed with any chemical assessments in a manner that would avoid unnecessary animal testing. In cases where real impacts exist, risk management strategies should be implemented in order to reduce those impacts, including use-specific restrictions where there are unacceptable risks. Continual Improvement of the Safety Profile of Chemicals in Commerce California can continually improve the safety profile of chemicals in commerce in the State by focusing on the high and medium priority chemicals in use, and using Green Chemistry and other tools to facilitate informed substitution with chemicals having an improved safety and life cycle profile. There are a number of opportunities for California to apply its resources towards traditional Green Chemistry activities. California could leverage the universities in the State and the high-tech business sector towards the development of alternative chemicals for those of the highest priority, and development of alternative manufacturing processes for those with high discharges of hazardous waste. For alternatives identified, there should be a separate Life Cycle Assessment by an outside party, or state-funded Center for Excellence in order to confirm that there is no loss in performance with the alternative, to avoid unintended consequences, and to assist in commercialization. The State also could develop a Cooperative Extension-type program to assist companies in Cradle-to-Cradle product design/formulation and assist in adoption of new alternative chemistries and processes. In order to facilitate informed substitution of high priority substances towards those with a more favorable environmental and human health profile, the State could develop database of chemical alternatives that compares a number of sustainability parameters: performance, price, human health and environmental (e.g., toxicity, bioaccumulation, persistence) including carbon footprint and source sustainability. Additionally, the State could map the flow of chemicals in California using information drawn from existing sources such as EPA's Inventory Update Reporting (IUR), the data received by Canada during its data call-ins for high priority chemicals, and other contributions from the public. In order to assess the performance of these programs and measure the impact of these reforms, the State should monitor metrics that will assess releases of chemicals to the environment and exposure to humans. Increased Transparency and Access to Information on Chemicals in Commerce California could expand access to information on chemicals for consumers, businesses and regulators by leveraging its preeminence in data management and mining in order to organize the world's chemical data. For example, the dossiers for the EPA High Production Volume (HPV) Chemical Challenge program, and the related European program are often difficult to find and the data difficult to extract. By partnering with the information technology sector (e.g., Internet search firms), the State could expand access to chemical information, support its local industry and raise awareness of chemical safety information currently available. Additionally, California could expand product-specific chemical ingredient disclosure for consumer products which currently do not have that requirement. To increase transparency and improve the management of chemicals in the workplace, California should adopt the 16-section Material Safety Data Sheet (MSDS) described by ANSI Standard Z400.1-2004. Recognition and Rewarding Success As California's Green Chemistry Initiative unfolds, it will be important to recognize efforts and reward successes. The State could establish a registry for companies seeking to align their business practices with the Green Chemistry principles and acknowledge their intent. Similarly, the registry could

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	accumulate examples of product development decisions and substitutions that have resulted in reduced waste produced and energy inputs. The registry could be the basis for recognition of successes in reducing impacts from chemical exposures similar to the Presidential Green Chemistry Challenge Award, but focusing on results achieved through implementation of a program or application of a new chemistry rather than development of a new technology. SUMMARY California's Green Chemistry Initiative should emphasize all three components of sustainability: the social benefits of chemicals and products, the economic contributions through innovation and improved performance, and the environmental and human safety. California can confirm the baseline safety of chemicals through a prioritization based on hazard and exposure, assessment of risk, and management of risks including use-specific restrictions where necessary. California can drive innovation, the benefits of products and the continual improvement of the safety profile of chemicals by leveraging the State's expertise, and applying resources to the application of Green Chemistry research and development. California can expand access to information on chemicals in order to improve decision-making by taking advantage of their data management industries to organize the world's chemical data, and by increasing the disclosure of chemical ingredients in consumer products. Once California has implemented its Green Chemistry Initiative, it should recognize the efforts of those industries seeking to apply the principles of Green Chemistry and provide recognition to those that have had notable
F-C2C-28	The following is feedback to the questions provided by the Department of Toxics Substances Control. After over 16 years of environmental engineering experience working for the Department of Defense (DOD), two tools have been identified that require coordination and work to fully implement. These tools are standardization of the LCA process as feasible covering most products and the Chemical Compliance Systems (CCS) quanlitative analysis database programmed with data to rank any chemical relatively to the universe of chemicals (quantitative analysis) and compare to the regulatory limits using the standardized environmental performance characteristic data provided by EPA and CAL EPA. With some work, these approaches would significantly improve the environment. At DOD and with those I interface with in the DOD and industry, it not a question of the intention to improve the environment and work "beyond compliance," but is a question of providing key data to the chain of industries moving product to market. This is now possible utilizing the CCS tool or similar applied to the LCA stages. Beyond the work, is a key to require manufacturers of chemicals, substances and products to provide both the hazardous chemicals in the Materials Safety Data Sheet (MSDS) and the nonhazardous chemicals so that a valid green rank score and comprehensive report may be provided via the web on-line automatically and real time. The report contains all the CALEPA and FED EPA environmental characteristics of concern with a normalized Environmental SCORE organized by the key areas ECOLOGY, HUMAN HEALTH and HUMAN SAFETY. Utilization of the IS0 14001 Environmental Management System (EMS) continual improvement for the environment of sustainability is an active process in DOD and city municipalities in whole or part that provides the management approach. Key is feedback to the manufacturers of chemicals, academia, industry, consumers etc so that the best choice for the environment may be made by all. This will mitigate the predicted increase of toxic pollution in the environment by CAL BERKLEY (see www.ucop.edu/cpre) "Special Report" Green Chemistry in California despite all the effort. Beyond Compliance is normal standard practice by DOD and industry. The key is quality real time information feedback to make the best choices by all involved in the "Cradle to Cradle" process of manufacturing-construction-R&D. As a team much is possible. Playing this in parts and pieces is not efficient. Further comments on Cradle to Cradle, Green Chemistry and Toxics in Products by Design.

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	on behalf of Ray Paulson, P.E. Fleet Readiness Center Southwest North Island
F-C2C-29	The California Green Chemistry Initiative (GCI) is an innovative mechanism with the potential to influence the design of products in ways that reduce the use of harmful chemicals and generate less waste and pollution. The objective to create partnerships between industry, the public, and government agencies to bring about this change represents an interesting social experiment. The success of such partnerships will surely rest upon the ability to simultaneously meet the competing needs of all stakeholders. Chemical Compliance Systems, Inc. (CCS) believes we have unique resources that can effectively assist California result in successfully establishing GCI partnerships. CCS has compiled the largest and most accurate relational hazardous chemical/product and regulatory databases in the world over the past 22 years. These unique databases have been derived from over 1,000 sources and are currently comprised of approximately 75,000,000 data elements for 210,000 chemicals, 350,000 products and munitions, and 650 local, state, federal, international and nongovernmental organization regulations. These databases are maintained current, expanded on a daily basis, and are constructed to facilitate utilization of discrete elements in a wide spectrum of analytical compliance systems. CCS has currently developed 13 nonmunition and 10 munition Web-based analytical compliance software modules that utilize different elements from these databases and could immediately be implemented, or easily be customized, to support GCI requirements/needs. In addition, CCS has developed eight detailed concepts that will apply to more broadly defined GCI considerations. CCS has been working to “green” products and the environment for nearly 10 years. We currently have four separate, but equivalent, Web-based “green” analytical compliance systems for chemicals, products, processes and munitions. Each of these four modules utilizes the same 43 specific ecological, health and safety criteria to quantitatively evaluate the “greenness” of a chemical, product, process (including wastestreams), or munition. Each of these systems also includes alternative product/process constituent chemical data tables to facilitate the selection of a less harmful ingredient. In combination, the “green” product/munition and process modules provide a complete life cycle (i.e., “cradle to cradle”) analytical capability. Each has product design and evaluation capabilities that enable chemists/engineers to design “greener” products/processes upfront, and acquisition, regulatory and ecological/health/safety professionals to assess, or compare, the “greenness” of the overall product/process (wastestream) to the level of detail they require. Each of these modules also simultaneously identifies the regulatory impact of the overall product/process, parts or components, or individual constituents. These tools will enable California regulatory agencies to partner with industry and the public to establish objective and quantitative “green” standards, or performance measures, for products and processes that can be incrementally increased over time and apply fairly to both small and large companies. The utilization of harmful chemicals will be reduced and less waste and pollution will be generated. The “green” standard will be a known, level playing field for industry, and the result will be greater protection for workers, the public, and for the environment. These “green” capabilities have also been incorporated into a Web-based Chemicals of Concern module that can quantitatively rank the concerns for a chemical/product inventory at a facility, thereby focusing alternative chemical acquisition, or research, on the worst offenders first, effectively accelerating pollution prevention. CCS regulatory compliance capabilities draw upon our List of Lists data that currently includes 650 state, federal, international, and nongovernmental organization lists and associated data. Our Web-based compliance capabilities are available as standalone modules, or incorporated into other analytical tools (as described above). Compliance assessments can be applied to facility inventories, products/processes, waste classification, and/or CERCLA/RCRA site remediation. CCS is scheduled to develop a new, Web-based Health Risk Assessment module for the U.S. Army that will utilize

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	our existing, Web-based Conceptual Site Model, and simplify RCRA Subpart X and CAA Title V Permit applications. Finally, CCS has conceptualized a Chemical Homeland Security System (C-HoSS) that will utilize existing facility chemical/product inventories to quantitatively rank resident chemical hazards, security risks and mortality risks by location at the facility. These three reports quickly prioritize inventory concerns. Entry of container accessibility constraints (i.e., storage conditions that control access) for chemicals of greatest concern enables C-HoSS to rank container vulnerabilities and identify accessibility requirements to nullify all vulnerabilities. C-HoSS concern levels are made proportional to the Homeland Security Advisory System daily risk levels. C-HoSS addresses all four levels in an effective security program (i.e., vulnerability assessment, corrective strategy, third party verification, and management system incorporation). C-HoSS will be a good tool for effectively eliminating terroristic chemical vulnerabilities at a facility. In addition, C-HoSS could have direct utility for preparation of California permit-required Security and Emergency Response Plans. Implementation of C-HoSS across the entire State of California can be accomplished “free,” utilizing a state grant for “equipment” from the Department of Homeland Security. CCS hereby offers to provide a remote demonstration of our existing Web-based capabilities and detailed concepts, at no charge, to any parties interested in their potential utilization in support of the California GCI, to achieve corporate “green” objectives, or to utilize in “green” product acquisition.
F-C2C-30	My name is George Kopcsak. I am the former Deputy for Munitions in the Office of the Secretary of Defense. During that time efforts were initiated to accelerate the demilitarization (DEMIL) of approximately 1 million tons of old, outdated, unstable and/or incompatible munitions in our nation’s stockpile. Initially this was accomplished through open burn and open detonation techniques. More recently there has been much focus on more environmentally friendly means to destroy munitions or to recycle the components. Some of this work is done within the state of California. Within the past decade a small business organization, Chemical Compliance Systems (CCS), has developed a metric to determine the environmental impact when differing DEMIL techniques are utilized. This metric is called the Green Munitions Analytical Compliance System (G-MACS) and was sponsored and initially funded by the US Army. I’m happy to say that this tool now exists on the web. Since this tool evaluates the ecological, health and safety risks associated with munitions by breaking each down to the chemical level I have learned that the tool can also be used by munitions designers and producers to evaluate the environmental impact of specific chemicals used to make the devices. The designer now has a tool to change specific components within a munition design and determine its positive impact on the “Greeness” of the design. The idea can now be carried forward to look at designing munitions to ease the environmental impact of its anticipated DEMIL 20 years down the road. Since CCS has focused on munitions at the chemical level they have been able to broaden their “compliance system” tools looking at any and all products being designed, produced, or destroyed as long as the chemical composition is known. This looks like a good fit with the California Green Chemistry Initiative. I believe that you should seriously consider its use. As a final note, the web-based CCS tools (G-MACS, GP-CAS, and G-MACS) appear to have the capacity to look at chemical compatibility issues related to their close proximity with a product design. This may well become important when one considers the environmental impact of munition/product aging or temperature cycling. Please give these tools a look.
F-C2C-31	The Dow Chemical Company (Dow) appreciates the opportunity to provide additional comments on a recent discussion initiated by the California Environmental Protection Agency on chemicals management policy. As a company providing products and services in over 175 countries, we comply with a broad range of chemical management policies and programs. Dow supports a consistent, coordinated regulatory environment for products at global, national and regional levels to complement industry voluntary efforts and to ensure a level playing field. Where new regulations are required, they should be based on established scientific risk assessment and risk management principles – predictable, flexible and capable of responsibly addressing society’s economic, environmental and safety requirements. We recognize that regulatory systems will inevitably vary by country since they must work effectively within the broader statutory and regulatory framework for each country. Nevertheless, we generally support broad regional

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	programs that provide the greatest consistency and uniformity for the industry as a whole. As a result, Dow is not an advocate for any particular program. Instead, we have developed a set of principles for effective chemical management programs. As governments select specific legislative or regulatory approaches to product safety or chemical control policies, we believe that certain principles should be adhered to, and we present them below. on behalf of Dow Chemical Company
F-C2C-32	The Bromine Science and Environmental Forum (BSEF) is pleased to offer the following recommendations to the California Department of Toxic Substances Control (DTSC) for your consideration in developing and implementing the Cal-EPA Green Chemistry Initiative. Summary: The guiding principle for this proposal is that it relies on successful management of chemicals already in the marketplace according to their characteristics and actual uses, rather than simply banning substances. This focus recognizes the important difference between risk and hazard, i.e., that hazardous substances properly managed may not pose actual risks, and would create a system that is based on successful management of indentified risks, as opposed to establishing prohibitions based on potential hazard. on behalf of the Bromine Science and Environmental Forum (BSEF)
F-C2C-33	Rutgers University purchases thousands of chemicals and products for use in hundreds of buildings throughout our three campuses. We have implemented comprehensive acquisition processes to assure that the products we purchase are manufactured and distributed in compliance with all applicable laws and Rutgers standards. In the past six months, I have become aware of the Web-based “Green” Product Compliance Analytical System (GP-CAS) and the “Green” Process Analytical Compliance System (G-PACS) developed by Chemical Compliance Systems, Inc. (CCS). These two, quantitative, Web-based systems have been incorporated into a third party cleaning product certification program by the Chlorine Free Products Association (CFPA). Together, GP-CAS and G-PACS evaluate the entire life cycle of a product. Rutgers University is currently in discussions with CFPA and CCS about the possibility of incorporating these capabilities into our chemical and product acquisition processes. California may find these existing Web-based capabilities applicable to the objectives of your Green Chemistry Initiative. They certainly have the potential to achieve a voluntary product certification program that could increase the application of available chemical hazard information in a way that reduces labor and cost requirements for both the State and industry, while increasing the protection of the public and the environment.
F-C2C-34	The Dow Chemical Company (Dow) is pleased to provide the attached paper on the role educational programs could play in California’s Green Chemistry Initiative (GCI). We have appreciated the open, collaborative environment utilized for this process and have taken advantage of opportunities to participate in a variety of ways. Attached is a brief paper on educational programs where Dow has been engaged with the objective of improving science education and understanding of sustainability. This is intended to catalyze DTSC’s thinking about the role education can play and the types of programs to consider. Dow believes that education must play a key role in California’s Green Chemistry Initiative for the effort to reach its full potential. on behalf of the Dow Chemical Company
F-C2C-35	The Consumer Specialty Products Association's California Green Chemistry Principles Belief Statement: CSPA members are committed to manufacturing and marketing safe products which are protective of human health and the environment while providing essential benefits to consumers.

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	Background: • CSPA member products improve the quality of human life and are necessary to protect the public health against dangerous diseases, infestation, and unsanitary conditions. • CSPA members are committed to providing products that are thoroughly evaluated for human and environmental safety and go through rigorous safety-based assessments before they are brought to market. • CSPA members are committed to clear and meaningful labeling on consumer products, i.e., label instructions are written to ensure that consumers use products in accordance with label instructions. • CSPA members are committed to the development of green products that are safe for human health and the environment. CSPA members routinely apply green chemistry and green engineering principles in their operations and have been honored with awards for their efforts. • The consumer products industry develops products that meet or exceed safety requirements of all state and federal agencies in the United States and Canada charged with regulating those products, including the California Department of Pesticide Regulation, the California Air resources Board, and other state agencies, U.S. Consumer Product Safety Commission (CPSC), the U.S. Environmental Protection Agency (EPA), the Occupational Safety and Health Administration (OSHA), the U.S. Food and Drug Administration (FDA), Health Canada, and Environment Canada. CSPA Supports: 1. CSPA supports initiatives that continue to foster innovation and encourage universities, educational institutions, and industry to partner in developing effective “greener” ingredients that reduce environmental impact. 2. CSPA supports company performed safety-based assessments of consumer products prior to the marketing of a product, that take into consideration all of the phases of a product’s life-cycle. 3. CSPA supports a chemicals management program based on sound scientific risk assessment to protect human health and the environment. 4. CSPA supports appropriate use-restrictions for chemical ingredients when scientific safety-based assessments indicate that they cannot be used safely in a consumer product or use application. 5. CSPA supports initiatives among companies, government, and interested parties to promote consumer awareness of the importance of reading and following label instructions for safe product use, storage, and disposal. 6. CSPA supports collaborative efforts to encourage public and private partnerships with the goal of developing “greener” products and “environmentally responsible” ingredients rather than mandatory and voluntary state labeling programs that endorse green products or programs that stipulate a single third-party certification of green products. 7. CSPA supports initiatives that provide incentives for companies that innovate and develop technologically and commercially feasible products using green chemistry. 8. CSPA supports research that identifies opportunities for the use of green chemistry in consumer products and also supports policies designed to overcome barriers to commercial application of green chemistry research and development efforts. 9. CSPA supports recognition for companies that develop sustainable business operations, processes, and/or products. Essential Green Chemistry Program Principles: 1. Green chemistry should ensure the safety of consumer products through the use of sound science in the decision-making process. 2. A green chemistry program should be designed with guidance from all stakeholder interests. 3. A green chemistry program should be designed to promote products which are technologically and commercially feasible to produce. 4. Green chemistry must foster innovation and not limit the development of new chemistry technologies.

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	5. A green chemistry program must ensure that product efficacy, performance, and usability are not compromised or undermined. 6. A green chemistry program should build on existing statutory and regulatory structures, voluntary initiatives, and data development efforts.
F-C2C-36	"Green Chemistry" is an intellectual framework that aligns technology innovation with improvements in the health and environmental "footprint" of materials used in our society. It requires inter-disciplinary collaboration among a variety of experts in chemistry, toxicology, and environmental science that work in business, government, and academia. Government cannot, and should not, dictate by statute or regulation precisely how this process for innovation and collaboration should occur. Importantly, a "Green Chemistry" program, in and of itself, should not be picking "winning" or "losing" products. Instead, it should be removing barriers and creating objective tools to allow companies to create new products and enable consumers to recognize and choose them. According to a March 28, 2002, publication of the Organisation for Economic Co-operation and Development (OECD) (of which the United States is a member) entitled, "Need for Research and Development Programmes in Sustainable Chemistry" (available at http://www.oecd.org/dataoecd/9/55/2079870.pdf), "For government, sustainable chemistry is a non-regulatory way of making regulations work more effectively." OECD at 15. Member companies of the American Chemistry Council (ACC) are leaders in Green Chemistry and Green Engineering in their operations and have been honored for their efforts (e.g., see http://www.epa.gov/greenchemistry/pubs/pgcc/past.html for a list of EPA Presidential Green Chemistry Challenge winners). Our members view both the American Chemical Society's (ACS) Green Chemistry Principles and the ACS Green Engineering Principles as useful approaches to resource efficiency, pollution prevention, and safety. These principles, however, were never intended to be applied as government mandates. In fact, prominently displayed on the home page of the Green Chemistry Institute is the statement: Green Chemistry differs from previous approaches to many environmental issues. Rather than using regulatory restrictions, it unleashes the creativity and innovation of our scientists and engineers in designing and discovering the next generation of chemicals and materials so that they provide increased performance and increased value while meeting all goals to protect and enhance human health and the environment. So, how can California encourage Green Chemistry rather than attempt to mandate it? Several actions may be taken to stimulate Green Chemistry in California and the United States broadly. For example, government can and should provide encouragement for Green Chemistry collaborations through the sharing of expertise, financial support for research, information exchange, and public education. In fact, a variety of federal agencies (including EPA and DOE), companies, professional associations such ACS, Non-Governmental Organizations (NGO), and universities are already working together to encourage Green Chemistry strategies. Additionally, government should consider offering incentives for companies to pursue and foster Green Chemistry and Green Engineering to help ensure these products/technologies can become economically viable and gain initial access to a competitive marketplace. These incentives might include tax incentives, low interest loans, awards, and marketing exposure. I. Education and Research/Development Industry is always working to drive down production costs. For specialties and fine chemicals, the synthetic chemists working in developing these materials have to know how to ask the Green Chemistry questions. This stands squarely in the realm of science education, especially in schools of chemistry. Not only do chemists and others involved in chemistry need to understand toxicology, but they also need to better understand the interaction between health and environmental protection, toxicology, and price. It is therefore essential that California support education in the methods and principles of Green Chemistry for all its state colleges and universities (and in its high schools and vocational schools, as appropriate). Anywhere that chemistry is taught, toxicology and Green Chemistry should also be taught. Additionally, California should encourage innovative research in Green Chemistry and Green Engineering. Research funding into new Green Chemistry

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	methods is always welcomed by colleges, universities, and others, and should be an important part of any Green Chemistry program. According to the OECD (again referring to their March 2002 publication): Governments can promote sustainable chemistry R&D…by establish[ing] and fund[ing] programmes on sustainable chemistry R&D. … In addition, parts of industrial programmes are often supported by government funds. Governments, in general, can provide funds for basic and pre-competitive research. …Practically, governments can orient sustainable chemistry R&D programmes by adjusting the distribution of funds for fundamental and applied research or by commanding competitive and targeted funds depending on policies. OECD at 15. II. Incentives To further stimulate Green Chemistry and Green Engineering, California should consider the following incentives: (1) awards like EPA's Green Chemistry Challenge (see http://www.epa.gov/greenchemistry/pubs/pgcc/presgcc.html for more information); (2) tax incentives/subsidies/grants/low interest loans for research and development; and (3) marketing exposure for Green Chemistry processes and products. For example, when California purchases chemicals for state contracts, it could decide to pay a modest premium for a set period of time for new "green materials" that show promise. The goal of this subsidy would be to help a new material achieve greater economies of scale, but avoid locking in an inefficient permanent subsidy. California could additionally make capital available to companies at preferential terms, whether via grant or lower interest loans, to encourage Green Chemistry and Green Engineering manufacturing process development. And California could also consider a marketing program (perhaps akin to the "California cows" and dairy ads currently on television) whereby the state would promote companies that are actively engaged in Green Chemistry and Green Engineering, and products that are the result of Green Chemistry and Green Engineering. The OECD suggests: [G]overnments can facilitate the consideration and application of sustainable chemistry R&D by supporting efforts which aim at educating and informing industry and the general public of the importance and benefits of sustainable chemistry. One possible role for government would be to identify incentives and disincentives for the promotion of sustainable chemistry and to use this information to modify or develop their policies accordingly. When appropriate, the use of incentives, such as a reduction in taxes or the use of subsidies, can be an effective way of supporting R&D by academia and industry in the field of sustainable chemistry. … It is essential that any sustainable chemistry technology or product be competitive in the marketplace, at least in the long term. However, some of those technologies, even if they are beneficial in the long term, will not be able to survive economically without incentives. Economic incentives, such as subsidies or tax reductions, could be effective in these cases. OECD at 15 and 17.
F-C2C-37	CALIFORNIA MEDICAL ASSOCIATION A MODERN CHEMICALS POLICY FOR CALIFORNIA (2007) Introduced by: San Francisco Delegation Whereas, the state, national, and global scale of industrial chemical production is immense and is expected to grow four-fold by 2050, and the chemical industry is an important industry with wide contributions to health and human development; and Whereas, ever-expanding research confirms that many chemicals that are useful to society are also known to be hazardous to human biology and health, particularly in utero and in developing children; and Whereas, for new and existing medications, the Food and Drug Administration has long required pre-approval evaluation of safety as well as efficacy, and many industrial chemicals with known impacts on human biology are present in human bodies at levels similar to active doses of medications; and Whereas, numerous other nations including Canada and the European Union are adopting more proactive health-oriented chemicals policies, based

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	upon scientific knowledge, assessment, and accepted public health principles; and Whereas, there are long-standing deficiencies in the federal regulation of industrial chemicals, most notably in the Toxic Substances Control Act (TSCA), as confirmed by the National Academy of Sciences and others, and the University of California documented in a 2006 report to the California Legislature that TSCA's deficiencies are important and can be remedied; and Whereas, these problems include the projected appearance of 600 new hazardous waste sites each month in the U.S. over the next 25 years; the appearance of hundreds of industrial chemicals in human tissues and fluids, including those of infants; and the development of chronic diseases caused by chemical exposures on the job among 23,000 California workers each year; and Whereas, the American Public Health Association's leadership has recently endorsed a policy titled "Calling on the U.S. Congress to restructure the Toxic Substances Control Act and implement a modern, comprehensive chemicals policy", to be considered for adoption at the annual APHA meeting in November; Therefore, be it Resolved: That the CMA calls upon the State of California and United States to implement a modern, comprehensive chemicals policy in line with current scientific knowledge on human health, and which requires a full evaluation of the health impacts of both newly developed and existing industrial chemicals now in use; And be it further RESOLVED: That this matter be referred for national action (AMA). REFERENCES: http://www.healthandenvironment.org/science/papers on behalf of the California Medical Association
F-C2C-38	Life Cycle Assessment: Novozymes agrees with the arguments presented by Dow Chemicals regarding the need to evaluate the environmental impact of products and process changes in a life cycle perspective. Novozymes also favour the view that LCAs first and foremost are useful in comparisons of specific products/processes - as support to the decision making process. In that context Novozymes would like to emphasise that LCAs should always consider the actual consequences in the market of a change from one product to another. Novozymes has carried out LCA's for 4 years and has learned that acceptance of LCA results in a business community requires that consequences in the markets are taken into consideration. To use LCA terminology this is to say that LCAs should apply system expansion rather than allocation, which is also what is recommended in the new LCA ISO standard. Novozymes also supports adherence to the ISO standards, particularly that no LCA results carried out by companies can be published unless critically reviewed by 3rd party or published in a peer reviewed journal. Finally transparency is key. Weighting of results with the aim of arriving at a single score should be avoided. Environmental declarations: The increasing interest in knowing the carbon footprint of consumer products – such as expressed by for instance Walmart – calls for product declarations, which in a cradle to gate perspective (use of LCA) describe the environmental impact of said product. In Novozymes we observe an increasing number of requests from our customers for the environmental performance data for our enzyme products – for instance from detergent manufacturers, who want to establish the carbon footprint of their enzyme containing detergent. This development requires a standardized approach for making environmental product declaration. A new ISO standard (ISO 14025) has just been issued. In Denmark this ISO standard has formed the basis for a brand new environmental product declaration system (to be implemented primo 08). This system is claimed to be the only environmental product declaration system which is in compliance with both the revised ISO standards on LCA

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	(ISO 14040/44) and ISO 14025. More information on this system can be obtained from Kim Christiansen, Danish Standards (kc@ds.dk) The development of a standardised environmental product declaration system is a logical first step for reliable Eco-labelling systems. Eco-efficiency At Novozymes we would like to see green chemistry not only being a matter of substituting toxic chemicals with less toxic and more biodegradable chemicals. Novozymes products are enzymes and we have several examples where enzymes, which are biodegradable proteins, substitute harsh chemicals. This is for instance the situation in the textile industry and in the leather industry. We have also examples where small amount of enzymes, which are produced from agricultural raw materials, can substitute large amounts of chemicals of fossil origin. This is likely to be the situation in the detergent industry. However, use of enzymes can have environmental impacts which go far beyond mere substitution of chemicals. Enzyme products can improve the utilisation of the agricultural products used in the food, feed and fibre industries. In a world suffering from climate change and from a rapid increase in consumption of food and not least meat, the eco-efficiency of processes should be given much more attention. Novozymes has documented these eco-efficiency gains in peer reviewed LCA studies, which can be supplied on request to Karen Oxenbøll, Eco Efficiency Assessment (kmo@novozymes.com) Novozymes is the worlds largest enzyme manufacturer. Novozymes has R&D laboratories in Davis, California
F-C2C-39	yes, biometric sugar conversion via enzymatic oxidation will be the key to independence from petroleum.... why you'd be amazed at the output i'm getting with just sugar,water, hydrochloric acid and enzyme's hydrogen conversion from sugar is nifty, but i'm really shooting for a direct line tap... just so we are all aware of what "we" all should be doing...it is this... god{of your choice} has provided a very efficient and successful way of creating energy within all bio life forms via the conversion of sugars....all you, we ,I {well i've already done it} need to do is mimic the conversion process outside of a bio life form, eliminate all unneeded energy draws{that to which are generally used in life function} and tap only the electrical heat output....you can get enough direct current to generate viable power....cell phones now, houses and cars later....mow your law, rake your leaves, toss your food garbage into your "house stomach" shut the lid...let it "eat" watch it make power... lets not even get into converting our infrastructure to generate methane gas from our waste....most chinese rural farms do all cooking and heating with methane generated from there pigs waste.... stop chemical treatment and ocean dumping....dig a pit catch the gas...watch it burn... keep it simple...
F-C2C-40	“Cradle-to-Cradle” as a term is problematic: • Comparison of biologic recycling to industrial recycling is not an apples to apples comparison. o Biologic “recycling” breaks materials into smaller, biologically usable units and reforms them utilizing outside energy sources. This is a complete cycle of use from element/molecule to complex structure to element/molecule and back again. o Conventional mechanical industrial recycling reshapes articles into other articles and is hampered in that the constituent molecules “age” over the lifecycle. However, there are processes that break down molecules into smaller, industrially usable units that can be resynthesized into molecules and fabricated into articles. Energy is required, but the technology is similar to that currently in use for making industrial chemicals. This so-called “chemical recycling” should be studied as a way of implementing cradle-to-cradle thinking. The term “cradle-to-cradle” is most often associated with Bill McDonough, working from the principle that all waste from one process must be an input for another. Those processes can be biological or industrial. In the biological process, animal or vegetable material is utilized by another organism. The preformed biological molecules or CO2 are converted by

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	metabolism or photosynthesis to new biological matter and thus reused. In the industrial cradle-to-cradle process, waste is effectively reused or recycled into another product. In the latter case, high level recycling—recycling of fabricated articles into other fabricated articles--is intended to preserve the energy and entropy already invested in making the raw material. I look at chemistry as being like a game of Scrabble. We take atoms--like the Scrabble tiles--and rearrange them into molecules--like words on the Scrabble board. Sometimes we create new words with only our letters; sometimes we co-opt other pre-formed words. But all we do is rearrange letters; we never create them and they never disappear. Chemistry is the science of transformation. In most of commodity chemistry—that which makes the high-volume building blocks upon which virtually everything else is based--we start with raw materials like the hydrocarbons in natural gas or petroleum and build them up, break them down or react them with other atoms to make useful products. But at some point, even with material recycling, those useful products are worn out or discarded. The atoms don't disappear--they get recycled, burned, degraded or put in a landfill. But recycling programs, unless 100% efficient are simply slower routes to the incinerator or the landfill. For example, even if a product has a 50% recycling rate, it means that after five cycles 95% will be discarded and out of service. And recycling an article does not necessarily rejuvenate the molecules or keep them from "wearing out" on a molecular basis. Especially polymer molecules can lose their properties through use, oxidation, photodegradation, weathering and reprocessing, to say nothing of simple contamination. So for the most part, we can follow any given set of atoms from gas or oil eventually to the landfill, faster or slower. Because of this, we have become comfortable with stewardship "cradle to grave". We are a bit flummoxed by the concept of cradle-to-cradle stewardship for synthetic materials. For biological materials, it is argued, cradle-to-cradle is a spontaneous system. In an ecosystem, all waste is food. Food is not necessarily recycled by organisms in the same article-to-article way as synthetic materials are; organisms also "burn" it as an energy source in addition to being a raw material for creating new living structures. For manufactured systems, a cradle-to-cradle life cycle is challenging. It may require intermediate steps that make progress but do not solve the problem as elegantly as nature has after a few billion years. While it hasn't yet been called "cradle-to-cradle"--at least as I remember--for about 20 years chemists and engineers have experimented with a chemical analog to biodegradation. Chemical feedstock recycling transforms plastics and other waste materials from long molecules in fabricated articles to shorter molecules not totally unlike the oil or gas they came from originally. There is a need to remove random chemical elements derived from dirt or other products; e.g., metals, sulfur and chlorine. But in principle, waste plastics or other materials can be taken back to a very crude oil-type product, or perhaps more correctly, to a liquid coal. Some quasi-commercial processes exist in Europe and Japan. Some early attempts were oriented to utilizing the crude product directly in an ethylene cracker or gasoline refinery. These attempts failed because such a crude product would quickly foul the highly efficient catalysts in those operations (See Green Chemistry Principles 2 and 9). On the other hand, today there is serious consideration of conversion of coal and water (C + H2O) to synthesis gas (CO + H2) in a process that removes random metals, sulfur and chlorine. Synthesis gas can be burned cleanly for energy, yielding only water and CO2 which rather than being emitted could be sequestered or used for tertiary oil recovery. This is the basis of the FutureGen or IGCC coal process (USDOE: http://www.fossil.energy.gov/programs/powersystems/futuregen/) Synthesis gas, as the name suggests, is good for more than fuel. It is the raw material for industrial methanol and can be converted to hydrocarbons of various lengths via a process known as Fischer-Tropsch. Materials made by this process are functionally equivalent to naphtha or natural gas liquids. At least two chemical companies operate and license this "coal-to-chemicals" technology: Eastman Chemical and SASOL. Pyrolyzed waste can be treated to produce synthesis gas in a properly designed process. Experiments have been done in a British Gas/Lurgi gasifier in a Schwartze Pumpe plant utilizing varied raw (discarded) materials. More description of such processes can be found at the Gasification Technologies Council (www.gasification.org). Thus, refining oil to make naphtha and cracking it to ethylene, then polymerizing it, depolymerizing it at the end of its

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	service life to make a rough oil and then making naphtha via pyrolysis and synthesis gas is a nascent cradle-to-cradle process. “Chemical Recycling” can be used to recycle more than waste plastics. Cellulose and other biomass--think waste paper or other material that might also be a raw material for cellulosic ethanol--can also be pyrolyzed to ultimately make synthesis gas. Which gets to the salient point: energy. Cradle-to-cradle processes in biology do not operate without externalities; however, the external source of energy is solar. Utilization of solar energy by plants is only about 1% efficient; but given the virtually infinite nature of solar energy, plants don’t need to be efficient. A process taking waste to chemical raw materials will require energy just as any other process does. But whether the process is more or less energy efficient than recycling or any other processing method is a topic for research and analysis, which the state of California could fund. And over the next 50 years there are very few environmental problems that could not be solved by a relatively cheap and plentiful source of renewable energy. Waste is just one of them, and no different than the others. For chemical processes, the proper energy analysis would compare various approaches to making, using and discarding or regenerating materials. This analysis would look broadly at inputs required to extract and transport oil or extract and clean up coal and compare them to the process of treating garbage similarly. There may be significant advantages, including energy advantages, to reusing resources that have already been extracted. Some argue that pyrolysis of biomass is has a better "energy return on energy invested" than breaking it down and fermenting is to ethanol. At first blush, this appears to be an expensive process--but perhaps not much more than some other alternative energy sources, especially those currently being subsidized. Collecting and delivering this material to a processing site is probably no more complex than the current system for collecting recyclables. Moreover, that "reverse distribution" system that powers recycling is energy intensive itself and the cost can only be supported by a high-value recycled material. On the other hand, our logistics are already well-optimized to deliver material to a landfill. Thus, proper segregation at the landfill—the mine, if you will--and processing geographically as close as possible could be an economical combination. Chemical recycling will probably not replace traditional high-level material recycling—bottles to bottles as we know it today--particularly if the price of oil and natural gas stays high. It's far easier and more profitable to mechanically recycle clean waste thermoplastics directly back into plastic articles and preserve the energy used in making them in the first place, but the key word is “clean”. The materials that would be most useful as a pyrolysis stream are dirty, oily, composite, thermoset, films, tires, auto shredder residue or materials that otherwise would be difficult to recycle—in other words, most of the material we currently discard. Clean unpigmented tip-of-the-pyramid materials will find a more lucrative market for those who choose to collect them. Some will look forward to a day wherein every material we use is bio-derived, biodegradable and convertible back into bio-based raw material. That day, if feasible, is some time in the future, especially if we hope for a smooth transition in lifestyle along the way. Chemical recycling deserves serious consideration as a bridge technology that utilizes and recovers much of the refined value of oil and natural gas and uses waste materials as food for an industrial process. November 1, 2007 | Anonymous My sincere thanks to the writer of this email. I regret your choosing to remain anonymous because you should be personally credited for this fine contribution. You have made visible some of the most critically important and centrally necessary understandings that will have to be taken into account for green chemistry to go forward. I salute your courage in bringing up some of the not-so-obvious and perhaps less-than popular, but realistic information about industrial recycling/chemical recycling compared to biologic recycling. The concept of "zero waste" from industrial production processes has long troubled me. Moving towards C2C is definitely in a much improved direction, but is not without problems and challenges. I liked your focus on transformation as the working process of chemistry and your placement of fossil fuels (both substrate and energy) at the core of the issues that green chemistry must address. Industrial recycling is a long way from the elegant, non-polluting, and non-destructive workings of nature. Chemical feedstock recycling of fossil fuels has held out and continues to hold out great possibilities for the future, especially with newly evolving technologies. California could fund

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	research in this very broad and promising area. As an interim measure, proposals for the conversion of harmful wastes to renewable energy and re-usable chemicalfeedstocks based on comprehensive energy analysis for the technologies chosen makes sense. However, much would depend on the results of the energy analysis and on the specific technologies and wastestreams chosen. It is important to note that this area of research is in its infancy, even as a bridge technology. You do not mention the considerable challenges ahead in instituting a C2C approach into a for profit market economy. If you have time, I would like to hear your thoughts about how this might be done. Many thanks again for your excellent email.
F-C2C-41	Last week I attended the Western Regional Pollution Prevention conference in San Diego and had a chance to see a demo of a software tool that would be incredibly effective in addressing some of the concerns here. In fact I understate my excitement because it is so eye-popping to see to see the software in action, I can only hope to do it justice here. The software is very sophisticated but unlike other solutions I've seen, this one is actually very user friendly. It is the first real tool I've seen that can be used by industry experts, academia and the general public. Wow, let me say that again…the general public can actually use this tool it is that user friendly. The implications for Compliance Managers, Risk Assessment Departments and Purchasing agents are enormous. In addition to these individuals who must regularly make decisions that affect their organization, colleagues, and communities, there are also many in the medical profession, biotech, agriculture, ecologists and yes even economists (!) can plug in use this tool to get the results they need. Those of us posting here can dig into the inner workings of the software, because behind the easy-to-use interface is a complex, meticulous database that has been so well tested and refined that it is virtually bulletproof with respect to passing peer-based reviews. Dr. George Thompson has spent 25 years creating a chemical database of 75 million data elements for more than 210,000 chemicals, 350,000 products complied from over 1,000 sources. His software can generate a score that can accurately and effectively measure the toxicity levels in a given chemical recipe, process, or product and give specific information about the impact on Health, Safety and Ecology. Not only that, it is possible to cross reference information regarding the chemicals, CAS numbers, regulatory lists, (very exciting!) and can eliminate redundant data so that it's easier for departments to work together and get things done faster. There is much more detail that I can go into, however what's more important is that you, as you're reading this, get curious enough to check out Dr. Thompson's tool. It is worth the time to take a look, and even more than that, I would be thrilled to see the technology implemented as part of California's comprehensive solution. For this reason, I'm getting the word out on the other forums too. We need to be looking at this solution. There is no more time to wait. We must involve people at the business and community level. We must give people at the business and community level a tool that will work for them. No just us. Check out www.chemply.com Read more about this man's work. It is phenomenal!!!!!!
F-C2C-42	The Department of Toxic Substances Control (DTSC) Director, Maureen Gorsen, met with DTSC staff in the Berkeley Regional Office on September 20, 2007, to gather their input on the Initiative. The comments below were received as a direct result of the breakout sessions and focus on the cradle to cradle approach. • Involve Industry o Create incentives o Offer rewards

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	• Get involved with EP: Formal partnership • Partners with DOD SERGP • Focus on smaller manufacturers and industries that use toxics • Create mandatory green curriculum kindergarten to post graduate • Economic incentives o Tax breaks o Bonds o Loans • Regulation • Enforcement • Education/ Outreach o Public o Manufacturers • Develop Technologies • Require businesses to follow Livermore lab like process to disclose all chemicals used in the research and development /design process • Plan out processes to get to just-in-time purchasing • Incorporate green chemistry principles into purchasing • Tax or financial incentives • Consumer Education • Governmental contract preferences • Require government to do green chemistry evaluation • Tax incentives • Grants, loans for research and development • Grants, loans for research and development • Tax penalty for purchaser/producer • Education- public/producer • Recycle • Education-industry • Higher tax on harmful chemicals used • Tax incentive for use of green products • Regulations • Labeling o Chemical content in product o Chemical cost, i.e. CO2 process used o Chemical/energy cost in transportation, waste o Similar to ingredients o Euro model • Incentives

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	o Simplicity o Monetary o Recycling, reuse o Upfront waste disposal fees, including vehicles o Euro Model • Education o Public o Private industry • Definition of toxicity- harmful level • Needed to become toxic o People o Places fishes and biota o Habitat • Inventory of toxics- what is toxic? • Initial screening tests “new products” • Balance o Quality of life issues o Modernization • Grants and financial incentives for development of new products • Grants and financial incentives to develop products from waste and recycled materials • Educating companies regarding options of students • Develop an environmental curriculum
F-C2C-43	Airgas, Inc., the largest U.S. distributor of industrial, medical, and specialty gases, and hardgoods, such as welding equipment and supplies, and the second-largest manufacturer and distributor of liquid carbon dioxide in the United States is committed to product stewardship innovation and to promoting environmentally friendly technologies. This is why we have long advocated the use of refillable refrigerant cylinders in servicing mobile air conditioning systems as well as stationary industrial, commercial, and residential refrigerating and air conditioning systems. Airgas led the industry in the late 1990s by introducing a 30 lb. refillable refrigerant cylinder to replace the standard size 30 lb. disposable cylinder. The use of refillable cylinders for refrigerants eliminates the emission of ozone depleting compounds and greenhouse gases remaining in disposable containers when they are discarded. Recognizing their significant environmental benefits, most developed countries, including Canada, the EU Member States, and Australia, have already banned the use of non-refillable cylinders for refrigerants. In addition to its atmospheric benefits, decreasing the number of cylinders discarded each year can also save tens of millions of pounds of steel (fostering conservation of an important natural resource) and hundred of thousands of cubic yards of landfill space nationally each year. The use of carbon dioxide (CO2) in environmentally friendly technologies is another area that Airgas strongly supports. With growing concerns over the environment and global climate change, and increasingly stringent regulatory requirements, companies are actively searching for alternatives for many of the coolants, solvents, and other chemical substances they currently use, which will be greener and have a smaller environmental footprint. The distinctive properties of CO2, combined with its environmental benefits, make it a cost- and performance-effective green alternative for other chemicals used in many industrial and commercial processes. Although CO2 is a greenhouse gas (GHG), it is generally obtained commercially as an industrial by-product from existing operations and, therefore, its further use in other industrial and commercial processes and operations does not make any further,

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	or additional, contribution to global warming. The unique lubrication and cooling qualities of CO2 are the reason it is seeing increased use as a coolant / lubricant, in industrial machining operations. Its use in these applications doesn't generate any hazardous waste compared to the disposal of hazardous cutting oils and biocides typically used in metal machining, which is significant when considering the cumulative environmental waste from the myriad of machine shops. In metal machining applications, CO2 delivers considerable economic benefit via increased productivity and tool life, hence indirectly reducing consumption of other natural resources. In addition to being environmentally friendly, the use of CO2 eliminates worker exposure to many of the hazardous chemicals used in the machining industry today. Dry cleaning is another area where use of by-product CO2 provides an especially attractive, environmentally preferable, alternative. With pending regulation, perchloroethylene (Perc) in commercial dry cleaning operations is being replaced in California by alternative technologies. Hydrocarbon or petroleum-based solvents are currently the most popular choice when replacing Perc equipment. However, their environmental profile raises some concern, plus their cleaning performance is very limited as petroleum based solvents do not clean water based stains, which make up the bulk of stain types on clothing. Use of hydrocarbons is controversial because it increases Volatile Organic Compound (VOC) emissions. VOC emissions contribute to the formation of ozone in the lower atmosphere. Ozone has been linked to a variety of health effects including respiratory irritation, asthma, and premature death. Moreover, the environmental persistence of hydrocarbon solvent mixtures is mostly unknown and has the potential for contamination of soils and drinking water. Carbon dioxide is non-flammable and non-toxic. Unlike Perc and hydrocarbons, waste disposal is not an issue with carbon dioxide dry cleaning systems as any waste generated is not classified as hazardous. Also, it is a win-win for customers as it can be used for cleaning sensitive articles like silk, linen, and leather and can extend the life of garments due to a less aggressive, gentler process, thereby conserving resources for textile manufacture (an environmental benefit through reduction in resource consumption). In addition to being environmentally preferable to Perc and the alternative hydrocarbon-based systems, carbon dioxide is a commercially and economically viable alternative. The higher capital purchase cost of a CO2 system can be offset by lower operating costs, improving its economic competitiveness. Short cycle times lead to higher throughput, improved productivity, and lower labor costs. Also, waste management costs are eliminated since process wastes are not considered hazardous. Airgas believes the concept of using by-product CO2 for dry cleaning is an excellent example of product stewardship innovation - one that warrants enhanced, innovative incentives to expand its use more quickly as a Perc replacement. Although financial assistance ($10,000 grants) for the dry cleaning industry to switch from Perc to non-toxic, non-smog forming alternatives like CO2 and water-based cleaning systems is offered in California's proposed legislation (AB 998), it may not be sufficient for small businesses to purchase a CO2 system which costs significantly more than alternative hydrocarbon systems. However, as more CO2 units are installed, the cost of the systems would be expected to continue to decrease. The State of California, by taking a leadership role in Green Chemistry and sustainable technologies, can foster broader stewardship and encourage further innovation through development of creative incentives for environmentally friendly technologies like refillable cylinders for refrigerant gases and CO2 for dry cleaning and metal machining.

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F-C2C-44	Contributions from chemistry bring many benefits to society, but there are chemicals which can pose risks to health or the environment in certain circumstances. Some argue that the most sensible approach to these chemicals is to replace them with substances considered less hazardous—a seemingly simple concept, but substitution is not always feasible and not always the right choice. American Chemistry Council (ACC) members, through Responsible Care®, regularly consider substitution as an option in their broader green engineering and process design efforts. When doing so, companies must closely examine the implications for the safety, functional performance, and cost of alternatives to avoid ineffective changes with unintended negative health and environmental impacts. A good cook knows that you cannot arbitrarily change ingredients in a recipe. Whole wheat, rye, all purpose, and pastry are just a few of the many different varieties of baking flour. Yet, bakers know that while all flour is similar, many cannot be substituted without creating a result nobody would want to eat. The same holds true for chemical processing. You cannot simply replace one chemical ingredient for another without impacting the final product. Therefore, significant problems would result if chemical substitution were mandated as the solution of first choice without careful consideration of potential consequences. This is very much the approach taken by an international group of experts to the Intergovernmental Forum on Chemical Safety (IFCS) earlier this year in talking about “informed substitution”. (see the background elements of the IFCS paper available at http://www.who.int/ifcs/documents/forums/forum6/12_original_prop.doc) SUBSTITUTIONS MAY CHANGE THE NATURE OF THE PROBLEM RATHER THAN SOLVE IT Mandatory bans and forced substitutions often are not a complete solution because, as one issue is addressed, another set of concerns may arise. This is the difference between “informed substitution” and “regrettable substitution”, with the goal of “informed substitution” being to avoid “regrettable substitution”. For example, the health and convenience of our lives has been greatly enhanced by modern refrigeration. Refrigerators originally used ammonia, a toxic chemical, as a coolant. As scientific discoveries were made, chlorofluorocarbons (CFCs) replaced ammonia. While CFCs are practically non-toxic, they were later implicated in depleting the ozone layer and eventually banned. CFCs were then replaced with hydrochlorofluorocarbons (HFCs), which have no impact on the ozone layer, are non-flammable, have low toxicity, and high energy efficiencies. Scientists have now learned that HFCs could contribute to global warming if released into the air. Alternative coolants such as hydrocarbons and carbon dioxide have been considered, but both need to be carefully examined because of the potential for emissions and the possible dangers from higher operating pressures. In another example, consider the Peruvian government’s decision to stop chlorinating drinking water. The result in 1991 was a five-year epidemic of cholera which spread to nineteen Latin American countries, causing more than one million illnesses and 12,000 deaths. After the outbreak, U.S. and international health officials criticized Peruvian water officials for not chlorinating the entire water supply. An official with the Pan American Health Organization (PAHO) blames the inadequate chlorination, at least in part, on concern over disinfection byproducts. In a 1997 article in the Journal of the American Water Works Association, Horst Otterstetter states, “Rather than being abated by increased use of chlorination, the waterborne transmission of cholera was actually aided because of worries about chlorination byproducts.” Substituting one material for another is never as simple or straightforward as it might at first appear. SUBSTITUTIONS MAY RESULT IN UNINTENDED ADVERSE CONSEQUENCES Trading in a fuel-hungry SUV for a moped may address energy efficiency concerns, but it’s probably not a reasonable option for a mother of four. Like the moped, forced substitution, without full consideration of the potential impacts, is impractical and unwise. For example, some substitute chemicals require higher processing temperatures and greater pressure conditions in order to achieve the same result as the original chemical. Additionally, if the substitute chemical is not compatible with the processing equipment, it can cause break downs or failures. In some circumstances, the substitute is not as effective as the original chemical and more quantity must be used which results in larger amounts of waste materials and increased waste disposal

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	management and risks. All of these factors can lead to increased safety concerns for the worker population, as well as increased energy consumption by the company. This unintended consequence of substitution was clearly demonstrated in Europe when energy companies decided that fuel derived from plants would be more environmentally friendly than fossil fuels. Those companies developed specialized generators for palm oil, which increased demand. To keep up with that demand, palm plantations cleared large tracts of land by draining and burning peat land, resulting in huge carbon emissions into the atmosphere. The production of the plant derived fuel had an unintended consequence of creating more harmful emissions than the fossil fuels they were intended to replace. SUBSTITUTION IS NOT THE ONLY VIABLE APPROACH TO CONTROL RISK The principle of risk reduction is and always has been part of the normal day-to-day operations for the business of chemistry. Industry's ability to innovate allows us to respond to society's evolving needs for better, safer products. Beyond substitution, the chemistry industry considers many other options to minimize potential hazards, such as operational management systems, engineering controls, modifications to the chemical product, and waste management innovations. The industry also provides specialized consumer training and works with communities to implement effective recycle/reuse programs. Through ACC's Responsible Care® initiative, ACC member companies go above and beyond government rules and regulations to continuously improve their environmental, health, safety, and security (EHS&S) performance. ACC members employ a rigorous EHS&S management system that is certified by third-party auditors. Among numerous other elements, auditors verify that our companies have systems to manage risk associated with chemical products including management of product development, transport, use, and disposal in a safe and secure manner. Companies are also audited on their programs to protect the environment and to conserve resources, as well as their efforts to dialogue with community stakeholders about the organization's impact on human health and the environment. Company performance under Responsible Care® is publicly shared through americanchemistry/responsiblecare.com. For more information on Responsible Care®, please visit http://www.responsiblecaretoolkit.com.
F-C2C-45	We write to you today on behalf of CHANGE, Californians for a Healthy and Green Economy. Ours is a broad-based growing coalition of approximately 35 environmental and environmental justice groups, health organizations, labor advocates, community based groups, parent organizations, and others who are concerned with the impacts of toxic chemicals on human health and the environment, as well as the lack of a regulatory framework that seeks to prevent exposures to toxic chemicals. We thank you for your leadership initiating the Green Chemistry Initiative and would like to take this opportunity to join the Conversation with California by offering our perspective on what would make the program successful in addressing the critical human and environmental issues related to chemical use. on behalf of CHANGE
F-C2C-46	The Dow Chemical Company (Dow) is pleased to provide the following comments on California's Green Chemistry Initiative (GCI). On June 29, 2007 Dow provided initial comments that represented our principles for sustainable chemistry at a corporate level. That letter spoke of Dow's accomplishments in sustainability, Dow's aggressive 2015 Sustainability Goals, and Dow's suggestions for framing California's GCI. We have engaged fully in the DTSC's process; Dow people have spoken at two of the three Green Chemistry Symposia and have participated in the workshops, including serving as break-out session facilitators. This current submission offers Dow's more-detailed thoughts in the specific areas of: § Life-Cycle Assessment § Eco-Labels § Consumer Choice

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	§ Environmentally-Preferred Purchasing § Incentives on behalf of the Dow Chemical Company
F-C2C-47	These comments respond to the American Chemistry Council's comments titled "Addressing the Data Gaps" posted on October 15, in particular those characterizing the types and amounts of information reported to EPA under: (1) the TSCA Inventory Update Rule (2) the US HPV Challenge Program and the industry's Extended HPV Program. (1) Information submitted to EPA under the TSCA Inventory Update Rule For certain chemicals in commerce, limited and infrequent reporting of production, use and exposure information by manufacturers has just been initiated under EPA's Inventory Update Rule (IUR). Such reporting is required only of chemical manufacturers (and in some cases, processors), but not of companies that use chemicals, whether directly or as ingredients in products. Beginning in 2006, manufacturers of non-exempt chemicals produced or imported in amounts of 25,000 pounds or more per year per site are required to report to EPA the information noted by ACC – to the extent it is "known or reasonably ascertainable." For chemicals manufactured in amounts of 300,000 pounds or more per year per site, the additional information on downstream processing and use noted by ACC must be reported – but only to the extent that it is "readily obtainable." Fewer than 10,000 chemicals are covered by the basic production information reporting requirements, and only a few thousand of these will be subject to the more extensive reporting that extends to downstream processing and use information. Reporting is required only once every five years and then only for a single reporting year. Much of the information reported to EPA is designated confidential business information (CBI). Under TSCA, EPA is prohibited from divulging any CBI to the public or to other governments, including the State of California. (2) Information developed under the US HPV Challenge Program and the industry's Extended HPV Program. For more detail and documentation of my comments below, see my recent report, High Hopes, Low Marks: A Final Report Card on the High Production Volume Chemical Challenge, available online at www.environmentaldefense.org/hpvreportcard. The Challenge represents the only systematic effort by the US Environmental Protection Agency (EPA) to foster the development of and public access to basic hazard data on a relatively large number of chemicals in commerce. It should be acknowledged that the program is developing and making public basic hazard information for more chemicals in less time than any prior effort, and it represents the first significant step taken in the US toward closing the gap between what we know and what we should know about widely used chemicals. But the limitations of this voluntary program and the information it is providing need to be understood as well. Because the Challenge is voluntary, it side-steps the onerous findings EPA must make to exercise its authority under Section 4 of TSCA to compel hazard testing of chemicals. However, for the same reason, EPA also has limited recourse to ensure full participation by manufacturers or the timely submission and high quality of hazard data sets developed for HPV chemicals. The following statistics on the status of the HPV Challenge, which began in 1998, are current as of July 2007. MORE THAN 18 MONTHS AFTER THE ORIGINAL DEADLINE, THE HPV CHALLENGE IS FAR FROM COMPLETE • Two-and-a-half years after final data sets were due, fewer than half (47%) have been submitted. • 10% of eligible HPV chemicals were not volunteered for the Challenge by the companies that produce them; EPA has issued rules to compel testing

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	for only 6% of these chemicals. THE QUALITY AND COMPLETENESS OF FINAL DATA SETS HAVE YET TO BE DETERMINED • The average quality of sponsors' initial submissions, while originally quite good, has declined over the course of the Challenge, especially in the past 18 months. The grade point average for initial industry submissions has declined from a solid B-plus in 2001 to a C-minus in 2006. • Of the final submissions examined so far by EPA, covering about 100 HPV chemicals, EPA has found that data gaps remain in about a third of them. THE HAZARD DATA SUBMITTED ARE SCREENING-LEVEL DATA ONLY • Hazard data being collected under the Challenge are limited to a subset of the Screening Information Data Set (SIDS), developed under the auspices of the OECD. • The SIDS data are generally acknowledged to be insufficient to provide the basis for a full hazard assessment, let alone a risk assessment, for a chemical. It relies primarily on testing of acute or subchronic toxicity, for example, and its ecological endpoints only include toxicity to aquatic organisms. THE PROGRAM FOCUS IS LIMITED TO HAZARD DATA • By design, the Challenge did not call for submission of use and exposure information, although some sponsors did submit some such information. • As a result, the program will provide little if any reliable, comprehensive information about the use of and exposure to HPV chemicals. EPA HAS LITTLE RECOURSE IF DATA QUALITY IS POOR OR DATA ARE INCOMPLETE • Because the HPV Challenge is voluntary, EPA has very limited ability to ensure that the data submitted by sponsors are of high quality and complete. While EPA and other commenters have often identified deficiencies in initial submissions, there is no legal or binding obligation on the part of sponsors to heed those comments. • EPA has agreed to conduct a quality and completeness review on final submissions, and to make known the results, but cannot compel sponsors to address any problems that are identified. THE REGULATORY "BACKSTOP" FOR THE PROGRAM IS WEAK • EPA's authority under TSCA to compel testing of the 10% of HPV Challenge chemicals that were not voluntarily sponsored is seriously constrained; to date, EPA has issued test rules for only 16 (6%) of the 265 unsponsored "orphan" HPV chemicals. THE MAJORITY OF CHEMICALS IN COMMERCE ARE NOT HPVS • While, as ACC notes, HPV chemicals constitute the bulk of chemicals in commerce when measured by tonnage, non-HPV chemicals far outnumber HPV chemicals. • The TSCA Inventory contains more than 82,000 chemicals that have been in commerce at some point since 1979. Based on the 2002 TSCA Inventory update reporting, EPA reported some 5,400 so-called medium production volume (MPV) organic chemicals manufactured in 2002 in amounts above 10,000 pounds per year; an unknown number of chemicals below that threshold are in commerce in the US, because they are not required to be reported. • The European Union (EU) estimates that about 30,000 chemicals are produced there in quantities at or above one metric ton (2,200 pounds) per year, fewer than 3,000 of which are HPV chemicals. THE EXTENT OF SPONSORSHIP OF NEWLY EMERGED HPV CHEMICALS IS POOR • Of nearly 600 newly emerged HPV chemicals – those that have reached HPV levels of manufacture since the Challenge was launched – eligible for sponsorship, only 40% have been sponsored through the chemical industry's Extended HPV Program. • EPA has found wide gaps in publicly available hazard data for these chemicals. • No test plans for these chemicals have yet been made available, and industry has not provided any tracking system to monitor the status of these commitments. • No final data sets have been submitted, despite a claim when the program was launched that data would be submitted starting in 2006.

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	• These findings indicate that the chemical industry is not making the development of, and public access, to hazard data on all HPV chemicals "evergreen" practices.
F-C2C-48	Here are some ideas for what California can do to start to advance chemicals policy and promote green chemistry. They are derived from ideas I have presented at several GCI forums, but I wanted to add them into the mix being collected via the Conversation. What can California do? • Ensure access to information gathered by others – Negotiate for access to confidential business information (CBI) submitted under the European Union's REACH Regulation and under the Canadian Environmental Protection Act (CEPA) – Require companies making/importing chemicals in California that are subject to REACH or CEPA to submit the same information to California officials – Enhance existing IT infrastructure to receive and share the large volumes of REACH data • Set clear criteria to identify chemicals of concern – Can be hazard-based (e.g., PBTs) and exposure-based (e.g., chemicals detected through biomonitoring) – Use these criteria to drive further assessment and control of chemicals meeting the criteria – Require adherence to clear timelines for conducting assessments and making control decisions • Map the flow of chemicals in California by developing and sharing production/use info – Require California producers/importers and users to submit and update information on production and processing (amounts, facility locations), uses (including in products), and post-use management – Require updating of MSDSs to reflect all available data (US HPV Challenge, REACH, Canada) – Require disclosure of chemicals in consumer products • Could focus initially on priority chemicals (Canada priority list, REACH Substances of Very High Concern (SVHC) list) • Advance the science – HPV, REACH data sets use 20+ yrs. old tests ("old toxicology") – Fail to account for: > Emerging issues, e.g., endocrine disruption, development neurotoxicity > Emerging science, e.g., low-dose effects, timing of exposure during development > Emerging methods, e.g., toxicogenomics, high-throughput screening and mechanistic assays > Perpetual concerns: e.g., cumulative, aggregate exposures, susceptible subpopulations – California is well-positioned to help move toxicology into the 21st century – Can help to develop, road-test and share new methods, testing strategies – Utilize biomonitoring data and methods to advance dose and exposure measurement – Press industry, federal government to move forward – Collaborate with universities Why do this?

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	• Casts a broad net – to identify not only “bad actors” but also chemicals of low concern • Influences and informs chemical and product design decisions • Identifies and fills gaps – information (data and safety) and technology gaps • Empowers a range of actors – government, industry, academics, public – to advance knowledge and make better decisions about chemicals
F-C2C-49	[NOTE: This post is based on a paper I published in the OECD Series On Testing And Assessment, No. 51, Approaches to Exposure Assessment in OECD Member Countries: Report from the Policy Dialogue on Exposure Assessment in June 2005, Chemicals Committee, Organization for Economic Cooperation and Development, p. 109, available at http://appli1.oecd.org/olis/2006doc.nsf/linkto/ENV-JM-MONO(2006)5. It is provided in part to respond to the American Chemistry Council's's comments arguing for sole reliance on risk-based evaluation for chemicals.] While both hazard and exposure are clearly relevant in determining chemical risks, there are critical differences between our ability to assess hazard and exposure that have implications for the development and application of risk and exposure assessment policies. And real-world experience in chemical assessment programs that have attempted to rely on exposure information to prioritize chemicals also offers lessons for exposure assessment. In this paper I first address these issues, and then discuss their implications for risk and exposure assessment policies. Critical differences between assessing hazard and exposure Approaches to integrating exposure assessment into regulatory decision-making need to acknowledge and account for a number of critical differences between the nature of hazard and exposure information and their relative extent of availability. While both hazard and exposure are clearly relevant in determining risk, certain characteristics of exposure information pose serious challenges to sound decision-making: 1. Hazard is largely inherent to a chemical, and doesn’t fundamentally change over space or time, whereas any exposure information necessarily represents only a “snapshot” in both space and time. A chemical’s hazard is relatively intrinsic, largely or entirely independent of how the chemical is used, where or how it enters the environment, or other factors that vary with time and place. Hazard data are therefore relevant (i.e., necessary though not sufficient) in characterizing risk whatever the use of a chemical, and hence are useful in understanding any and all potential uses of or exposures to a chemical -- and what kind of exposure-reducing efforts may need to be taken. Just the opposite is true for exposure, the potential for which changes depending on how a chemical is produced, used, transported and discarded. Conditions that determine exposure can and often do differ enormously for every setting and point in time that a chemical is present. And even if a “snapshot” of current exposure were able to be assembled, the next new use or activity leading to a release would alter the exposure picture. The variable nature of exposure poses a major challenge to exposure (and risk) assessment: It means that exposure assessment must be an ongoing activity, with the scope and frequency of its measurement sufficient to characterize the variation in as well as magnitude of exposure. 2. Voluntary and regulatory mechanisms for generating and collecting exposure information are undeveloped relative to those for hazard information. Extensive international consensus exists as to how to test a chemical for most hazardous properties. Detailed government-sanctioned procedures, guidelines, criteria and standards are already in place for conducting hazard tests, for assuring the quality and reliability of the results, and for determining whether the results constitute evidence of a particular hazard. Moreover, these measures allow that results are reproducible and can be independently verified. In contrast, virtually none of these mechanisms are in place to assure that exposure information is complete and accurate. Debates over what constitutes adequate exposure assessment and how to address the “moving target” nature of such information are far from resolved. Government-sanctioned procedures for generating, evaluating the adequacy of and interpreting exposure data have yet to be developed or validated, including testing and measurement standards, guidance, methods and tools. Even use and exposure information reported in sufficiently qualitative terms or sufficiently aggregated form so as to eliminate any confidential business

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	information (CBI, see next bullet) concern is rarely systematically collected and made public. For the first time, beginning in 2006, USEPA has begun to require the reporting of basic information relevant to understanding uses of and exposure to chemicals, although it will be limited to several thousand chemicals, and will be collected only once every five years – despite enormous documented variability in these chemicals' production volumes that presumably reflects changes in their underlying use patterns. 3. Differential access to both exposure data and the means to generate them severely limit the "reproducibility" of such data. In addition to the variability and absence of agreed-upon procedures noted above, other factors limit "reproducibility," that is, the ability to readily and independently measure or verify exposure data. Most exposure data and the means to generate them reside virtually exclusively with industry. It must be acknowledged that industry has a strong interest in maintaining that exposure to its products is low, so the ability to independently measure and verify exposure data is critical. Yet physical access to many exposure "settings" (e.g., workplaces) is very limited and infrequent at best, even for government officials. Broader access to exposure-relevant information is even more restricted: Wide latitude is typically provided to claim chemical use and exposure information as CBI, preventing even its review outside government; this situation is often in contrast to that applying to hazard data, which is more likely to be deemed ineligible from designation as CBI. Finally, even chemical manufacturers have incomplete access to and information on their customers and how their chemicals are used. Intermediaries (vendors, brokers, distributors) are a formidable information flow bottleneck, as is the often-proprietary nature of information concerning downstream use and competition among suppliers. These factors serve to impede information-sharing even within supply chains, which in turn affects the extent and accuracy of exposure-relevant information that any one entity in a supply chain can provide if asked or required to do so. For all of these reasons, we believe that risk and exposure assessment at this time are simply too uncertain and unreliable to serve as a basis for deciding for which chemicals hazard data should be developed. While ultimate decisions concerning risk identification and management need to account for exposure as well as hazard, in all but the most exceptional cases, chemical prioritization approaches should be hazard-, not risk-driven. Difficulty of using exposure information in chemical priority-setting: OECD experience as a real-world example The ongoing work of the OECD Existing Chemicals Program vividly illustrates the limitations to available exposure information – and to efforts to prioritize chemicals based on such information. In that program, chemical-by-chemical assessments of high-production volume (HPV) chemicals are conducted. Typically, industry collects existing information and conducts any testing needed to fill gaps in the required set of hazard information. Industry then prepares draft assessment documents, which are reviewed by health and environmental agency officials in member countries. While the primary emphasis is on hazard assessment, program procedures currently allow for exposure information to be included to "place the hazard information into context." As we have documented in detail elsewhere, in practice this exposure information is routinely being used to decide that chemicals that have been identified as possessing clearly hazardous properties are nevertheless low priorities for further work based on "anticipated low exposure." Unfortunately, the exposure information typically being relied upon has truly massive deficiencies with respect to scope, quality and completeness. Such information typically is: • very limited in scope, and hence incomplete or even haphazard in its coverage of potential exposures, because it: - covers only a portion of known production and use; - covers only a subset of relevant activities, e.g., production, transport, storage, processing, use by customers, use in consumer products, product disposal, waste management; - covers only a subset of exposed entities, e.g., workers, consumers, the general population, sensitive populations, and wildlife; - addresses only a subset of relevant routes of exposure, e.g., by inhalation, ingestion or dermal contact; through food, water, air;

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	- rarely is based on ongoing or sufficiently frequent measurement to address variation or changing conditions; • unverified, unpublished, rarely peer-reviewed and of uncertain or undetermined quality; • frequently based on judgment or speculation, rather than on actual measurements, monitoring or validated methods of exposure modeling. Some of these deficiencies are related to the limited requirements under the program governing what exposure information is to be provided. However, others reflect the fundamental characteristics of exposure information described in the first section of this paper, as well as limitations on the extent and quality of information actually available and the capacity for effective review, and the lack of agreed-upon measures of scope, quality and completeness. The OECD Existing Chemicals Program has wrestled repeatedly with this problem over its history. Indeed, because of what many saw as an over-reliance on exposure-related considerations in the absence of an agreed-upon approach, the program went through a major refocusing to return to a primary focus on hazard characteristics as the primary driver for the program. However, despite the refocusing effort, inconsistent and insufficient exposure-related information – more than any other factor – drives the recommendation process for chemicals being assessed through the program. Implications for risk and exposure assessment policy All of the factors discussed above mean that assembling a complete and reliable exposure picture even for a single point in time faces obstacles and has proven exceedingly difficult in practice. So how should risk and exposure assessment policies – and practices – address these current realities? Guidelines development: We continue to strongly support the development of comprehensive guidelines for collection, analysis, validation and presentation of exposure information, as the much-needed foundation of any exposure assessment policy and practice. In our view, the OECD program needs to invest at least the same effort in developing a process for exposure assessment as was invested in developing the hazard screening program. There remain a number of substantial obstacles that must be solved in order to ensure that adequately robust data on exposure can be gathered. Resolving these challenges will not be easy. These obstacles include: • lack of agreement as to what exposure information is relevant and needed; • lack of consensus as to the framework and methodologies needed to conduct an exposure assessment; • limited availability of and access to internationally accepted, comprehensive measured exposure information or models for predicting exposure; and • limited information available on all uses and other exposure pathways of chemicals. Guidelines need to ensure that the measured and modeled or estimated data address and are representative of the full range of actual and potential exposures that can or do occur. Procedures are needed to govern, for example, the minimum number of samples, the frequency of sampling, and other parameters so as to ensure that the results of any exposure measurements are both statistically meaningful and representative of the spatial and temporal variations present in the sampled environment. Quality assurance/quality control procedures to ensure data quality are needed. Where data are available for only a subset of production sites/release points/exposure sources, procedures are needed to determine whether and if so how extrapolations from available data can be used to characterize exposures arising from the missing sources. Adequate expert review: Policies need to provide for thorough review of exposure information. This starts with ensuring exposure-related expertise among reviewers is sufficiently diverse to address each of the various relevant exposure settings (workplace, consumer, environmental), and data generated through direct measurement as well as modeling. The review process should yield an explicit assessment of the scope, completeness and quality of the exposure information, in which any conclusions are qualified to accurately reflect the actual extent and nature of exposure information provided and hence the degree of associated uncertainty. Specific factors to be assessed should include: • Scope and Completeness: geographic, temporal extent of applicability and associated limitations; to what fraction of total production and use, to what uses, and to which specific facilities, processes, activities and products the provided information applies; which activities associated with the chemical's full lifecycle (production, processing, storage, transport, use and disposal) are covered; whether information on releases and exposures relate to workers, consumers, public or the environment; whether information is based on measurements, modeling, judgment, extrapolation. • Quality: extent of documentation provided/cited; reference to/description of procedures used; representativeness of sampling underlying any

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	measured data; validation of any model used; peer review and extent of access to underlying data; assignment of measures of reliability; reproducibility. Accounting for the variable nature of exposure: Policies need to acknowledge and account for the inherent variability in exposure over time as well as space. For example: • For new chemicals, the nature or extent of production, use and exposure needs to be tracked and revisited/reassessed over time, not only as a chemical enters commerce but as its production level and range of uses change. During the initial review/approval process, conditions should be included that require reporting of any changes in the nature and extent of production and use and other exposure-relevant factors, and such reports should trigger a reassessment of exposure potential. • For existing chemicals, policies should also be responsive to changes in the production level or use profile of a chemical. One recent illustration of this need in the U.S. is the change that has accompanied the phase-out of pentabromodiphenyl ether and its replacement with a different chemical, the production and use of which has increased dramatically as a result. Data verification and model validation: To the extent data from industry are relied on, policies need to incorporate mechanisms to ensure and demonstrate that such data are accurate and representative, and wherever possible, to be able to independently verify such data. To the extent that modeled as opposed to measured data are relied on to provide exposure estimates, policies need to outline procedures to be employed to validate the models, provide public access to the models and their underlying data sets. Just as for measured data, policies also need to ensure that models effectively account for variation in exposure over time. Differential access: The differential access to exposure-related information (as discussed above) is a serious barrier to public confidence in both industry- and government-derived exposure assessment. In addition to adopting and abiding by comprehensive guidelines covering all aspects of exposure assessment, government needs to develop and implement mechanisms to demonstrate that it can independently verify the reliability of industry-generated exposure information; and industry needs to be encouraged or required to implement its own measures to increase confidence in the information it provides, including routine third-party review and a commitment to make information public whether exculpatory or not. In addition, policies need to consider means to break through the supply-chain bottlenecks that effectively prevent development of a full understanding of chemical processing and use. In our view, one of the key innovations offered by the European Union's REACH regulation is its intent to compel information-sharing up and down the chemical supply chain. Finally, in our view, serious reconsideration of the currently overbroad broad allowances for CBI claims related to exposure-relevant information is warranted. Transparency: Policies should ensure that any descriptions of exposure information are clear and transparent in describing the scope and nature of the information and its limitations, including by addressing all of the elements specified above under Scope and Completeness and Quality. Policies should require that conclusions or recommendations be carefully written and explicitly qualified so as to limit their perceived and actual applicability to those settings for which information has been provided and deemed sufficient to warrant the conclusion or recommendation. Furthermore, the degree of uncertainty associated with a conclusion or recommendation should be stated and should reflect the extent of exposure information available. Lastly, policies should ensure that in the absence of good exposure information, exposure should be assumed possible or likely. Additional challenges Cumulative and aggregate exposures: A common limitation of exposure assessments in practice is to examine exposures only to single chemicals at single points in time, or from single sources or products, as if they occur in isolation from other exposures that are in fact relevant to understanding the true nature and magnitude of exposure. While understandable given the complexity involved in going further, this frequent failure to consider or even acknowledge the need to ultimately examine cumulative and aggregate exposures undermines the credibility of an exposure assessment. Policies, therefore, need to ensure that an accurate context is provided within which to judge a particular exposure assessment, one that accounts for factors such as:

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	• production, processing and use of the same chemical by multiple entities; • multiple uses of the chemical leading to actual or potential exposures; • multiple routes of exposure (direct, indirect) to a chemical; • continuous or periodic release of or exposure to a chemical; and • exposure to multiple chemicals producing the same/similar effects and/or acting by the same/similar mechanism(s) Biomonitoring/environmental monitoring/health tracking: The ultimate arbiter of the value of exposure assessment is the extent to which its findings comport with reality. It is relatively rare for extensive data from actual environmental and biomonitoring to be available, and rarer still for health tracking statistics to be available that can be linked to particular exposures. Nonetheless, exposure assessment policies should ensure that such data are examined and incorporated where available, and should encourage the development of and public access to such data. Susceptible subpopulations: In addition to variation over time and space, exposure to a chemical or the effects arising from such exposure may differ among particular subsets of human or ecological populations. This variation may be due any number of factors, such as inherent differences in the subpopulations themselves (e.g., children's respiratory rates are higher than those of adults), differences with respect to proximity to, or reliance on activities associated with, particular sources of exposure (e.g., occupational exposure, dependence on a diet high in fish or groundwater as a drinking water source), or differences in sensitivity to a substance (e.g., sensitization, genetic susceptibilities). (Less understood at present are the analogous differences in ecological subpopulations.) Policies need to account for such variations and ensure protection of the most susceptible and sensitive sectors of potential exposed populations. [end]
F-C2C-50	What if you could have a plastic polymer that you could recycle with the efficency and a robust system similar to paper and aluminum? Polylactic acid can be hydrolzed from PLA back into Lactic acid and repolymerized back into PLA. This process does not need complex chemistry to seperate copolymers because PLA is a homopolymer and would yield only lactic acid. The end-of-life vision for NatureWorks Biopolymer in the long term is to maintain a journey to zero waste – keeping the Biopolymer, regardless of form, out of the landfill and being to able to recycle into the same use or higher valued use if possible. Where food composting infrastructure exists, NatureWorks Biopolymer heavily contaminated with food waste should be composted in those streams to assist with food waste diversion. The ideal for PLA is chemical hydrolysis back into essentially new PLA
F-C2C-51	super cool...i'd like that for my product
F-C2C-52	Ecolab Inc. supports science and risk-based chemical management policies that balance the 'triple bottom line' of sustainability: protection of the environment, assurance of product safety and promotion of innovation in the marketplace. Ecolab encourages the members of the California 'green' committees in the following specifics: • Understand both the burdens and benefits of new regulatory proposals. • Find a way to successfully manage both toxicity and exposure (i.e., risk) while providing the solutions California needs. • Utilize risk assessment methods that integrate knowledge regarding potential hazards of chemicals with an understanding of their uses and exposures. • Look for product stewardship and risk management programs that establish mechanisms to assure exposures remain in the safe region for typical uses and foreseeable misuses; and • Enact laws and regulations that: • are science-based,

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	• balance potential risks with benefits, • factor in existing scientific knowledge as well as reasonable uncertainties, and • consider the degree of risk to people and the environment." We encourage California to study the availability of data now, particularly the availability of both hazard and exposure data, so that risk determinations can drive decision making. Please coordinate information needs with other governments and other sources of information. Do not reinvent the wheel. Ecolab is in the process of evaluating products/services to evaluate the 'greenness' and 'sustainability' of our products. One of the companies we have evaluated is Chemical Compliance Systems, Inc. (CCS) which specializes in ecological, health and safety compliance, chemical security, and hazardous material management services. CCS has a database containing 220,000 chemicals and more than 75,000,000 data elements comprising 43 key environmental metrics. I first became aware of CCS on June 28, 2007 when I heard Dr. George R. Thompson, President & CEO, giving a presentation called “Web-based Databases That Facilitate Chemical, Product and Process “Green” Assessments and Automated “Green” Cleaning Product Development or Acquisition Assessments” at the 2007 Green Chemistry & Engineering Conference, Washington DC (www.GCandE.org) For products we submitted to them, they organized the results in three categories Ecology, Human Health and Safety in their default product 'report card' which weighs constituent chemicals and and their percentages in the formulation. They evaluated and produced ‘report cards’ on both concentrates and ready-to-use solutions on a number of our products, showing the sensitivity of their approach. The following procedure was used to produce each report card. For each metric, the chemical that is least sustainable/green is given a score zero and the most sustainabile/green is assigned 100. The scores in between are normalized so that each chemical (all 220,000) has a quantitative normalized score. They also have a Cross-Reference Dictionary & Regulatory Lists. The Chemical Cross Reference Dictionary contains 550,000 records of purified CAS numbers and their associated synonyms. This file facilitates accurate and complete materials management data searches and product substitution research. The Regulatory List of Lists file is comprised of over 650 international, federal, state and local regulated chemical lists and their associated data, as well as numerous CCS compiled lists (e.g., incompatible chemicals, hazard classes, etc.). CCS’ modules compare a single chemical inventory file against these lists and generate a multitude of regulatory reports utilized by logistics, environmental/safety/ health, and chemical security professionals, as well as first responders. I strongly recommend California evaluate CCS’s capabilities for application as part of California’s Green Chemistry Initiative. I believe California’s efforts will benefit from use of CCS’s capabilities.
F-C2C-53	Chemistry has enabled the development of countless products that consumers use each and every day, and consumers want to understand what impact these products may have on the environment and on their health. Industry shares this desire, and continues to strive to develop, produce and market products that are both beneficial and safe for people and the environment. Given the complex and multifaceted technical, societal and policy elements that are inherent in the design, manufacture, use and disposal of these products, one must consider a number of factors to effectively assure their safety. Approaches to safety that are performance based and flexible will provide the greatest benefits and allow the development of innovative approaches within the context of California’s Green Chemistry Initiative. Industry works to minimize exposure of workers and the public to all chemicals that could be considered hazardous as used, and we pay particular attention to chemicals considered to be hazardous to humans or the environment. At the same time, industry uses chemicals that are least hazardous, and thus require the least expense in worker and public safeguards, consistent with the production of effective and economically accessible products. The two halves of risk--hazard and exposure--are always part of our planning and never far from our minds. Approaches that utilize risk-based evaluations of chemicals to determine efficacy and safety should serve as the foundation for decision making within programs that flow from the California Green Chemistry Initiative. While the toxicity of a substance is an important consideration in a risk based evaluation, the potential for toxicity must be considered in the context of exposure--including exposure level, route, duration and timing. Every substance can produce toxicity under certain exposure conditions. Even common-

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	place substances usually thought of as benign, such as water and table salt, can cause death when ingested at too high a dose over short periods of time. Conversely, even the most toxic substances pose virtually no risk when releases are controlled and exposures are minimized to levels below which, given an adequate margin of safety afforded by risk assessment techniques, the doses will not elicit adverse effects. For example, arsine gas is used to make microcontroller and microprocessor chips, and although arsine gas is highly toxic when inhaled, its “presence” in semiconductor chips in products used in every day life--computers, calculators, appliance microprocessors--poses no health hazards or risks from in-home normal and customary uses. So the question is not just, “How do we control toxic substances?”, but also how do we successfully manage both toxicity and exposure--risk--while providing the solutions society needs? The answers to these questions are best provided through: 1) Risk assessment methods that integrate knowledge regarding potential hazards of chemicals with an understanding of their uses and exposures; 2) Product stewardship and risk management programs that establish mechanisms to assure exposures remain in the safe region for typical uses and foreseeable misuses; and 3) Laws and regulations that: • are science-based, • balance potential risks with benefits, • factor in existing scientific knowledge as well as reasonable uncertainties, and • consider the degree of risk to people and the environment.
F-C2C-54	After some 34 years working as a Chemical Enginner in the chemical industry I continue to applaude Green Initiatives. Regulatory Initiatives that create burocicy have made many differences in every State of this great nation, but they add cost, sometime in the a fair way but normally spread over the general population in a way that seams easy politically but counter productive. It seams to me that if a product consumes xxxBTU/lb then the tax should be on the product when sold so that no matter where in the world it was produced the same tax would be applied. Some manufactures may be more effecient that others but thier competative edge would not be impacted. In like manner a product creates waste that is considered harmful or toxic the finished product might be taxed based on the waste. Again if a producer developes a new process eliminating the production of toxic waste perhaps they could register for a pass on the tax. Sound like value added tax but perhaps its a green tax as only Green products get a complete pass. The impact is not negative to the State economy because the same tax is paid regardless of where the product comes from.
F-C2C-55	For many years, the Department of Defense (DOD has made a concerted effort to reduce the potential impact of munition constituent and other chemicals on human health and the environment. In 2000, the U.S. Army Defense Ammunition Center (DAC) began working with Chemical Compliance Systems, Inc. (CCS) to use CSS’s extensive centralized Relational Chemical and Product Databases as the basis for a series of integrated, web-based modules within what has become the Munitions Analytical Compliance Suite (MACS). (CCS’s centralized databases included over 650 regulatory lists.) MACS includes eight modules. In a few months, the 9th and 10th automated modules the Emissions Risk Assessment and Human Health Risk Assessment–will be added. The most comprehensive of the MACS modules is the “Green” Munitions Analytical Compliance System (G-MACS). CCS developed G-MACS for DAC and PEO Ammunition Office in 2003. DAC and CCS co-own G-MACS, which has been available to 13 military munitions demilitarization facilities and two munitions management offices from coast to coast since its development. Military munitions design engineers can use the G-MACS’s 43 quantitative ecological, health and safety criteria (Endpoint Criteria) to eliminate or reduce the use of hazardous munitions constituents to create a theoretical munition composition that substitutes alternative components, parts or chemicals, and calculates the “green” grade for the total, component, or part composition in 5 to 20 seconds. G-MACS can also quickly identify which munition constituents have an impact on any of 112 state, federal or international regulations. This electronic design capability greatly reduces the labor and time required to design a “greener” munition.

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	G-MACS also has application to other munitions activities (e.g., acquisition handling, demilitarization). Using a munition's National Stock Number (NSN), G-MACS can calculate a munition's overall "green" grade, its ecological, health and safety scores, and the 43 Endpoint Criteria scores within five to 10 seconds. Because all scores are normalized on a scale from 0 (worst) to 100 (best), comparisons of the "greenness" of two (or more) munitions is easy and quantitative. The evaluator can view individual scores, from worst to best, as a means to determine those constituents that need to be replaced to improve the "green" grade. When G-MACS is combined with CCS's proprietary "Green" Process Analytical Compliance System (G-PACS) the four stages of a product life cycle (i.e., design; manufacture; stockpile management [e.g., handling, transportation, storage]; and disposal) can be evaluated. G-PACS uses the same 43 Endpoint Criteria as G-MACS, but analyzes the chemicals used in each step of the manufacturing process, or wastestream, rather than the constituents used in a munition. The MACS Chemicals of Concern (MACS-COC) module combines the objective and quantitative 43 Endpoint Criteria with quantitative Regulatory Impact and Inventory On-Hand Criteria to calculate a ranked Level of Concern listing for any facility's inventory. This prioritized list can be beneficial in decision making, particularly in regard to inventory management, pollution prevention, and cleanup. I strongly recommend California evaluate CCS's capabilities for application as part of California's Green Chemistry Initiative. I believe California's efforts will benefit from use of CCS's capabilities. CCS's web-based capabilities, their innovative approach, and their willingness to develop new or modified, integrated capabilities has proven beneficial to the Army's efforts to both be good stewards of the environment and to implement its sustainability program. Although I have not used them, I am aware of CCS's non-munitions capabilities, and believe that they would prove to provide tools of value to the civilian community and decision makers.
F-C2C-56	Is more data always better when it comes to understanding chemical safety? In many cases, the answer is yes, but when making this determination, it is important to understand the difference between a "data gap" and a "data need." WHAT DATA IS NEEDED? The U.S. EPA has clearly distinguished "data gaps" from "data needs" in the past. Data gaps are areas that could benefit from additional data, additional analyses, or clearer presentation, while "data needs" are data gaps requiring additional work before the potential risks can be adequately characterized – an important distinction to keep in mind. As was discussed at OEHHA's October 1 – 2 workshop on "Practical Decision-Making Tools," there are many models, tools, and guidance on structure-activity relationships to provide California with a tremendous amount of knowledge about chemicals without performing direct testing. The Canadian chemical prioritization under its Environmental Protection Act (CEPA) discussed at length in the workshop made extensive use of such modeling. The oft-touted EU REACH system initially proposed broad new testing mandates, but in its final version, the regulation backed away from that in deference to concerns over animal welfare. Sound scientific decision-making does not require the blunt approach of mindless box checking that only serves to require unnecessary data and animal testing, and burdens already strained public and private resources. Simply requiring unnecessary testing would only serve to put California seriously out-of-step with scientific consensus in the U.S., Europe, and the 30+ member countries of the Organization for Economic Co-operation and Development (OECD). WHAT CAN CALIFORNIA DO? 1. California should begin its assessment of information needs by first leveraging the information that already exists on chemicals. This includes accessing the information publicly available on High Production Volume (HPV) chemicals. Through the groundbreaking HPV Chemical Challenge Program, the OECD ICCA HPV program, and industry-led extensions of that work in the US, the chemical industry has already made and continues to make more information publicly available on more chemicals than any other voluntary or regulatory program globally. HPV chemicals in this program represent more than 95 percent of the U.S. market for commercial chemicals by volume. The information provided covers 17 endpoints internationally

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	agreed by the OECD member countries as sufficient to initially assess chemical hazards including physical/chemical properties, environmental fate, ecotoxicity, and hazards to human health. Although this database is still being populated, there is a wealth of data and a solid platform from which the state of California can prioritize chemicals of interest, and evaluate further information needs. 2. Additionally, the HPV hazard data will be soon be supplemented with the information required by EPA's Inventory Update Rule. Specifically, in 2006 chemical manufacturers and importers of chemicals with site-specific annual production of 25,000 pounds or more were required to submit the following information for chemicals manufactured or imported in calendar year 2005: • Basic company and facility site information • Chemical identify information • Specific chemical production volume • Chemical site limited status • Number of workers reasonably likely to be exposed to the chemical substance at the site of manufacture or import (in prescribed ranges); • Physical form(s) of the chemical substance as it leaves the submitter's possession, along with the associated percent production volume; and • Maximum concentration of the chemical substance as it leaves the submitter's possession (in prescribed ranges). In addition, manufacturers and importers of chemicals with site-specific annual productions of 300,000 pounds or more were also required to provide the following production and use information: • Application - North American Industrial Classification System ("NAICS") codes that best describe the industrial activities conducted by the sites that use or process the substance; • Industrial functions of the chemical substances; • Approximate number of processing and use sites; • Estimated number of workers reasonably likely to be exposed to each chemical substance at all sites at which the chemical is used or processed; • Commercial and consumer uses of reportable chemical substances o An indication of whether the commercial/consumer products are intended for use by children; o Maximum concentration of the reportable chemical substance in each commercial and consumer product category; and • Estimated percentages of the submitter's production volume in each industrial function category and commercial and consumer product category. A compilation of the IUR information will be made publicly available by EPA sometime by the end of this year, and will provide the core of basic chemical "mapping" data discussed in recent Green Chemistry dialogues. 3. California should also work now to understand how it can leverage the regional chemical cooperation program recently announced by Canada, Mexico and the United States under the Security and Prosperity Partnership (SPP). The SPP program will leverage the information Canada has produced under its Chemical Management Program, and the related CEPA priority-setting. In addition, the U.S. has committed that by 2012 it will assess and initiate any action necessary on more than 9,000 existing chemicals produced in the U.S. This will include both HPV chemicals and Moderate Production Volume (MPV) chemicals. WHERE CAN CALIFORNIA GET THIS DATA? Identified below are websites where California can obtain a significant amount of information on chemicals that already exists. The HPV Challenge data is available at: • http://www.epa.gov/hpv/pubs/hpvrstp.htm A more user-friendly version of the above referenced database is being built, and should be complete later in 2007. An initial version of that database is

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	available now at: • http://www.epa.gov/hpvis/metadata.html. Recently, the chemical industry announced that it is extending its work on HPV chemicals - calling it the Extended HPV Program or EHPV. The EHPV Program broadens the original initiative by calling on companies to provide health and environmental information on 573 chemicals that have become HPV since the initiation of the Challenge Program, and increases the scope of information requested for all sponsored HPV chemicals by asking companies to provide use and exposure information. Information from this program will be submitted to the EPA over the next four years. Additional information is being generated under the Voluntary Children's Chemical Evaluation Program (VCCEP), in which USEPA evaluates both hazard and exposure information submitted by companies which have volunteered to determine potential effects on children's health. This information is publicly available at: • http://www.epa.gov/chemrtk/vccep/index.htm Beyond the databases for these voluntary programs, there are numerous other publicly available government databases. The Toxic Substances Control Act Test Submission database, TSCATS, is a central system for the collection, maintenance, and dissemination of information on unpublished technical reports submitted by industry to EPA under TSCA. Studies on over 8,000 chemicals are categorized into three broad subject areas (health effects, environmental effects, and environmental fate). Searches can be conducted using these subject areas as well as indexing terms. • http://www.syrres.com/eSc/tscats_info.htm EPA and its Office of Research and Development maintain an electronic database called the Integrated Risk Information System (IRIS) and it contains descriptive and quantitative information on human health effects that may result from exposure to various chemicals in the environment. IRIS was initially developed for EPA staff in response to a growing demand for consistent information on chemical substances for use in risk assessments, decision-making and regulatory activities. Information in IRIS is intended for those without extensive training in toxicology, but with some knowledge of health sciences. The heart of the IRIS system is its collection of computer files covering individual chemicals. • http://www.epa.gov/iris/ The European Chemical Substance Information System (ESIS) is an electronic system that provides information on both new and existing substances in the EU. It includes proposed classification and labeling for 3,300 chemicals, information and data for roughly 2,500 EU HPV chemicals and final risk assessment reports for chemicals with completed assessments. • http://ecb.jrc.it/ESIS/ The EU’s REACH legislation will eventually make available hazard data on all chemicals in the European market, as well as use-specific chemical risk assessments for chemicals on the European market above a specific threshold. Data will be publicly available, fully searchable, and formatted in software known as IUCLID. The International Council of Chemical Associations has committed to submit data and assessments for 1,000 global HPV chemicals to the 30 developed nations of the OECD for government assessment. To date, 667 chemicals have been assessed under the OECD program and work is continuing. OECD assessments are published as soon as they are completed on the OECD website. The data included in those assessments are also available, via the United Nations Environment Program (UNEP). • http://cs3-hq.oecd.org/scripts/hpv/ • http://www.chem.unep.ch/irptc/sids/OECDSIDS/sidspub.html The EXICHEM database is a pointer system on current, planned and completed activities on existing chemicals in OECD member countries and other relevant bodies. It was created to provide information for the OECD member countries on "who is doing what with which chemicals", (e.g. information gathering, testing, evaluation), in order to assist countries that are identifying opportunities for co-operation. • http://webdomino1.oecd.org/ehs/exichem.nsf

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	The International Program on Chemical Safety (IPCS - a joint program of UNEP, ILO and WHO) developed INCHEM - a freely available collection of internationally peer-reviewed documents about chemicals and chemical safety. It was initiated in 2003 in response to priorities established by the Intergovernmental Forum on Chemical Safety (IFCS) and provides convenient worldwide full-text electronic access to chemical safety-related documents provided by intergovernmental organizations. All documents referenced by INCHEM contain hazard information and the site can be queried by key-words and free text. INCHEM contains Environmental Health Criteria documents, and cancer assessments by the International Agency for Research on Cancer. • http://www.inchem.org/
F-C2C-57	California does not need to build a monstrous new regulatory regime to additionally manage risks from chemicals. Instead, it should focus on 1) building knowledge needed to make better life cycle based decisions and 2) supporting entrepreneurship to implement advances. See Part II of my comments below. But first, a satiric set of steps for the “final solution” for California: I. Creating The Country Of Green California 1. Secede from the US and form the country of Green California (GC). The country’s motto will be “Sustainability Above All.” 2. Prohibit manufacture and import of any product without prior registration, review and authorization by the government of GC. A base set of test data is required – as in REACH – with the possibility of additional testing as the reviewers may want. Only products deemed to be “green” will be approved for use for a period of two years, after which a new review and probably additional testing will be required since the definition of “green” will have changed in two years. Staff will be drawn from UC Berkeley, who will define “green,” the base set of data that must be submitted, and make decisions to authorize sales as they think is appropriate. There will be no right of appeal. (A border wall may be required to prevent smuggling.) 3. Require all agriculture and manufacturing operations to be “organic” and sustainable, as defined by the staff at UC Davis and UC Berkeley, respectively. 4. Prohibit personal cars, as they are the scourge of GC’s environment. All existing personal cars will be confiscated and recycled. GC will use the scrap sales to purchase zero emission cars for designated essential government personnel. All other citizens must use mass transit. 5. Prohibit all waste disposal (except for incineration in permitted zero emission facilities for energy recovery). All materials must be reused, recycled or stored safely for future use and recycle. This will support a robust barter economy for GC citizens and reduce the amount of new products (that are authorized under CAL-REACH). Illegal disposal will be punished by deportation. 6. GC will be self-sufficient and sustainable in energy and water use. Each citizen will be given an annual ration of energy and water, proportionate to the population (after allocation for government use made). 7. Population reduction: It is expected that the above restrictions will result in a significant migration out of the country of Green California. In addition, illegal immigration is likely to cease because the economy of GC will be unstable for a significant period of time. If insufficient numbers of people leave GC, it may be necessary to limit the number of children to two per family unit. 8. Professors at UC Berkeley will report to the president of Green California on the options available to prevent further degradation of GC’s environment (e.g., air pollution, global warming) by other countries, such as China or the United States. The options will include both political (e.g., declaring war) and technical (massive fans along the borders) solutions and their net impact on the sustainability of Green California. Final Solution: California becomes a self-sustaining island (an island, at any rate.) II. Supporting the Future California would best serve its citizens by supporting continued movement toward greener chemistry in two areas:

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	1. Building Knowledge: California has incredible public and private higher education resources. These should be supported fully and directed toward better understanding the ecosystem, developing new technologies (especially in energy generation and utilization), and educating the public so we can make better decisions and implement solutions to known and future issues. This initiative is focused on chemicals – man-made chemicals – but the issues in need of research and development extend beyond how chemicals interact in the environment and impact health. Scientific, medical, social, political, economic, technological actions all impact the ecosystems of earth. We need to understand how we can intentionally and unintentionally change the system to reduce adverse impacts. We also need to understand where the biggest threats to health and the environment come from because we can never eliminate all risks. I do not believe “toxic” chemicals represent the biggest challenges we should spend our limited risk reduction resources on. The real issue is our ignorant misuse of chemicals – we inefficiently use chemicals as fuels, make consumable products we don’t really need and then release them into the environment without thinking about the consequences. California should build knowledge in all its citizens and businesses about product stewardship and life cycle thinking to achieve responsible development and use of chemicals in products. 2. Supporting Entrepreneurial Effort: Engage the business creativity resources in the state in a Sputnik/Man on the Moon effort by providing economic incentives to develop and implement solutions to our biggest challenge: sustainable energy. We need low impact energy sources and high efficiency energy utilization technologies. Support invention; don’t suppress it. Do not create duplicative, expensive and inefficient review and approval processes that will drag down the already challenged California and national economies. “Toxic chemicals" are not a significant threat to public health – poverty is. Georjean Adams EHS Strategies, Inc.
F-C2C-58	The United States Army Defense Ammunition Center (DAC) has partnered with Chemical Compliance Systems, Inc. (CCS) to develop munition analytical compliance capabilities for the past eight years. Along with other DOD organizations, in 2003, DAC contracted CCS to develop a tool that would assist the Army in efforts to assess munitions from a “green” perspective. What came out of this was a Web-based tool known as the “Green” Munitions Analytical Compliance System, or G-MACS. Since no green criteria had previously been established for munitions, or any other product, the development of G-MACS by CCS with 43 ecological health and safety “green” criteria made a giant step forward in helping our design and manufacturing installations with an automated capability to assess the “greenness” of munition constituents early in the life cycle. The “green” scoring criteria in G-MACS was programmed to be flexible and dynamic enough to be modified as needed to support any environmental factors and/or guidelines on “greenness” that might be developed. G-MACS is unique in that it can, in combination with the CCS “Green” Process Analytical Compliance System (G-PACS), be used to “score” a munition for “greenness” throughout the life cycle (cradle to cradle). G-MACS, along with other CCS systems such as their "Green" Product Compliance Analytical System (GP-CAS), and "Green" Process Analytical Compliance System (G-PACS), could be utilized to provide a complete life cycle “green” product measuring tool that not only covers munition constituents but also, paints, pharmaceuticals, cleaning products, pure chemicals, etc. After a number of years of working with CCS and knowing the tools that they developed such as MACS and G-MACS, DAC is confident that the State of California could benefit by utilizing CCS and their GP-CAS, G-PACS and G-MACS Web-based tools.

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F-C2C-59	The California Green Chemistry Initiative is defined by DTSC as an effort to stimulate a “transformation in the design of products and processes.” Interestingly, DTSC’s leading recommendation for bloggers (“…Consider public health and the environmental effects of chemicals during the process of designing products and industrial processes…”) could have been lifted directly from the American Chemistry Council’s Responsible Care® product stewardship program – a program which has been in place since 1991, more than 15 years before California’s initiative. All members of the American Chemistry Council, which represents the leading companies engaged in the business of chemistry, participate in Responsible Care® as a requirement of membership in ACC. “Green chemistry” is product stewardship done right. It is the practice of making health, safety and environmental protection an integral part of the full life cycle of chemical products, including design and manufacture. Under Responsible Care®, this includes evaluations of chemical products and their uses to help assure that those products deliver their intended benefits to society while protecting public health and the environment. Responsible Care® requires our members to employ rigorous management systems that are certified by third-party auditors. In addition to numerous other elements, those auditors certify that our companies have systems to manage risk associated with chemical products and that those systems include management of product development, transport, use and disposal in a safe and secure manner. Companies are also audited on their programs to protect the environment and conserve programs, as well as processes to dialogue with stakeholders about the organization’s impact on human health and the environment. Companies’ performance under Responsible Care® is publicly shared with the public through a first-of-its-kind website: americanchemistry/responsiblecare.com. Reducing hazardous materials in products and processes is also simply good business sense. Hazardous materials cost companies money in additional storage, transportation and disposal fees, as well as additional cost for protecting their work force through engineering controls and personal protective equipment. DTSC and the public can obtain more information on what the chemical industry has been doing in the Responsible Care® program from http://www.responsiblecaretoolkit.com. It’s critical that DTSC’s recommendations to CalEPA in the Green Chemistry Initiative recognize the value and role of industry stewardship programs, and create incentives for others to take similar steps. This is particularly true through the entire value chain, up to and including end users of chemicals and the products made from chemistry.
F-C2C-60	I recently returned from Beijing and I noticed that a Chinese couple purchased a toaster without a box. The clerk simply handed a toaster in a plastic bag. I also noticed toothpaste are also being sold without a box. I discovered that there is very little retail packaging since the goods are being directly shipped to the retail stores from the factories in "reuseable shipping containers" which translate into very little packaging waste. The reuseable shipping containers were returned by poor people on bicycles. I could not help wondering why we could not reduce our packaging requirements for goods which will also reduce the transportation's emission footprint, landfill waste, manufacturing of packaging, and associated energy costs. In any case, I suggest DTSC look at foreign cities with high population density for new ideas and processes in green chemistry. The rationale is that people living in high population density will most like be affected by toxic chemicals. Therefore the local government must have

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	more stringent controls or innovations to deal with toxicity problems. We should not rely on experience in California or the United States alone for ideas in green chemistry alone. Is DTSC ignoring possible innovations and knowledge that are being developed in South America, Asia, and other continents? I always believe that SF and LA will be like Beijing when the US population growth increases. When I visit other foreign countries, I discovered that people do things completely different. Is the US EPA involved in acquisition of foreign experience and knowledge? If not, perhaps California should think about going international. Victor M Chan, PE, BCEE Solano County Environmental Engineer
F-C2C-61	The regulations need to be modified to allow and expand recycling or reclamation activities at the generating facility so that streams can be re-introduced back into the process as feedstocks or raw materials without requiring a Part B or tiered permit. EPA is currently proposing revisions to the definition of solid waste under 40 CFR Parts 260 and 261 to exclude certain hazardous secondary materials from regulation under Subtitle C of the Resource Conservation and Recovery Act (RCRA). Federal Register: March 26, 2007 (Volume 72, Number 57). DTSC needs to be proactive and prepared when EPA adopts these changes. Benefits: reduction in raw material usage, reduction of transportation of raw materials and hazardous waste on public roadways, and reduction of hazardous waste generation.
F-C2C-62	The business of American chemistry is built on fundamental science. As a result, the members of the American Chemistry Council (ACC) support science and risk based chemical management policies that simultaneously protect health and the environment, assure product safety and promote innovation in the marketplace. Our industry has always relied upon innovation in its development of products and processes to meet customer needs and expectations, address new regulatory requirements, and to fulfill voluntary commitments to programs that go beyond the law. It's important to note that "Green Chemistry" is a way of doing business was never intended to be applied as a government mandate through regulation or legislation. Indeed, the American Chemical Society's Green Chemistry Institute states: "Green Chemistry differs from previous approaches to many environmental issues. Rather than using regulatory restrictions, it unleashes the creativity and innovation of our scientists and engineers in designing and discovering the next generation of chemicals and materials so that they provide increased performance and increased value while meeting all goals to protect and enhance human health and the environment." So how should California approach green chemistry? We think there are a number of threshold issues DTSC must be prepared to address in making recommendations on the basis of this initiative: 1. Make a baseline assessment of chemical information that is already available to the State. In ACC's view, there is a lot of information already publicly available on chemicals in commerce, and a lot more coming on line, from other States, the federal government, foreign governments, intergovernmental organizations, and even non-governmental organizations (including industry). DTSC should be studying the availability of data now, particularly the availability of both hazard and exposure data, so that risk determinations can drive decision making. It simply makes sense for California to coordinate on information needs with other governments and other sources of information – why reinvent the wheel? More importantly, DTSC doesn't have to wait until the end of its Green Chemistry Initiative to get the ball rolling on this important element. 2. Reiterate the commitment that the Green Chemistry Initiative will be governed by science. Many entries in the "Conversation with California" appear to be based on an underlying assumption that the current design of products and manufacturing processes is not adequately protective of health and

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	the environment, and recommend that DTSC suggest hazard-based approaches to decision making. That's not good policy. As DTSC acknowledged in the launch of the Initiative, science should govern the process. Americans (and Californians) are living longer, healthier, and safer lives than ever before, and significant improvements have been made in public health and the environment. An extensive legal and regulatory framework, coupled with myriad voluntary programs, initiatives and innovations, has led to those advances in health and the environment. We hope that the Green Chemistry Initiative will examine the basis for the assumptions about the adequacy of current protective measures as policy options are identified. 3. Commit to understand both the burdens and benefits of new regulatory proposals. One University of California report on chemical regulation in California noted that businesses in California labor under a "labyrinth" of rules enforced by a number of agencies. Interestingly, many of the entries in the "Conversation with California" argue that even more regulation is necessary! Some have referred to Europe's new REACH regulation as the solution – taking the interesting position that a regulatory program that is not yet even operating is now a benchmark for chemical regulation. 4. Acknowledge that engineering is a part of "green chemistry." ACC member companies are leaders in green chemistry and green engineering in their operations and have been honored for their efforts. Modifications in process technology have significant potential to minimize possible adverse health or environmental effects of chemical substances. Many of the entries in the "Conversation with California" appear to focus largely on promoting product substitution – the simplistic substitution of one hazardous chemical for a less hazardous alternative – without regard to the consequences of such an approach, and without recognizing the important role that process improvements can have. It's time DTSC made clear in this dialogue that engineering is every bit as important as product improvements. ACC and its member companies believe that the Conversation with California should address a number of the complex, specific issues that are implicated by the Initiative. In the weeks ahead, we intend to address issues like the role of product stewardship, the role of regulation in promoting innovation, how California might stimulate "green chemistry" and "green engineering", and the four broad categories on which DTSC has invited specific comment. Mike Walls Managing Director, Regulatory and Technical Affairs American Chemistry Council
F-C2C-63	A database has been created with over 220,000 chemicals (all listed to date) and all cross reference names with filters for all state and federal regulatory lists. Each chemical has assigned the 33 federal EPA Environmentally Preferred Characteristics (EPP) and additional credible Characteristics given by regulatory agences CAL EPA, other key USA states and key countries totaling 41 key environmental performance characteristics (e.g. LD 50, excess lifetime cancer risk, flammability, health hazardard indicies etc). These characteristics may be organized into three categories Ecology, Human Health and Safety. This database, updated annually, contains over 75,000,000 elements to rank products as a function of the chemicals and chemical percentages. For each environmental characteristic, the chemical that is least compatable with living systems is given a score zero and the most compatable the score one hundred. The scores in between are normalized so that each chemical (all 220,000) has a quantitative normalized score. The navy tested eight adhesives meeting MIL-SPEC by providing the chemicals that make up the products. The chemicals were tranmitted via the on-station web site database of products Hazardous Material Management System (HMMS) to Chemical Compliance System's (CCS; www.chemply.com) web site. A report of all 41 Environmental Characteristics was automatically generated, and with equal weights as the default mode, a normalized score for Ecology, Human Health and Safety and an overall Environmental Score (Green Rank Score to make the best decision for the environment). This tool may be used for face cream, road paint, military aircraft munitions or paint, any product with a list of chemicals and percentage created a true quantitative score. This tool may be utilized by acedemia, government, industry, householders, military etc to formulate-design and or determine the best products compatable with the ecology, human health and safety.

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	The vision is that the state of California purchases the tool for the USA to be utilized for no cost by all so that the environmental may improve rapidly. This would become the biggest pollution prevention project ever and the most cost effective to reduce pollution through source reduction. The federal EPA may also participate. With this tool in place via a web site sponsered by CAL EPA and or FED EPA, the products most compatible with the ecology, human health and safety may be chosen by the consumer. Also, formulations by acedemia, the govenment, industry etc may be optimized for environmental compatability. The user simply imputs the chemical makeup of a product and the web site generates a complete report of the EPA EPP chacteristics (and others from the key state and countries if desired) and a normalized score for the ecology, human health and safety and a total environmental score (green rank). This would be easy to put the information into a green label. Dr. George Thompson, PHD in Chemical Engineering developed this tool taking over 25 years for the DOD through a company www.chemply.com. The rest of the nation should benefit from this significant work.
F-C2C-64	Legislative Changes I have conducted research on safer alternatives for the last 30 years. Over the last 17 years, my organization, the Institute for Research and Technical Assistance (IRTA), has identified, tested, developed and demonstrated safer alternatives in a range of different applications and industries. Over that period, IRTA has assisted hundreds of facilities in California in adopting alternatives. IRTA has worked on alternatives in dry cleaning, repair and maintenance cleaning, handwipe cleaning, batch loaded cold cleaning, electronics cleaning, vapor degreasing, printing cleanup, paint stripping, coatings and adhesives. In some cases, whole industries have adopted alternatives developed and tested by IRTA. Over the course of this work, I have learned much about how the system works and have become aware that, in order to ensure that safer alternatives are used, legislative changes are required. First, California needs a California Toxic Substances Control Act (CAL TSCA). CAL TSCA would require all new chemicals sold into California to be tested for toxicity before they are marketed. A set of toxicity tests that would be required would be developed by a consensus group of toxicologists with input from DTSC and the public. The manufacturers or distributors would have to conduct these toxicity tests at their own expense. CAL TSCA would also establish a set of toxicity tests that would be required for existing chemicals, chemicals that are already being used and marketed in California. In a few cases, the toxicity test information would already be available; in other cases, the tests would have to be performed. When the toxicity test data were provided by the manufacturers or suppliers, DTSC, with the help of the Office of Environmental Health Hazard Assessment (OEHHA), would evaluate the results and decide whether the chemical could be marketed (new chemicals) or whether the chemical would have to be removed from the market (existing chemicals). The criteria for deciding on this up or down vote would be predetermined by the group of toxicologists who designed the tests and DTSC with public input. Many chemicals that have toxicity problems have come on the market in the last 10 years. These chemicals are used extensively and exposure of workers and community members is high. An example is n-propyl bromide (NPB). NPB is a reproductive toxin in animals and has also caused nerve damage. It is currently undergoing testing for carcinogenicity. When the chemical was first marketed, EPA did not require toxicity testing for the substance under Federal TSCA. The chemical has been listed on California's Proposition 65 but is not on the state toxics list. Cal/OSHA and Federal OSHA have not established worker exposure levels for the chemical. NPB is used in vapor degreasing. The dry cleaning industry is considering using it as a dry cleaning solvent and there is nothing that would prevent this. Once chemicals like NPB are on the market, there is no mechanism for preventing their use in dispersive applications. Adopting a CAL TSCA would allow the state to deal with chemicals like NPB. Second, OEHHA has the responsibility of determining whether chemicals pose an unacceptable risk and that agency has few resources. OEHHA's budget should be expanded substantially. Dry cleaners in the state have been using a dry cleaning solvent called D5 for several years and D5 has caused cancer in laboratory animals. OEHHA has been evaluating toxicity test results to determine whether D5 is a threat but has not completed their analysis. In the meantime, no regulatory agency can regulate D5 and the dry cleaning industry is using it extensively. Giving OEHHA more resources could speed the evaluation process and give high priority to the new work the agency would be called upon to do under CAL TSCA. Third, the California Air Resources Board (CARB) is limited in their regulatory authority and their authority should be expanded. CARB regulates

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	consumer products but is forbidden from regulating away a whole product type. In other words, if a low-VOC or low toxicity nonaerosol product is available and could substitute for a higher VOC more toxic aerosol product, CARB cannot regulate the VOC content or toxicity of the aerosol product on that basis. CARB can set a lower VOC limit or ban certain toxics in the aerosol product if there are other aerosol products with lower VOC content or no toxics. Aerosol products are inherently not green. They lead to a very large waste stream and they rely on propellants that are often VOCs or greenhouse gases. As an example, consider antiperspirants and deoderants. Roll on products have very low or no VOC content. In contrast, aerosol products have a higher VOC content and contain propellants that may be greenhouse gases or VOCs. Expanding CARB's authority would permit the agency to establish VOC and toxics limits based on the nonaerosol products. This would allow the state to forbid the use of aerosol products in cases where there are greener products. It would also allow CARB to forbid the use of certain toxics as determined under CAL TSCA as a threat. The three legislative suggestions described here would make it far easier to restrict the use of certain materials that cause problems for health and the environment. The strategy would provide an incentive for manufacturers and suppliers to find and market greener products. This would result in better protection of the health of consumers and workers and of the environment in California.
F-C2C-65	Endocrine disruption may ultimately prove to be more impactful on human and animal health than toxicity. The following is a link to a list of possible endocrine disruptors. http://www.silsoe.cranfield.ac.uk/ieh/pdf/w20.pdf This report is eye-opening.
F-C2C-66	Green chemistry is not only about developing a means to identify and avoid chemical hazard, but it is also about implementing a prohibition or use restriction when necessary to protect human and animal health. Clearly, in some cases, such as fire safety and toxic fire retardants, toxicity and ecotoxicity must be weighed against benefits of crucial importance like burn injury and death. In the case of fire retardants in furniture, the authority to make determinations regarding prohibition must be made in a transparent process that is informed by peer-reviewed reseach conducted under the highest standards. A process of this nature has been drafted and is pending on the California Senate floor in the form of AB 706 (Leno). That process leaves to the fire safety experts at the Bureau of Home Furnishings the decisions related to prohibitions within their jurisdiction while requiring that the toxicologists at the Office of Environmental Health Hazard Assessment make decisions regarding what chemicals are selected for risk assessment. AB 706 can be viewed as a pilot for the 2 primary approaches to chemcial regulation: 1. Prohibited until proven safe. Brominated and chlorinated fire retardants have a preponderance of evidence of serious health risks. It is not prudent to public safety to proceed with unregulated usage until they are proven safe for use in furniture. 2. Permitted until proven unsafe. All other components or chemicals that are used to meet furniture fire safety standards are permitted, but may have to undergo a toxicity risk assessment if serious health questions arise. A petition process, that enables anyone with data to petition the state to consider if a risk assessment is neccessary is a crucial piece of the regulatory process. Authority has been broadly granted by the Legislature to state agencies to protect public health, but actions that come at a cost to industry (and the most important actions nearly always do) are commonly delayed or never acted upon. This is why the threat of environmental toxins is so serious. Green chemistry should never be an excuse to delay prudent action necessary to protect public health. Government's highest responsibility is to protect the health and safety of its citizens. We can only hope that in addition to an adherence to high scientific standards, there is also a big dose of courage among decision makers.

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F-C2C-67	First, protect the contents of the cradle! The emergence of endocrine disruption understanding requires major changes in the way that industry should develop new products and processes with both major regulatory and separate but related scientific challenges. • Do not saddle GC with the destructive burden of being the excuse not to regulate!—you will hurt the field! • Do not rely on risk analysis—instead develop legally binding EDC toxicity assays. • Ban all known EDCs ASAP—help industry make the transition • Encourage expanded R&D at the EDCs/Green Chemistry interface.
F-C2C-68	How about "Green Chemistry Shares"? An industrial plant would receive a given number of GC Shares, based on an evaluation of their operation (according to Green Chemistry Criteria that have been specified). Over the years they have to show improvements in these specified areas (overall reduction of shares: 10% over 5 years or whatever); if they do better than that, they can trade the GC shares with other companies. Benefits: clear criteria are established; allows and anticipates future needs of CA; industry can self regulate where and how to reduce GC shares
F-C2C-69	A complete product footprint that adresses Energy usage, greenhouse gases produced, multimedia wastes generated during the phases of production (including raw material procurement/mining etc.), normal usage of the product (impact parameteres during usage to be on a per unit time basis) and in the end of life ultimate disposition will be a good strp in the right direction...

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F-GC-1	American Chemical Society Response Cradle to Cradle: Through product design and industrial innovation, produce products that reduce the use of harmful chemicals, thus generating fewer emissions and less waste. How do you think California should move to a Cradle to Cradle framework? California needs to carefully review and identify with stakeholders the current significant barriers that impede investment in, and adoption of, sustainable technologies. Although the long-term economic benefits of sustainable technologies, such as reduced regulatory and waste disposal costs, can be significant, businesses can be placed at a near-term competitive disadvantage because of potentially prohibitive, up-front costs. Regulations need to be revised to allow flexibility for the superior environmental performance obtained when clean technologies are employed. To effectively address this dilemma, ACS believes that governments should provide incentives for the implementation of sustainable technologies, as explained further by our answer to the green chemistry question.
F-GC-2	Use of Existing Web-Based Tools to Certify "Green" Cleaning Products Industrial cleaning product constituent chemicals have a wide spectrum of potential effects on human health and the environment. Manufacturer employee, product user, and cleaned building resident exposures potentially encompass both acute and chronic health risks. Selected products and processes also manifest safety risks (e.g., fire, explosion, incompatibilities). Constituents may additionally pollute air, water and soil. Everyone gains when historic industrial and household cleaners are cost effectively replaced with “green” products and manufacturing processes that have passed quantitative, objective, and comprehensive assessments. Customization of the Chemical Compliance Systems, Inc. (CCS) “Green” Process Compliance Analytical System (G-PACS) and their “Green” Product Compliance Analytical System (GP-CAS) enables the Chlorine Free Products Association (CFPA) to utilize the “Green” Cleaning Product Process Analytical Compliance System (GCP-PACS) in conjunction with the third party accountability services of our Sustainable Manufacturing Initiative (SMI) on-site audits. Those facilities that complete the SMI with GCP-PACS are then offered access to the on-line, automated “Green” Cleaning Product Compliance Analytical System (GCP-CAS) to provide a complete, comprehensive, cleaning product assessment within 5-10 seconds. Both systems utilize over 40 ecological, health and safety criteria for each chemical constituent. The process, or product, is quantitatively rated on a scale of 0 (worst green) to 100 (best green) for easy manufacturing, or acquisition, assessment against pass/fail criteria, or comparison of competitor products. Compromising product hazards and offending constituents are also quantitatively identified. Both GCP-PACS and GCP-CAS include alternative constitutent databases in their process/product Design modes that greatly streamline selection of less hazardous constituents to replace more harmful ingredients. This latter feature greatly facilitates “green” cleaning product and process research and development by rapidly calculating product, or process, “green” ratings as alternative constituents are theoretically inserted for compromising ingredients. Cleaning product or process constitutent impacts on over 100 state, federal, international and other third party regulations are simultaneously assessed. GCP-CAS and GCP-PACS represent the first standardized, Web-based analytical compliance capabilities for quantitatively certifying the “greenness” of industrial cleaning products and processes by an independent third party. CFPA recommends that California consider these CCS capabilities as options for achieving the objectives of the California Green Chemistry Initiative.

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F-GC-3	Green Chemsitry & Low Income Community Cal-EPA's Green Chemistry Initiative presents a welcome and needed opportunity to explore claims made by individuals and legislators proposing chemical bans in a forum where policy decisions should be driven by science instead of politics and anti-chemical hype. Earlier this year our organization and others who serve the minority and low income communities opposed AB 706 (Leno). We opposed this legislation because it proposed sweeping bans on the most cost-effective options currently available for flame-retarding upholstered furniture and bedding products. It was felt that if there is a ban, the remaining options would greatly increase the cost of new products, driving low income consumers to cheaper, untreated imports or used products and placing them at greater risk of fire deaths and fire-related injuries. A state chemical policy that is not enforceable is meaningless in terms of protecting Californias low income and minority communities. In the case of flame retardants, the Bureau of Home Furnishings already routinely cites importers for violations of the existing state fire retardant standards. To the extent new standards are deemed necessary, they must not result in an increase in cheaper imported products to compensate for higher production costs. Any proposal that would increase existing enforcement challenges will increase the likelihood that dangerous products will make their way into the homes of low income consumers. Any type of Green Chimestry Initiative should include a science-based process and criteria for evaluating chemicals currently in the marketplace on a level playing field with the alternatives advocated by chemical ban proponents to inform the need for, and extent of, risk management actions. By contrast, the trial and error decision making process inherent in current legislative proposals could jeopardize public health and safety. For example, the flame retardant option most favored by anti-chemical advocates is fire resistant barrier (cover) material, which allegedly eliminates the need to treat foam cushions and fills. However, any breach in the barrier from shipping, moving, or normal wear and tear would expose untreated foam, which burns like gasoline. Low income consumers, who are more likely to own second hand furniture, would be at greater risk than those able to afford new products. We feel that when evaluating alternatives to existing flame retardant chemicals, Cal-EPA must also address affordability issues. Low income and minority communities already bear a disproportionate share of fire-related deaths and injuries, in part because they lack the financial resources to invest in fire safety. Thus, any new chemical policies that flow from this Initiative must not have the effect of placing fire safe products further out of reach of these individuals.
F-GC-4	AB 706 & Green Chemistry During the 2007 legislative session, a number of minority organizations opposed AB 706 (Leno) because it proposed sweeping bans on the most cost-effective options currently available for flame-retarding upholstered furniture and bedding products. The remaining options would significantly increase the cost of new products, driving low income consumers to cheaper, untreated imports or used products and placing them at greater risk of fire deaths and fire-related injuries. Cal-EPA's Green Chemistry Initiative presents a welcome opportunity to explore claims made by those proposing chemical bans in an atmosphere where policy decisions can be driven by science instead of politics and anti-chemical hysteria. The Initiative should include a science-based process and criteria for evaluating chemicals currently in the marketplace on a level playing field with the alternatives advocated by chemical ban proponents to inform the need for, and extent of, risk management actions. By contrast, the trial and error decision making process inherent in current legislative proposals could jeopardize public health and safety. For example, the flame retardant option most favored by anti-chemical advocates is fire resistant barrier (cover) material, which allegedly eliminates the need to treat foam cushions and fills. However, any breach in the barrier from shipping, moving, or normal wear and tear would expose untreated foam, which burns like gasoline. Low income consumers, who are more likely to own second hand furniture, would be at greater risk than those able to afford new products. A well intentioned state chemical policy that is not enforceable is meaningless in terms of protecting low income and minority communities. In the case of flame retardants, the Bureau of Home Furnishings already routinely cites importers for violations of the existing state fire retardant standards. To the

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	extent new standards are deemed necessary, they must not result in an increase in cheaper imported products to compensate for higher production costs. Any proposals that exacerbate existing enforcement challenges will increase the likelihood that dangerous products will make their way into the homes of low income consumers. When evaluating alternatives to existing flame retardant chemicals, Cal-EPA must also address affordability issues. Low income and minority communities already bear a disproportionate share of fire-related deaths and injuries, in part because they lack the financial resources to invest in fire safety. Thus, any new chemical policies that flow from this Initiative must not have the effect of placing fire safe products further out of reach of these individuals.
F-GC-5	Green Chemistry in Office Furniture Products BIFMA International is an organization dedicated to all aspects of safety as it relates to the products that our members manufacture. We support the principle of using less toxic materials in all manufactured products. We also strongly support the concept of global sustainability. In general, most companies in our industry are assemblers of components and therefore users of chemicals within supplied products, not developers of chemicals themselves. Manufacturers typically rely on suppliers to provide information on the contents of the materials they supply to users, in accordance with applicable laws. BIFMA supports public/private collaborative efforts to identify best available options for component materials. In 2004, BIFMA teamed with the Design for the Environment (DfE) Branch of the U.S. Environmental Protection Agency in working with the chemical manufacturers to phase out the use of pentabrominated diphenyl ether as a fire retardant additive in polyurethane foam and replace it with substitute chemicals. Today, the substitute chemicals that were considered to be better alternatives are now being questioned by organizations concerned about their potential adverse long-term environmental effects. At this point in time, furniture industry suppliers indicate that they are not able to eliminate all of the chemicals or compounds thought to pose risks to the environment because there are not agreed upon alternatives. This situation leaves the furniture industry, along with other industries that use chemicals in need of research and guidance in choosing the most appropriate materials BIFMA is actively developing an ANSI Sustainability Assessment Standard for business and institutional furniture, which promises to further improve the environmental performance of office furniture products and is actively working with groups or individuals who are experts in these areas. We have recently become a stakeholder in the State of California's Green Chemistry Initiative and hope to work collaboratively with other organizations in support of education and increased knowledge, both in the area of reducing environmental risk from manufactured products and improving consumer safety. We urge our legislators and regulators to work with us to solve these challenging issues.
F-GC-6	California Bed Clothing Flammability Standard and Green Chemistry One immediate challenge for the green chemistry initiative is Technical Bulletin 604 (TB 604) to regulate the flammability of filled bed clothing including comforters, mattress pads, and pillows. This regulation, being implemented by the California Bureau of Home Furnishings and Thermal Insulation, is likely to lead to the introduction of large amounts of fire retardant chemicals and materials into California's homes and environment. Health and environmental questions such as those listed below should be answered for all stages of the lifecycle of these products: manufacture, use in consumers' homes, and end of life disposal. Although no specific materials are required to meet TB604, it is expected to be met by fiber mixtures containing inherently fire resistant materials and/or added fire retardant chemicals. Some of the these fibers, (modacryllic, polyvinylidene chloride, and polyvinyl chloride) consist of polymers that are composed of monomers that are known to be mutagens/carcinogens and/or can cause neurological, developmental or reproductive impacts in animals.[1],[2], [3]. In addition TB604 would also impose flammability requirements on foam used in bedding materials, such as mattress pads and pillows. The TB604 foam test is rigorous and, if met by adding FR chemicals to foam, would require significant amounts - much more than currently used to meet the furniture foam requirements included in TB117. A U.S. Environmental Protection Agency study of fire retardants shows areas of significant toxicological and

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	environmental concerns as well as large data gaps for safety information for all of these chemicals. [4] The fire retardant chemicals currently used in foam in California include tris (1, 3-dichloro-2-propyl) phosphate (TDCP), which is a known mutagen and carcinogen. A CPSC analysis predicted up to 300 excess cases of cancer per million when humans are exposed to TDCP from furniture. Another primary fire retardant used in foam is a proprietary mixture called Firemaster 550 containing brominated fire retardants for which little toxicological information is available and a phospahate which is known to be highly ecotoxic. . Before TB604 is implemented, the following questions and considerations should be addressed: 1) What are the environmental impacts of the manufacture, use and disposal of products which are polymerized from toxic monomers or contain toxic or potentially toxic fire retardant chemicals? 2) What are the health impacts of using these fibers and materials in bedding? What is the level of human exposure to the toxic or potentially toxic fire retardant chemicals added to foam and fabrics? Are there residual monomers present in the inherently flame resistant fibers? Exposures for fetuses, young children and pregnant women (the most vulnerable populations to endocrine disruption and potential adverse health outcomes) as well as the number of hours people spend in bed in intimate contact with bed clothing should be considered. 3) Will the inherently flame resistant fibers break down to the toxic monomers in landfills? In that case, will the legislature need to add these bedding products to the list of products banned from the landfill under the Universal Waste Ban, which went into effect in February 2006? If so, will government managed and ratepayer financed local government programs be responsible for their safe disposal or will manufacturers be required to take these products back at the end of their useful life? 4) Do the flame retardant chemicals that would be used to meet the standard persist, accumulate and/or be potentially toxic in hundreds. Other fire retardant chemicals are rapidly accumulating in humans, wildlife, and the environment. U.S. women have some of the highest levels of fire retardants in their breast milk in the world. Many studies completed underway postulate that a relationship exists between previously used fire retardant chemicals such as PBDEs and birth defects, hyperactivity, reduced fertility and sperm counts and other neurological and reproductive conditions. Will similar chemicals be used to meet your standard? 5) Have studies been conducted on the fate and transport of fire retardant chemicals and materials as following their use in furniture and other consumer goods? Fire retardants such as PBDEs and PCBs have been found in remote areas including the Arctic Circle, with the highest levels found in killer whales. The lifecycle of products containing fire retardant chemicals must be considered including occupational exposure during manufacture, chemical exposure during use, and end of life disposal when products are combusted, land-filled, composted, littered, or recycled. 6) When polyvinylidene chloride, polyvinyl chloride, or materials treated with brominated or chlorinated fire retardant chemicals burn, highly toxic dioxins and furans are believed to be produced. If there will be incineration of these bedding materials, an analysis of the health and environmental impacts of this disposal method should be done. 7) Will plasticizers be used to make polyvinylidene chloride, polyvinyl chloride, and other polymers in the inherently flame resistant materials soft and flexible? Phthalates are sometimes used for this purpose. They are known endocrine disruptors and just have been banned from use in children's items in California. 8) Estimates from New York State suggest that fire-safe cigarettes could lead to 50 to percent reduction in fire deaths The CPSC estimated that the current mattress flammability standard would reduce bedding fire deaths by 69 to 78 percent. With the requirement for fire-safe cigarettes in California beginning January 1, 2007, and a stringent standard for mattresses already in place, has the estimated fire death reduction associated with the proposed bed clothing standard been reevaluated? Has this significantly reduced fire death and injury risk led to a reconsideration of the need for potentially toxic fire retardant chemicals in consumer products? 9) The Green Chemistry Initiative calls for the design of products and processes that reduce or eliminate the use and generation of hazardous substances

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	at all stages of the life of a product, ranging from the manufacture of a product all the way until end-of-life disposal. Implementing a new bedding standard that results in the increased use and generation of hazardous substances appears to contradict the premise of the California Green Chemistry Initiative. [1] IARC (1999). IARC Monographs on the Evaluation of Carcinogenic Risks to Humans. Volume 71. Re-evaluation of some organic chemicals, hydrazine and hydrogen peroxide (Part One). IARC, Lyon. pp. 43-108. [2] U.S. EPA (2000). Toxicological Review of Vinyl Chloride (CAS No. 75-01-4). In support of summary information on the Integrated Risk Information System (IRIS). May 2000. EPA/635R-00/004. U.S. Environmental Protection Agency, Washington, D.C. Available at: http://www.epa.gov/iris/toxreviews/1001-tr.pdf [3] U.S. EPA (2002). Toxicological Review of 1,1-Dichloroethylene (CAS No. 75-35-4). In support of summary information on the Integrated Risk Information System (IRIS). June 2002. U.S. Environmental Protection Agency, Washington, D.C. Available at: http://www.epa.gov/IRIS/toxreviews/0039-tr.pdf [4] U.S. EPA (2005). Furniture Flame Retardancy Partnership: Environmental Profiles of Chemical Flame-Retardant Alternatives for Low-Density Polyurethane Foam. September, 2005. EPA 742-R-05-002A, U.S. Environmental Protection Agency, Washington, D.C. Available at: http://www.epa.gov/dfe/pubs/flameret/ffr-alt.htm
F-GC-7	Center for Biological Diversity Comments The Center for Biological Diversity ("the Center") appreciates the efforts being made by the state of California to address the issue of toxic chemicals. Toxic chemicals have become a pervasive part of our lives and action is necessary to protect public health and the environment from further degradation. The Center encourages California to lead the way as it has on other important environmental issues such as global warming—waiting for nationwide consensus will only result in further damage to the health of Californians and to California's environment. The Center for Biological Diversity advocates a precautionary approach to toxic chemicals. This means the burden of proof should be on the chemical producing companies to fully disclose the chemicals in their products and to adequately demonstrate that the chemicals and products are safe. A precautionary approach also means that California should not fail to act in the face of uncertainty—there is no reason for humans and the environment to suffer simply because of the lack of conclusive proof about the effects of various chemicals that have been found to be potentially harmful. In other words, if conclusive proof is required, such a burden should lay with the chemical producers to conclusively demonstrate that their chemicals and products are safe. Chemical companies should also be required to fund independent research of the impacts of their products, not just research conducted by their own scientists. Moreover, the research should address the effects of multiple chemicals—only testing chemicals in isolation will fail to address the real world impacts. Furthermore, "safe" should not focus solely on human health. It is imperative that the precautionary approach be directed at the health of animals and plants as well. For instance, frogs, other amphibians, and fish are highly sensitive to chemicals in their environment. Many scientific studies have shown how chemicals are harming fish and amphibians, especially by disrupting their immune, endocrine, or reproductive systems. See, e.g., Rosen, Michael R. et al., Investigations of the Effects of Synthetic Chemicals on the Endocrine System of Common Carp in Lake Mead, Nevada and Arizona, U.S. Geological Survey, Fact Sheet 2006-3131, Version 1.1, October 2007, Prepared in cooperation with the U.S. Fish and Wildlife Service and National Park Service (found at http://pubs.usgs.gov/fs/2006/3131/); Hayes, Tyrone B., et al, Hermaphroditic, demasculinized frogs after exposure to the herbicide atrazine at low ecologically relevant doses, Proc. Natl. Acad. Sci. April a6, 2002, Vol. 99, Issue 8, 5476-5480 (found at www.pnas.org/cgi/reprint/99/8/5476.pdf); Endocrine Disrupting Chemicals: Summary of Research Activities within BRD (found at http://www.cerc.usgs.gov/Other_Webs/endocrine/summary.htm); Summary of Endocrine Disruption Research in Contaminant Biology Program (found at

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	http://www.ecrc.usgs.gov/endocrine/summary.htm); Poisoning our imperiled wildlife: A Center for Biological Diversity Report, February 2006 (found at http://www.biologicaldiversity.org/swcbd/programs/science/pesticides/BayAreaPesticidesReport.pdf. In fact, heavy metals and PCBs are persistent in high quantities in fish, marine mammals, and seabirds, which can cause genetic damage as well as harm to immune systems. See, e.g., Toxicology of Marine Mammals, Edited by Joseph G. Vos et al.; David R. Thompson1 & Keith C. Hamer; Stress in seabirds: causes, consequences and diagnostic value, Journal of Aquatic Ecosystem Stress and Recovery 7: 91–110, 2000. Again, in order to protect California's biodiversity, the focus should be on only allowing the use of products that have been demonstrated to be harmless. Where uncertainty exists, caution should be exercised in favor of protecting wildlife and the environment—uncertainty should not be allowed to be used as an excuse for continued use of potentially unsafe chemicals and products. While impacts to all wildlife should be addressed, it makes sense to prioritize by focusing research on the impacts of chemicals to endangered, threatened, or imperiled species. By addressing the most vulnerable, we will likely be protecting many other species as well. It also makes sense to focus the most energy on amphibians and upper trophic level predators. Amphibians, due to their body type, are often the first animals to be impacted by toxics and can therefore likely provide us with early and important information about the harmful impacts of chemicals; upper trophic level predators (like polar bears) bioaccumulate toxins and therefore often exhibit high toxin concentrations in their systems, making them important sentinels of the ecological impacts of toxins. Research efforts should also include the monitoring of various species, especially amphibians and upper trophic level predators, so as to better understand what chemicals are already present in the environment and what their impacts are. In short, there is no sound reason to place the health of humans, or of other species, at grave risk, simply because we failed to adequately and carefully ensure that various chemicals were safe and would not accumulate in the environment. In addition to the adoption of regulations that better prevent harmful chemicals from being used in the first place, the Center advocates for the phasing out and ban of all chemicals found to be harmful to people or wildlife. A good example is the legislation recently passed by the state of California that outlaws the use of lead bullets in California condor habitat. This was necessary because the science showed that condors were being significantly harmed by lead. Similar legislation should be passed when confronted with situations where chemicals are harming people, wildlife, or the environment. Finally, incentives should be instituted that encourage the production and use of products that do not contain toxic chemicals as well as more aggressive education campaigns about the alternatives to harmful chemicals and their products.
F-GC-8	Comments - California Green Chemistry Initiative Thank you for soliciting input from California residents concerning the Green Chemistry Initiative. I am currently writing a book-length narrative about environmental illness (including one fictional character based on Dr. John Balmes, who was extremely helpful to me when I first became chemically sensitive), and I would love to contribute my insights to your project. The REACH program currently underway in the E. U. would be a wonderful model for California. In addition to this, however, we need to zero in on those toxins to which the general public is being heavily exposed on a daily basis. At the top of this list is secondhand cigarette smoke. Twenty-one years ago, Surgeon General C. Everett Koop concluded that secondhand smoke causes disease. Twenty years later, Surgeon General Richard Carmona called secondhand smoke an alarming public health threat, "a serious health hazard at any level" One and a half years ago, the State of California's Air Resources Board defined secondhand smoke as "toxic." So what are we waiting for? Who are we afraid of? …more on behalf of Trudy Fisher

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F-GC-9	Education and the Environment Initiative November 16, 2007 Maureen Gorsen Director Department of Toxics Substances Control PO Box 806 Sacramento CA 95812-0806 Dear Ms. Gorsen- On behalf of my environmental organization Heal the Bay, and the public-private partnership of the Education and the Environment Initiative, I express strong support for the Green Chemistry Initiative. Clearly, the current structure by which we regulate chemicals in California is not sustainable. Given that California has serious pollution, ecosystem degradation, and natural resource scarcity concerns, it is imperative that the state develop a more cradle-to-cradle approach. The Department of Toxics Substances Control's (DTSC's) leadership is essential to create such a new policy and regulatory framework. Green Chemistry will better enable California to protect people, and the environment, as well as economically keep pace with changes worldwide, and here at home. Educate about the environment is fundamentally critical to any such new Green Chemistry policy and attendant programs. Education is necessary in order to scientifically inform such a policy, practically and efficiently implement it, and also to disseminate information about it to future generations. Luckily, California is currently poised to lead the nation in environmental literacy: the Education and the Environment Initiative (EEI) is a landmark environmental education law that requires the development and implementation of multi-disciplinary environmental education curricula in all disciplines (science, history/social science, English/language arts, and mathematics) for all K-12 grade students in state public schools. The EEI was co-authored by environmental organization Heal the Bay and signed into law in 2003 by former California Governor Gray Davis. In 2005, Governor Schwarzenegger allocated state funds over two years for environmental education curricula development under the EEI. A national model, the EEI will ultimately allow six million California school children each year to have the information they need to make informed decisions about protecting their health and our precious natural resources. As currently being developed, the EEI will necessarily include information that touches on green chemistry specifically. For example, EEI statutory mandates specifically call for the EEI curricula to address topic areas such as "toxics and hazardous waste," "public health and the environment," "pollution prevention," and "environmental sustainability." Obviously, there is significant overlap between the educational mandate of the EEI and the subject matter and goals of any state Green Chemistry Policy. We therefore encourage DTSC to make sure there is full integration between the EEI curricula development and its implementation, and the Green Chemistry policy and program development (including, but not, limited to K-12, post-secondary, and vocational educational efforts associated with Green Chemistry.) To date, DTSC has been very supportive of the EEI effort, and we gratefully applaud their leadership in this regard. We hope that as the Green Chemistry policy unfolds, that DTSC will continue to closely coordinate with the EEI and share Green Chemistry educational content, potential outreach opportunities, and other resources. Together, we can help children learn about environmental issues and make informed decisions about their individual impact on the environment. Sincerely, Leslie Tamminen Legislative Director/EEI Director Heal the Bay

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F-GC-10	The Green Chemistry Matrix As was pointed out at a recent conference I attended, there really is no such thing as "green chemistry" per se. The second law of thermodynamics dictaes that some disorder -- aka resource depletion and pollution -- is inevitable in any process. The concept of "greener" cheistry, however, is a very viable one. Many -- if not most -- of the processes that create consumer products could be made greener without sacrifcing technical or economic values. Greener chemistry has a few crtical characterisitcs: First -- and really, by definition, a green chemistry alternative it must result in a reduced carbon footprint in comparison to the chemical process it is replacing. Second, it should involve the use of less hazardous and more degardable reagents. Third, it should entail substantive utilization of renewaable feedstocks. And, very importantly, it should entail increases in efficiency and optimizaiton of processes. Green chemistry, then, repesents an optimization of hazard and depletion minimization with process efficiency maximization. A useful way way to develop a Green Chemistry initiative that can identify optimal future directions would be to devekio a simple Green Chemistry Natrix system to sort out current and projected chemical practicies into the four categories of: Clean Product/Clean Process (upper left corner - most desired), Clean Product/Dirty Process, Dirty Product,/Clean Process, and Dirty Product/Dirty Process (lower right corner, least desired),. With this matrix in place it is then possible to identify the tradeoffs involved and factors entailed in enhancing feasibilities of shifting to that upper left corner. The Green Chemistry Matrix proves a framework for identifying the most expedient paths to clean produces and services produced through clean processes. Pollution and waste -- the byproducts of nonn-green chemistry -- have been defined as resources in need of beneficial applications.The Green Chemistry Matrix makes it easier to understand how to go about identifing these applications.
F-GC-11	CalARVC's Comments The California Association of RV Parks and Campgrounds (CalARVC) requests that the Department of Toxic Substance Control prohibit the import, sale, or use of certain RV toilet additives as part of the California Green Chemistry Initiative. Many of these products are detrimental to onsite septic systems and often cause systems to fail and pollute surrounding soil and groundwater. CalARVC, which is comprised mainly of hundreds of small "mom and pop" RV parks and campgrounds from all over the state, has been seeking a solution for this problem to several years. CalARVC believes the best solution is to ban the sale and use of deleterious products that contain formaldehyde or similar biocides. Most of the toilet additive products sold and used in California contain formaldehyde or a derivative of formaldehyde. These products help dissolve toilet paper and bio-solids and are used by RV owners to prevent odors and blockages in their toilet systems. However, the chemicals in these products that help dissolve toilet paper and bio-solids also kill natural biological organisms used in many onsite wastewater systems. Many onsite wastewater treatment systems use natural organism to breakdown bio-solids and toilet paper. Thus, when RV holding tanks containing certain RV toilet additives are dumped into an onsite wastewater system, which is a common everyday occurrence at RV parks, the chemicals designed to eliminate odors and dissolve toilet waste also kill off the natural organisms causing the onsite septic systems to fail....more on behalf of California Association of RV Parks and Campgrounds

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F-GC-12	Johnson & Johnson - Additional Comments On behalf of Johnson & Johnson and its family of companies, I appreciate the opportunity to provide additional comments on the California Green Chemistry Initiative. Johnson & Johnson has identified a number of key policy points regarding green chemistry that we believe are important guidelines that will lead to the overall success of California's Green Chemistry Initiative. Johnson & Johnson recommends specific policy points should be structured around the following policy goals and objectives: on behalf of Johnson & Johnson
F-GC-13	Policy Options The stated purpose of the Green Chemistry Initiative is to stimulate a green chemistry transformation in the design of products and processes. The policy options available to a governmental decision maker are not unlimited. However, there are many things that a governmental policy maker can do and these various options are fairly well understood. Some people may think of them as the policy maker's "tool kit." The options (or "tools") are basically as follows: (1) activities or substances can be prohibited or banned; (2) activities or substances can be legally restricted; (3) activities can be regulated; (4) activities can be taxed; (5) reporting obligations can be imposed on certain activities; (6) permits can be issued to govern the manner in which activities are carried out at a particular location; (7) government studies can be conducted to bring increased knowledge to bear on an issue; and (8) grants can be established to fund research and development and other activities. The rest of this email looks at the options or tools one at a time to see which of them would be most helpful in stimulating a green chemistry transformation in the design of products and processes. Prohibitions: Prohibiting the use of certain substances will not directly stimulate a green chemistry transformation in the design of products and processes. Banning certain substances would presumably lead to a search for substitutes for the banned substances. This could lead to more benign substitutes being developed to replace the banned substances. This is largely what happened when chlorofluorocarbons were phased out by the Montreal Protocol. However, prohibitions can also lead to the marketing of substitutes that are not so benign, such as methyl tert-butyl ether. Restrictions: A restriction prevents the use of certain substances in their most problematic uses. This differs from a prohibition, which prevents the use of certain substances for essentially all uses. Similarly to prohibitions, restrictions will not directly stimulate a green chemistry transformation. Restrictions may be useful in preventing certain substances from being used in ways that are particularly problematic, but restrictions will have at best only an indirect effect on promoting innovation. Regulation: Regulation generally entails placing a series of requirements—sometimes quite detailed—on certain activities. Regulation is generally not perceived as a mechanism that fosters innovation. In general, regulation has the opposite effect—it tends to stifle innovation. Taxation: A tax scheme could theoretically be used to create disincentives to the use of more toxic substances. Higher taxes on more toxic substances and smaller or no taxes on more benign substances would theoretically lead to substitution of the more benign for the more toxic. However, a tax system would be difficult to implement in practice. There are many different ways to measure toxicity and little agreement on which method is best. Taxes would have to be established for thousands of substances, which could create regulatory gridlock. There is also a lack of data on which to make relative toxicity determinations and due to the flow of new information, adjustments would have to be made continually to the various tax rates. Finally, if an incorrect toxicity determination were made, it would result in incorrect incentives being established. Reporting Obligations: Reporting obligations, such as the Toxic Release Inventory, create incentives to minimize the use of hazardous substances, as entities that use chemicals generally do not want to appear near the top of the listings that are published. It is unclear whether reporting obligations spur the substitution of more benign substances. It does not appear that reporting obligations by themselves would lead to green chemistry innovations.

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	Permits: While permits can be useful in conforming existing practices to accepted standards of conduct, it is difficult to see how a permitting scheme would lead to innovation in this area. Permits could contain a condition that facility operators review their processes and inputs periodically to determine whether changes could be made that would result in a reduction in the use of hazardous substances. Such conditions are unlikely to be effective, as such conditions are essentially unenforceable and are, in any event, too weak of a mechanism to effect significant process changes. Studies: Government sponsored studies often bring needed fact finding to bear on governmental decisions. The Green Chemistry Initiative is one form of governmental study. Further studies into various aspects of chemical usage may be helpful. Grant Funding: Funding for research and development is a well understood method of spurring innovation. Public and private research has developed many techniques for decreasing the use of chemicals in various applications. To take one example, it was common practice 25 years ago to strip paint off aircraft by using solvents. This process was replaced by plastic media blasting, where small plastic pellets are used to blast the paint off aircraft in a process similar to sand blasting. This process eliminates all chemical waste, except for the paint itself and minor losses of the plastic pellets. It has been suggested that the plastic media could be replaced by high pressure water or ice crystals, thus eliminating all waste streams except for the old paint. It appears that one of the most effective ways to stimulate a green chemistry transformation in the design of products and processes would be to substantially increase funding for research and development in this area. California is home to many universities that have excellent research facilities and that would be ideal for this type of research. A dedicated program could be instituted at one university, or research could be spread out at many campuses. Varied funding sources may be available, including legislative appropriation, bond funding, and donations from interested companies and foundations. Conclusion. Of all the tools available to the policy maker, increased funding for research and development appears to be by far the most likely to stimulate a green chemistry transformation in the design of products and processes. None of the other mechanisms offer much realistic promise of stimulating innovation. The transformation in products and processes has really already begun (e.g., the paint stripping process discussed above). More research and development funding could be instrumental in speeding the transformation.
F-GC-14	Policy Elements proposed by the Silicon Valley Leadership Group Green Chemistry in California – Initial Policy Elements Proposed by the Silicon Valley Leadership Group (These comments have been posted to all four discussion forums in the same form, due to overlap in topics.) The Silicon Valley Leadership Group advocates a comprehensive, integrated approach to expanding Green Chemistry in California. By highlighting leaders in the corporate environmental practices and encouraging those who are further behind, we can all move ahead. We envision Green Chemistry as an interactive, evolving partnership with industry, government and consumers working together to protect human health and promote a cleaner, safer environment. Leadership Group members involved in crafting these initial suggestions include those from the electronics, biotechnology, pharmaceutical, chemical manufacturing, and supporting sectors. For more information about the Leadership Group please visit www.svlg.net. The Leadership Group proposes the following policy elements to further Green Chemistry in California: 1. Strengthen the recognition and pursuit of Green Chemistry processes and products by establishing clear criteria and voluntary certification based on comprehensive lifecycle considerations. Equally important, consumers need to be educated about responsible choices and practices. 2. Explore models other than, or building upon, the current Materials Safety Data Sheet (MSDS) system to provide needed chemical hazard data throughout the supply chain. 3. Establish a Green Chemistry Coordination Council to collect and promote the sharing of information, highlight businesses with green practices, provide

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	assistance to businesses lacking resources, and educate consumers. 4. Prioritize chemicals for screening, testing and appropriate restrictions. We suggest building upon the model of Canada's analysis and prioritization as well as the Proposition 65 review process conducted by OEHHA. Chemicals of high concern should be allowed for targeted, low-exposure uses as determined in an open process by DTSC. 5. Greater investment in pollution prevention in the short term as well as extension of the current CA Pollution Prevention model to downstream chemical users as an element of the long term Green Chemistry strategy. 6. Continue the Conversation with California to sustain progress in Green Chemistry. The dialogue between DTSC and stakeholders has been very helpful and will result in more well-developed, effective policy. IN MORE DETAIL: 1) Issue: Our market economy and the innovations that it engenders, environmental and otherwise, are driven by the relationship between industry and consumers. In order for industry to offer products that are environmentally-sound, and for consumers to recognize them, clear and stakeholder-driven criteria are necessary. Proposal: The Leadership Group proposes we strengthen the recognition and pursuit of Green Chemistry processes and products by establishing clear criteria and voluntary certification based on comprehensive lifecycle considerations. Equally important, consumers need to be educated about responsible choices and practices. While the focus of the Initiative has been on chemical safety, green chemistry in the broader sense should incorporate an accounting of embedded energy, C02 impact, water usage, packaging, recyclability and so forth. Industry on the whole is already moving toward a greater consideration of these factors in our practices. The difficulty of quantifying and ascribing relative importance to these factors points to the need for commonly-held practices or industry standards. A voluntary certification program for green chemistry processes and products will clarify goals for industry members while empowering consumers with the information they need to make informed choices. As green chemistry practices evolve, according to the green chemistry principles we are so well aware of, so should the criteria - we should build flexibility into the system. It is important to note that a voluntary system is more pragmatic than standards at this point, given the innovative and often resource intensive approaches that will be required, the longer timeline necessary for industry transformation, and the need for consumers to have choices. As with organic food, not every consumer wants the environmentally-sensitive approach, if it costs more. The International Standards Organization (ISO) 14001 process certification and ACC's Responsible Care Management Practices are good examples to build upon. It is also important to note that potential green chemistry certification should be a recognition of process in addition to the product. As many experts in the DTSC Symposia have remarked, we are not only trying to improve products, but the entire system that goes into making that product. And we should realize that perfection will not be immediate, but evolve over time. In order to motivate voluntary certification some type of incentive, especially market mechanism such as rebate, tax incentive, or fee refund, should be explored. We understand very well that the consumer wants environmental accountability. As consumers gain in accountability, though, so should they gain in responsibility. This is in no way a proposal to allow industry to abdicate its responsibility for the safer use of chemicals, but rather to acknowledge that in a market-based society, corporate and consumer responsibility must closely intertwine to be successful. Beyond making informed purchases, we can best protect the environment when consumers understand Green Chemistry applies to them as well. How they collectively handle chemical products has an enormous effect (for example, nail polish remover can be easily poured down a household sink which would not be allowed in the workplace). The Green Chemistry Coordination Council described in the third point below could assist in consumer education.

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	2) Issue: The MSDS provides insufficient data on chemical hazards to those downstream in the supply chain. Proposal: The Leadership Group proposes the DTSC explore models other than, or building upon, the current Materials Safety Data Sheet (MSDS) system to provide needed chemical hazard data throughout the supply chain. Our members often find the data included on the Material Safety Data Sheet (MSDS) to be insufficient for determining chemical hazards. Many times important information is addressed in a superficial, boiler-plate fashion or missing altogether. The same raw material from different suppliers may have divergent information. This is in part due to some government regulations requiring that an MSDS be obtained directly from the manufacturer. While we recognize that confidential business information needs to be protected, best possible data on hazard and ecological effects should be made readily available to the supply chain and other stakeholders. In order to meet customer information requirements on chemicals in products, some electronics manufacturers currently must request additional information from upstream suppliers. Instead of doing this on a case by case basis, and in some cases taking the costly approach of reverse-engineering products to determine content, it would be more cost-effective to make raw materials hazard information available further upstream. One approach that could facilitate the sharing of information could be to use the existing MSDS system as a vehicle. More uniform information availability, through approaches such as the ANSI standard for a 16-section MSDS or the IPC 1752 could be an improvement. However, since the MSDS was originally intended to provide more immediate emergency response and use information, it might be best to explore other options such as an MSDS addendum, focused on hazard data. As both REACH and industry efforts such as the Global Product Stewardship initiative make available this data over a 4-10 year timeframe, it is important to recognize that generating this hazard data will take time. A voluntary certification process, with recognition for particularly thorough MSDS's, could also improve the quality of information while allowing chemicals manufacturers to differentiate their products. The Global Harmonization System for the Classification and Labeling of Chemicals (GHS) should be considered, as well. Any model chosen should include the appropriate ecological as well as toxicological information. We also recommend that early stage R&D chemicals be exempted due to their limited use and limited exposures. Worker exposure issues involving recognized hazards (mostly in small/medium enterprises) during the Conversation with California suggests that incorporating MSDS information into real-life practices may be an issue, aside from content. Technical Assistance for those less familiar with critical MSDS information is included as part of the Green Chemistry Coordination Council described below. 3) Issue: Some companies and industries have already made much progress in achieving the aims of Green Chemistry while others lag behind. Green Chemistry involves myriad innovations and the collection and processing of much information. We do not have an adequate way of sharing Green Chemistry practices nor have we made the investment to encourage and reward green efforts. Proposal: The Leadership Group proposes the establishment of a Green Chemistry Coordination Council to collect and promote the sharing of information, highlight businesses with green practices, provide assistance to businesses lacking resources, and educate consumers. The information presented by the speakers, panelists, and stakeholders during the past year of effort on this Initiative has been incredibly thorough, enlightening, and inspiring for all stakeholders. We suggest the DTSC catalog and make easily available information regarding best practice screening processes, green chemical design, collaborative efforts such as the ACS Green Chemistry Institute, and international efforts such as the Global Harmonization System. All stakeholders still have a lot to learn in this dynamic area, and everyone stands to gain from continued information sharing. DTSC's leadership in this area should be continued by establishing it as a central clearinghouse of information for the state and beyond. Many medium and small companies are lacking in appropriate knowledge and resources, and will need assistance in taking advantage of Green Chemistry practices. Providing incentives for the sharing of data and best practices will help all companies. We further suggest building upon and making readily available the information provided by existing efforts: ACS Green Chemistry Institute, Cleangredients, U.S. EPA's Design for Environment

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	Program, Performance Track, the chemical industry's HPV testing program, eChemPortal, EPEAT, and DTSC Technical Resource Center. 4) Issue: California has limited resources to evaluate chemicals for restriction. Chemical safety is a measure of exposure as well as toxicity. While we need to carefully assess and restrict the use of chemicals of concern, complete bans fail to allow for appropriate and beneficial uses. Proposal: The Leadership Group proposes the DTSC prioritize chemicals for screening, testing and appropriate restrictions. We suggest building upon the model of Canada's analysis and prioritization as well as the Proposition 65 review process conducted by OEHHA. Chemicals of high concern should be allowed for targeted, low-exposure uses as determined in an open process by DTSC. The DTSC, together with other relevant State agencies, needs to establish clear and consistent science-based protocols for screening and testing. These should include determination of endpoints of concern and modes of action, where scientific and methodological questions are sufficiently advanced to enable consistently sound science-based judgments of potential risk. The use of a transparent and rigorous process to evaluate risk factors as indicated by toxicological, epidemiological, and exposure data will allow us to compare the relative importance and safety of chemicals as well as determine whether any restrictions or substitutions are appropriate. A scientific panel of experts with a range of theoretical and applied chemicals experience can best establish and oversee a process acceptable to all stakeholders. The Proposition 65 review process may offer a starting point for development of a thorough, scientific process to meet these broader needs. Government entities around the world have been or are in the process of revamping their chemicals use policies. Although the DTSC will need to analyze the individual needs of our state through such means as chemical mapping, we should coordinate with the chemicals policies of other countries to minimize confusion, cost and competitive impacts. Starting with the thorough screening done by Canada's Environmental Policy Act (CEPA) would allow us to build upon their scientific knowledge base and mitigate the burden of data gathering. Any proposed restrictions or mandates should be targeted and include careful evaluation of alternatives. This targeted approach will allow us to concentrate our resources where most needed. Furthermore, any mandates should be harmonized with systems in other countries as much as possible. While we wish it were not necessary to use chemicals determined by such scientific protocols to be of high concern, many times they are needed to promote human health or advance ground-breaking research. This is the uncomfortable irony with which we will have to live until we find better alternatives. In the meantime, targeted use of these chemicals under highly controlled and low-exposure scenarios should be allowed by DTSC, after an open, scientifically based stakeholder process. In the absence of safer alternatives, which should be technically feasible, improve health/safety/environmental profile, be of comparable or superior performance, cost-effective, and be capable of persistence, banning should be avoided. In that case, resources should be devoted to R&D or incentives should be provided to develop cost-effective alternatives. Our goal should be a marketplace where informed decision making at both the manufacturing and consumer levels is consistently delivering changes/substitutions that advance our collective interests along the dimensions outlined above. We recommend that novel R&D chemicals, used in relatively tiny amounts in highly controlled settings, be excluded from any consideration of a restriction or mandate. There are rarely, if ever, exposures outside of the laboratory. Government oversight of these chemicals would not be cost-effective and would be counterproductive to the aims of Green Chemistry. Flexibility in this type of research chemical use promotes the innovation of safer chemicals and processes. Both CEPA and REACH exempt these chemical uses. Exemptions should also be allowed for select pilot demonstrations and testing. 5) Issue: It will take a significant amount of time for industry and consumers to move to Greener Chemistry and we need to address pollution concerns in the meantime. Existing efforts at pollution prevention in the state utilize a collaborative model that has proven effective, but has been limited by its modest resource commitment and its narrow manufacturing focus. Proposal: The Leadership Group proposes greater investment in pollution prevention in the short term as well as extension of the current CA Pollution

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	Prevention model to downstream chemical users as an element of the long term Green Chemistry strategy. Pollution prevention programs and policies such as SB 14 have been promoted for quite some time, yet they never receive anywhere near adequate funding and attention. We need to increase our investment in pollution prevention assistance, especially for medium and small businesses that either lack the resources or motivation to tackle the problem on their own. Since pollution prevention has led to demonstrated improvements and optimization of chemical processes, it is a critical, complementary approach to Green Chemistry's goals of better chemical design. The model of collaboration between companies, the DTSC and third party experts (in the case of the SB 14 program, from the University of California), may also offer a model applicable to a broader Green Chemistry strategy. The impressive accomplishments of the Institute for Research and Technical Assistance in enabling development of substitutes for problem solvents in various applications suggest that such targeted 3rd party collaboration may pay dividends in products/product use as well as in manufacturing. This suggests the possibility of 1) taking chemicals of top priority concern, 2) identifying the specific applications or industry uses posing the greatest risk from those chemicals, and 3) applying a collaborative process of agency, industry and third-party experts to identify or develop viable alternatives that can maintain efficacy, but reduce risk in those targeted applications. 6) Issue: The stakeholder process for developing Green Chemistry has provided much more comprehensive progress than could have been achieved otherwise. Proposal: The Leadership Group proposes we continue the Conversation with California to sustain Green Chemistry progress. The dialogue between DTSC and stakeholders has been very helpful and will result in more well-developed, effective policy. We commend the DTSC for encouraging creativity in finding safer alternatives and providing opportunities for open-ended discussion. There remains, though, a very real need for extensive further discussion by the stakeholders in this Green Chemistry Initiative. We hope that the inclusive nature of this process is not at an end. There are so many pieces to Green Chemistry and as the focus narrows to various subtopics, meaningful stakeholder participation will be essential. We have all built personal relationships and broadened our understanding of the various points of view. It would be a shame to toss this hard-won experience aside. Submitted: November 16, 2007
F-GC-15	An integrated green chemistry program I am an assistant professor of Science, Technology and Environment at the Department of Environmental Science, Policy and Management at UC Berkeley. Green chemistry constitutes one of my prime research interests. I welcome this opportunity to contribute my research insights to the ongoing dialogue. In order to facilitate greater adoption of green chemistry in industry, I urge the State of California to develop an integrated program that features the following actions. Introduce a regulatory requirement that all existing chemicals undergo a tiered process of scrutiny for their environmental, social and health/toxicity impacts. No chemical used or sold in high volumes, or potentially highly hazardous, should be allowed to remain on the market unless it has been, or is being, tested according to standards that the State of California has formulated after considering world best practices. These standards need to be harmonized with the leading practices of the world to avoid multiplying requirements. In parallel, introduce a regulatory requirement that this information should be passed in a standard form along the supply chain. Currently, many downstream manufacturers lack the ability to understand what they are receiving. Require manufacturers to label consumer products with all the chemicals and materials (including nanotechnology) that these contain. Consumers currently lack the information required to discriminate between products based on their toxicity impacts, so industry has few incentives to develop new green chemistry products. Proposition 65 is aging and needs extensive updating along with a re-focusing on green chemistry solutions rather than simply

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	toxicity warnings. In parallel, develop interactive consumer tools and technologies that assist consumers to interpret and use labeling data in their shopping. The Toxics Release Inventory succeeded because information tools made its data highly accessible. Require industry to conduct green chemistry assessments for chemical products sold or used within California. These assessments would consider whether there are green chemistry design options available and use options analysis to justify how products are designed. These assessments can be modeled on the Massachusetts TUR Act but be updated greatly to reflect the combination of both products and processes. Companies currently do not generate enough decision-making information within their businesses. Registration of chemicals for marketing could be linked to the use of green chemistry design tools: if these tools have been used, then approval of the chemicals could be expedited. Expand greatly the investment of resources into green chemistry education and research at California State-supported universities, including the UC system. Chemists and chemical engineers are not trained adequately to address toxicology, ecology and societal concerns. Universities in California can begin developing technologies and new products, helping generate revenues through licensing and commercialization. Introduce a modest toxicity tax on all intermediates and chemical products used or sold within the State of California. Modeled on European examples, as well as the tax on pesticides and chemicals that helped support the Superfund for a decade, this tax would create a new incentive for industry to develop products with less toxicity. The tax would also reduce the subsidy that society is paying the chemical industry through externalizing health impacts, by supporting better health tracking and university R&D. The State of California itself can work with leading procurement entities, such as Kaiser Permanente, to create a systemic process for favoring green chemistry products according to a California Certified Green Chemical Standard that stakeholders in the state jointly develop.
F-GC-16	An Opportunity for Enhance Educational Partnerships Albemarle Corporation is pleased to submit additional comments on the California Department of Toxic Substances Control program for Green Chemistry. We would encourage initiatives to drive programs designed to help develop educational opportunities focused in math and science, cultural initiatives, health and social programs, and volunteerism. The importance of skills obtained from a solid foundation in science, including critical thinking and analyzing data is recognized. We are excited about the possibilities Green Chemistry can bring to the young scientists of today and believe that through fundamental and applied research initiatives, the Green Chemistry program in California can unleash the creativity and innovation found in University and school chemistry departments around the country. Students can become involved in discovering the next generation of chemicals, materials, products and processes, which can lead to enhancement of human health and the environment. With focused research, scientists will be able to discover better ways of maximizing the benefit while minimizing the environmental footprint that chemicals may have during their life cycle. Collaboration with industry should be a key part of the Green Chemistry program. Direct engagement between the chemical industry, academia, government entities and environmental organizations can bring about chemical innovation that is sensitive to public needs and concerns. Increased funding and better research into new methods for chemical process development, risk assessment and life-cycle management are essential elements to such a program. One area that warrants further attention is in end-of-life options for electronic waste, such as recycling, incineration, smelting and re-use. These options are currently in place around the world today, but are yet to prove economically sustainable in most cases to allow for broad application. Stakeholder partnerships involving industry are one way that Green Chemistry could be used to progress and drive efficiencies in this area.

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F-GC-17	WSPA's Comments on the California Green Chemistry Initiative The Western States Petroleum Association (WSPA) is pleased to offer the following comments on policy options being considered in the context of Cal-EPA's Green Chemistry Initiative. Many of the comments submitted to DTSC to date and debated in public forums refer to the need for California to supplement the requirements of the Federal Toxic Substances Control Act (TSCA). Prior to immediately moving in this direction, WSPA believes that DTSC must evaluate what regulations and information are currently available and whether these tools are being appropriately implemented and applied prior to developing new programs. Indeed, we expect this analysis is already underway, pursuant to the mandate to conduct a "baseline assessment" of existing programs and information described in the April 20 memorandum from Cal-EPA Secretary Linda Adams announcing the Green Chemistry Initiative. We further expect that this analysis will be presented to Initiative stakeholders for review and comment along with the policy options that flow from it, to ensure that all relevant information has been considered, including information obtained from national and international programs. We are optimistic that this approach will lead to meaningful improvements in existing state programs. on behalf of Western States Petroleum Association
F-GC-18	Concerned About Safety of Products I am a resident of OJai, California, and am concerned about the safety of many of the products we use from toxic chemicals in them - mostly food, but also pharmaceuticals, cleaners, etc. I have learned about the Green Chemistry Initiative which provides an opportunity to protect California by acting to restrict or eliminate especially dangerous substances and by mandating safer alternatives. This is a wonderful idea and I heartily endorse it. However, I really encourage you to ensure that in addition to incentive programs, the Initiative implements protective regulations, including restrictions and bans of chemicals for which the weight of evidence demonstrates a severe hazard to human health and/or the environment. Many thanks for considering this suggestion. on behalf of Walter M. McClelland
F-GC-19	California Green Chemistry Initiative - Comments I am in support of the Green Chemistry Initiative to restrict or eliminate dangerous substances in California. We are being exposed to far too many chemicals in our daily environment and many of us are getting sick. It is especially necessary to get them out of commercial cleaning products that are used everywhere, from stores to doctor's offices and even hospitals! We need some strict regulation on use of harmful chemicals that in many cases can simply be replaced by less or non toxic ones. This is a critical situation which requires regulations to test chemicals and ban those shown to be a hazard to our health and well being. Please reply too: Diane Brodd on behalf of Diane Brodd

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F-GC-20	Comments on the California Green Chemistry Initiative I would like to add my support of the Green Chemistry Initiative to restrict or eliminate dangerous substances in California I would like to see this initiative include the problem of chemicals being used in our daily lives that have not been tested for neurotoxicity in children. I urge you to include restrictions and bans on chemicals that demonstrate a hazard to our health and/or environment. This is a critical situation that requires immediate attention by not only providing incentive programs but requiring restrictions and bans on those chemicals that are potentially dangerous. Please reply too: Linda Blackwell on behalf of Linda Blackwell
F-GC-21	CSPA Summary Comments on the California Green Chemistry Initiative Dear Director Gorsen: The Consumer Specialty Products Association (CSPA) has appreciated your continual efforts to include us in the discussions and stakeholder input on the Department of Toxic Substances Control (DTSC) California Green Chemistry Initiative. We also appreciate this opportunity to provide supplemental comments in addition to the information that we have provided on the “Conversation with California” website. CSPA is a national nonprofit trade association that represents more than 260 companies engaged in the formulation, manufacture, distribution and sale of consumer, institutional and commercial products. CSPA member companies manufacture and market a wide range of products, including: cleaning products, disinfectants and sanitizers, candles and air care products, household pesticide products, automotive products used to clean and maintain vehicles, and polishes and floor maintenance products. CSPA members are committed to manufacturing and marketing safe products which are protective of human health and the environment while providing essential benefits to consumers. CSPA and our members support the broad goals of the Green Chemistry Initiative and look forward to working with DTSC and other stakeholders in the state to help spur green chemical innovation and ensure that products are safe. I. Background CSPA member products improve the quality of human life and are necessary to protect the public health against dangerous diseases, infestation, and unsanitary conditions. CSPA members are committed to providing products that are thoroughly evaluated for human and environmental safety and go through rigorous safety-based assessments before they are brought to market. CSPA members are also committed to clear and meaningful labeling on consumer products, i.e., label instructions are written to ensure that consumers use products in accordance with label instructions. Finally, CSPA members are committed to the development of green products that are safe for human health and the environment. In addition, CSPA members routinely apply green chemistry and green engineering principles in their operations and have been honored with awards for their efforts. The consumer products industry develops products that meet or exceed safety requirements of all state and federal agencies in the United States and Canada charged with regulating those products, including the California Department of Pesticide Regulation, the California Air resources Board, and other state agencies, U.S. Consumer Product Safety Commission (CPSC), the U.S. Environmental Protection Agency (EPA), the Occupational Safety and Health Administration (OSHA), the U.S. Food and Drug Administration (FDA), Health Canada, and Environment Canada. While we support the California Green Chemistry Initiative and believe there is much that can be done to address and spur the development of green chemical technology, CSPA believes that regulation of our members’ products under current federal and state regulatory authorities provides safety and protection to consumers. Below is a short summary of the various regulatory authorities that ensure the safety of consumer products and their ingredients.

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	While it is not an exhaustive list of the regulatory requirements these products undergo, it illustrates the extensive oversight that already surrounds the manufacturing and marketing of consumer specialty products. II. Toxic Substances Control Act (TSCA) The Toxic Substances Control Act (TSCA) gives EPA the authority to regulate chemicals produced or imported into the United States. EPA repeatedly screens these chemicals and can require reporting, testing or a complete ban of those that may pose an environmental or human-health hazard. Any person intending to manufacture or import a chemical substance first must determine whether the substance is listed on the TSCA Inventory. If it is not listed, the prospective manufacturer or importer must satisfy premanufacturing notice (PMN) requirements before commencing production or importation of the substance. In filing a PMN, the manufacturer or importer must give their identity, specific chemical identity, product volume, use, exposures (worker, user and consumer), and environmental fate. Additionally, any test data relating to environmental or health effects of manufacturing, processing, distributing, using, or disposing of the new chemical substance must also be submitted. The PMN must be filed at least 90 days prior to the commencement of commercial production or importation of a new chemical substance. EPA's review of a PMN consists of seven major stages designed to ensure that EPA examines all aspects of a new chemical, including its physical and chemical properties, potential toxicity, exposure of workers, users and consumers, and economic benefits. EPA has the authority to prevent, delay, or limit manufacture after the initial PMN review period ends. EPA can issue an administrative order regulating a new chemical substance if the Agency finds that there is insufficient information to reasonably evaluate the risk and either the chemical may present an unreasonable risk to health or the environment or it will be produced in substantial quantities with the result that either substantial quantities will enter the environment or there will be substantial or significant human exposure to the substance. While EPA does not require a designated set of toxicity testing to be included in the PMN submissions, it has identified several categories of chemicals and the concerns areas where it has required such tests. Under these requirements a company must provide information addressing these risk concerns or face restrictions based on default assumptions. EPA has broad authority to regulate the existing chemicals in commerce as well. If a chemical presents unreasonable risks to health or the environment, EPA must initiate a rule-making to regulate the chemical. As of 2007, EPA has issued over 1300 Significant New Use Rules, which restrict the manufacture, import, or processing of a substance . EPA can prohibit or limit the manufacture, processing, distribution, commercial use or disposal of the chemical; prohibit or limit the use of the chemical in a concentration above a specified level; require adequate warnings and instructions with respect to the chemical's use, distribution in commerce or disposal; require record-keeping; prohibit or regulate disposal of the chemical; and require notification to the purchasers or the general public about the risks involved and to replace or repurchase a chemical substance or mixture if requested. EPA also has the authority under TSCA to require manufacturers of substances to develop safety and environmental data. III. Consumer Product Safety Act (CPSA) The Consumer Product Safety Act (CPSA) provides that when the Consumer Products Safety Commission (CPSC) finds an unreasonable risk of injury associated with a consumer product it can develop a standard to reduce or eliminate the risk. The CPSA also provides the authority to ban a product if there is no feasible standard, and it gives CPSC authority to pursue recalls for products that present a substantial product hazard. The CPSC is authorized to set safety standards as to consumer product performance, composition, contents, design, construction, finish, packaging and labeling. In general, the manufacturer of a consumer product subject to regulation must issue a certificate announcing compliance with the applicable standards, and must label the product with the date and place of manufacture, the identity of the manufacturer, a certification of compliance with any applicable rule, and a brief description of such rule. Manufacturers are required to immediately notify the CPSC if it obtains information which reasonably supports the conclusion that a product: (1) fails to comply with a consumer product safety standard or banning regulation or a voluntary consumer product safety standard upon which the CPSC has relied

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	upon; (2) contains a defect which could create a substantial product hazard described in the CPSA; or (3) creates an unreasonable risk of serious injury or death. In the last ten years, CPSC obtained 472 voluntary recalls involving 110 million product units. During this time, CPSC obtained 1031 corrective actions (including recalls and other actions to keep unsafe products from consumers). IV. Federal Hazardous Substances Act (FHSA) The Federal Hazardous Substances Act (FHSA) requires labeling of hazardous substances sold to households. It prohibits the sale or introduction into interstate commerce any product which does not comply with the regulations. FHSA regulations provide specific guidelines to determine potential risks specific to the entire formulation and package. Product risk assessments are the basis for label decisions and precautionary label text to protect consumers and children. At a minimum, labels must include hazard signal word, affirmative statement of hazards, the name of each component that contributes to the hazard, and precautionary measures to be taken to avoid risk, required or appropriate instruction for first aid treatment, handling instructions, storage instructions, and “Keep out of reach of children.” V. Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) The Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) provides the basis for regulation, sale, distribution and use of pesticides in the U.S. FIFRA authorizes EPA to review and register pesticides for the specified use which a registrant applies for. Before registering a new pesticide or new use for a registered pesticide, EPA must first ensure that the pesticide, when used according to label directions, can be used with a reasonable certainty of no harm to human health and without posing unreasonable risks to the environment. To make such determinations, EPA requires more than 100 different scientific studies and tests for active ingredients. In fact, EPA has banned and severely restricted 64 pesticides in the United States. When EPA registers a pesticide, it approves the product’s label, which includes (among other things) directions for use, hazard warnings, and precautions. It is a violation of FIFRA for any person to use a pesticide in a manner inconsistent with its EPA-approved labeling. EPA also has the authority to suspend or cancel the registration of a pesticide if subsequent information shows that continued use would pose unreasonable risks to health or the environment. EPA may decide to remove a pesticide from the market based on information from a variety of sources: new studies conducted by the registrant, the Government, or a third party; incident information submitted by a registrant; or results of the EPA’s periodic review of pesticides and tolerances. EPA is currently completing a review of those pesticides registered before November 1984 to ensure that they meet current scientific and regulatory standards. This process, called reregistration, considers the human health and ecological effects of pesticides and results in actions to reduce risks that are of concern. Concurrently, EPA has begun a registration review process for those products registered subsequent to 1984 and for those pesticides that were review under the reregistration process previously. These ongoing review processes assure the continual reexamination of the safety and environmental profile of pesticides. EPA and the states enforce FIFRA primarily through stop sale, use, and removal orders, civil penalties, or a combination of the two. Unlawful acts under FIFRA include: selling an unregistered or misbranded pesticide; selling a pesticide whose composition differs from the one described in the pesticide’s registration application, violating EPA’s labeling requirements, failing to file annual production reports, and violating FIFRA’s export requirements. VI. Recommendations for Product Stewardship & Safety-based Assessments As stated in our November 6 “Conversation with California” entry, CSPA supports company performed safety-based assessments of consumer products prior to the marketing of a product, that take into consideration all of the phases of a product’s life-cycle. CSPA also supports appropriate use-restrictions for chemical ingredients when scientific safety-based assessments indicate that they cannot be used safely in a consumer product or use application. CSPA and our members believe that every responsible company should be performing these types of safety-based assessments and supports initiatives

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	that recognize companies for these types of procedures. In fact, CSPA has demonstrated our industry's commitment to manufacturing and marketing safe products which are protective of human health and the environment while providing essential benefits to consumers, when we initiated our Product Care program in 2001. CSPA's Product Care program is a stewardship program for the consumer and institutional specialty products industry where participating companies have agreed to go beyond government regulations in emphasizing health, safety and environmental concerns by carefully designing products, purchasing raw material and packaging, operating safe manufacturing facilities, promoting safe storage and distribution, providing useful product information, answering consumers questions and anticipating product disposal needs. CSPA believes that these types of product stewardship programs should be considered as frameworks for programs developed under the Green Chemistry Initiative. Product Care provides a framework for companies to identify and commit to stewardship principles, share ideas and information and benchmark better performance. Participating companies have pledged to develop management principles for each of seven areas in a product's life cycle from development in a research facility through product use and disposal. Through this program Companies Must Commit to Evaluate: 1. Product Design 2. Raw Material, Package and Service Supply 3. Manufacture and Production Site Management 4. Product Storage and Distribution 5. In-market Support, Incident Evaluation and Follow-up 6. Consumer Education and Outreach 7. Product Disposal Stewardship did not begin when CSPA's Product Care program was initiated in 2001. Responsible companies have long followed policies promoting safe products that provide important health benefits while not adversely affecting the environment. CSPA believes it is vital that these types of product stewardship programs and companies that participate in these programs be recognized and fostered through any program developed under the Green Chemistry Initiative. In particular, CSPA believes that DTSC and California can leverage and recognize programs like Product Care as a way of encouraging companies to establish robust procedures to ensure product safety and environmental safety. VII. Recommendations for Chemical Data Development Initiatives Chemical data development efforts should build on existing statutory and regulatory structures, voluntary initiatives, and data development efforts. CSPA does not support California-specific data development requirements and pre-market approval process for chemicals or consumer products. However, CSPA supports collaboration by DTSC and California in ongoing work by other government agencies to assess chemicals and consumer products. Specifically, California and DTSC could leverage efforts by Health and Environment Canada in addressing priority chemicals in the Chemicals Management Plan. DTSC and California could collaborate with these agencies on their high priority list and avoid needless duplication of current data development and prioritization efforts. DTSC and California could also participate in the effort launched in August during the Security and Prosperity Partnership (SPP) with under the Montebello Agreement involving trilateral cooperation among the governments of Canada, the United States and Mexico to share chemical information and safety assessments. In addition if DTSC and California move forward with efforts to establish chemical priorities the process should be collaborative and should include scientific experts in toxicity and exposure, chemical manufacturers, consumer product manufacturers, and nongovernmental organizations. CSPA believes inclusion of manufacturers of the chemicals and consumer products could provide toxicity and exposure/use data to determine whether the uses of "priority chemicals" are safe or should be restricted. As referenced above, CSPA does not support pre-market approval of chemicals or consumer products, because this would be an incredibly burdensome

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	and expensive process for the State of California and would unnecessarily slow down the development of products. For example, the Department of Pesticide Regulation registers approximately 12,000 pesticide products sold in the State and in 2005-06 it cost the agency over $17.5 million to review and approve these products . To require pre-market approval for the hundreds of thousands of chemicals and consumer products in commerce would be cost-prohibitive. VIII. Support for Appropriate Ingredient Disclosure Throughout Green Chemistry discussions and in recent market research consumers and others have expressed a desire to know what ingredients are in the products they use in their everyday life. These consumers are interested in having this knowledge in order to make informed product choices. It may appear that product ingredient information may not be readily available to consumers; however, our members willingly provide information to meet consumer needs. While some organizations have expressed concerns about ingredients in consumer products, much of this information is inaccurate. This is primarily due to the reliance on outdated resources that are dependant on old technologies or on assumptions made by sources that are not well versed in specific product chemistries. CSPA and our members support an appropriate approach to providing accurate information to consumers through ingredient communication. Our industry stands behind the safety of our products and the appropriate use of chemical ingredients in those products. We would like to work with DTSC and the State of California to implement a means of ingredient communication that would provide consumers with the information they can use to make informed decisions regarding the products they use in their homes. IX. Essential Principles for Green Chemistry Initiatives As any Green Chemistry program moves forward, CSPA believes, that in order for the effort to be credible and have a positive impact it must be structured in a way that includes all stakeholders and provides a sound scientific basis for the program. Specifically, Green Chemistry should ensure the safety of chemicals and consumer products through the use of sound science in the decision-making process. Additionally, green chemistry programs should be designed to ensure that products remain technologically and commercially feasible to produce; and that product efficacy, performance, and usability are not compromised or undermined. As such, Green Chemistry must foster innovation and not limit the development of new chemistry technologies. X. Support for Initiatives to Spur Green Innovation Stimulating green chemical innovation has been a core concept of the Green Chemistry Initiative, and discussion of this topic has shown the promise that new technologies have for improving the standard of life in California and reducing environmental impacts. CSPA supports collaborative efforts to encourage public and private partnerships with the goal of developing “greener” products and “environmentally responsible” ingredients rather than mandatory and voluntary state labeling programs that endorse green products or programs that stipulate a single third-party certification of green products. CSPA supports initiatives that provide incentives for companies that innovate and develop technologically and commercially feasible products using green chemistry. CSPA also supports recognition for companies that develop sustainable business operations, processes, and/or products. We also believe there are unique opportunities in California for research that identifies areas for the use of green chemistry in consumer products. Essential elements to ensuring that these technologies become widespread are implementing State policies that are designed to overcome barriers to commercial application of green chemistry research and development efforts. XI. Conclusion Once again, CSPA has appreciated DTSC’s efforts to include all stakeholders in the discussions during the California Green Chemistry Initiative. CSPA believes that the Green Chemistry Initiative holds incredible promise for helping spur green innovation in California. We also believe that the Initiative can leverage ongoing chemical data development initiatives in setting chemical priorities. Further, CSPA believes that DTSC should recognize and encourage

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	the current product stewardship procedures and safety-based assessments that companies perform prior to marketing a consumer product. CSPA would also look forward to working with DTSC and the State of California on an appropriate ingredient information system to help inform consumers when making their purchasing decisions. CSPA looks forward to continuing to work with DTSC through the Green Chemistry Initiative, as recommendations are developed, and CSPA hopes that our continued participation in this discussion will provide meaningful help to the endeavor. Please feel free to contact me directly at (202) 833-7328, or CSPA's in-state representation, Laurie Nelson at (916) 446-1111 if you have any questions about these comments. Respectfully Submitted, Andrew R Hackman Manager, State Affairs Programs
F-GC-22	Through Innovation, Education and Communication,we can improve our health and safety In order to design safer, less toxic products, we must have well-trained, knowledgeable scientists and engineers. Today, chemists, chemical engineers and most biologists receive absolutely NO toxicity training during their education. Students are usually familiar with unsafe compounds and how to work with them safely, but there is often little to no thought put into the safety of the end user when designing new products. This has been exacerbated in recent history as more and more companies become increasingly specialized and may have their starting material handled and processed by many other entities during the production process. An example in the news recently is that of phthalates in plastic children's toys. The chemist who designed the softer plastic using these chemicals probably didn't envision the wide array of products that would rapidly permeate our society. The original polymer mixture was then transferred through many levels of industry for processing, molding and final packaging before being brought to market. The engineer who designed the baby toys using these polymer mixtures probably had no idea there were phthalate monomers remaining in the plastic, much less the effects it might have if ingested. Neither of these characters is at direct fault--they are simply fulfilling the economic demand for materials with new properties and inexpensive products. In order to prevent toxic substances from making it into consumer homes, we need to look critically at the system that allows toxic chemicals to be used in consumer goods. This example highlights three issues that work together to cause the situation we have today: lack of testing, communication and reporting of potentially toxic compounds, lack of education and responsibility on the part of chemical producers and, I think most importantly, a lack of enforcement capabilities within our regulatory system. We rely on risk management policy which might sound like we "manage to avoid risk" but in actuality means we can't stop a chemical from making it to market until people are PROVEN to have been harmed by that very specific compound. And even if the product is removed, similar chemicals that vary by only one or two atoms, but are likely to have the same physiological consequences can remain in circulation. With the vast amount of chemistry, biology, epidemiology and toxicity knowledge we have today, there should be a better way. The idea of synergy, where the sum toxicity of compounds mixed together is more than the toxicity of the components alone, becomes important to think about because of the enormous variety and combination of chemical-based compounds in our modern society. All these issues point to the need for a more holistic approach to chemical policy and regulation. By adopting Green Chemistry policies and initiatives, most of these issues can be addressed. Integrating toxicity training and the green chemistry principles at all levels of the educational process, and having real-time monitoring and innocuous degradation of starting materials will help prevent end-user exposure. These are main tenets of the 12 Principles of Green chemistry, which if adopted and promoted could vastly improve the safety of chemical-based products. In addition, we need to change our current, risk-based method of policy making, which limits the scope of chemical evaluation

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	and puts people in harm's way before allowing the government to make chemical regulations. The only groups who benefit from "risk management" are chemical suppliers—they don't have to run toxicity tests or report their findings, they don't have to report quantities or end uses of potentially toxic substances, and they have no incentive to update manufacturing methods or reformulate, as that always comes with some monetary cost. They need markets and incentives to design better products, but won't comply without preventative regulation in place. Let's stop being reactionary and start being revolutionary. California is at the forefront of progressive policy and this is an extremely important issue that the European Union and many other countries have already begun to address. By adopting and practicing the green chemistry principles, in addition to a more preventative approach to policy making, we can demonstrate to the rest of the country that we can innovate and fulfill market demands while at the same time, protecting the health and safety of all living things
F-GC-23	ACC Final Comments to the "Conversation with California" The American Chemistry Council (ACC) is pleased to provide these comments as a final submission to the "Conversation with California" on the Department of Toxic Substances Control's (DTSC) Green Chemistry Initiative (CGCI). These comments supplement another ACC blog entry today that presents a proposal for DTSC's consideration ("ACC Proposals for Future Actions Related to California Green Chemistry Initiative"). The CGCI has attempted to address a wide range of issues and approaches to promoting "green chemistry" in California. As we understand it, the input received by DTSC will be used to assess the options that can be presented to "establish the blueprint for keeping California in the forefront of protecting health and the environment in a robust economy. . . [and show that] California is leading the effort to fundamentally change the way it deals with its chemicals and waste." ACC believes that the overriding objective of the CGCI – "protecting health and the environment in a robust economy" – properly acknowledges that encouraging and sustaining a sound commercial economy is an important basis for "green chemistry." Indeed, ACC believes that "green chemistry" must be considered first and foremost a way of doing business, not a government mandate. As numerous commentators on green chemistry have acknowledged, green chemistry cannot be legislated, although both green chemistry and green engineering can be promoted and enhanced by appropriate policy decisions. Clearly proposals for additional regulatory requirements and for additional legislative authority may be part of the recommendations made by DTSC to CalEPA by mid-2008. Those proposals, however, should be based on a clear understanding of their objective, the likelihood that the proposals will achieve the objective, the time frame in which they can reasonably be implemented, and the likely positive and negative impact on California, including health, environment, and the economy. ACC believes that the largest single challenge for DTSC is bringing coherence to the hundreds of suggestions the Agency has received through the "Conversation with California" and the stakeholder meetings. The volume and breadth of the recommendations reflected in the "emerging options" paper does not, in our view, lead to any clear conclusions. Our comments below on each of the major categories reflected in the "emerging options" document are intended to focus on policy and program options that can be practically and pragmatically implemented, while achieving the overall objective of the CGCI. I. Policy Options The DTSC's recommendations to CalEPA should be built around a core set of reasonable policy options. A few recommendations have been made that California should adopt a "substitution" policy – a stated policy of forcing the substitution of hazardous chemicals for "less hazardous" alternatives. ACC believes that a substitution policy is impractical at best, and a negative disincentive for technological progress and innovation. "Green Chemistry" is not just about substitution of one hazard for another; it is ultimately about the reduction of risks to health and the environment that are otherwise unmanaged. Indeed, a risk reduction policy seems to ACC to be a much better approach to accounting for the economic, social, health, and environmental dimensions of green chemistry, particularly because by definition it will address not only inherent toxicity (hazard), but potential exposures as well. Perhaps most

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	importantly, a risk reduction policy (one that addresses both hazard and exposure) correlates very well with the pollution prevention policies that have been at the heart of many existing DTSC programs, and can serve as a meaningful focal point in encouraging the development of sustainable chemistry, green engineering, and products that improve the lives of Californians and the State environment. The successful implementation of a risk reduction policy requires a clear articulation of the objective, the various options for reflecting that objective in regulation, legislation, and programs, and the consequences and expected benefits of such a policy. Such an approach would suggest that DTSC needs to define success in this initiative, identify the problems that are in need of a solution, and assess the resources, tools, information, and mechanisms necessary to achieve those goals. ACC believes that California's primary objective should be the reduction of risks to health and the environment that are otherwise unmanaged or unacceptably under-managed. And to succeed in that objective, California must establish a process by which state-wide priorities can be identified, where existing and new risk reduction measures – spanning the entire spectrum from research and financial incentives to regulation – can be appropriately assessed, and where the relative benefits and impacts of the approach can be evaluated. In short, a risk reduction policy provides an important and appropriate organizing principle for DTSC's "Green Chemistry" recommendations. II. Legislation/Regulation Any legislative or regulatory proposals emerging from the Green Chemistry Initiative should be oriented toward proposals that support the underlying policy objective of risk reduction. As a practical matter, ACC agrees that chemical specific legislation may not be a practical way of using the State's resources to address critical risk related issues. For this reason, ACC believes that if DTSC determines that it needs a program specific to California, the key component of the DTSC's recommendations should be a proposal for a regulatory process that allows DTSC to identify key priorities and take appropriate action on those priorities. We want to be clear – ACC is not recommending that DTSC adopt a comprehensive chemical regulatory program. We believe that there are practical, pragmatic options for California far short of a California version of the federal Toxic Substances Control Act (TSCA), a California version of Europe's Registration, Evaluation and Authorization of Chemicals (REACH) program, or a California version of Canada's Chemical Management Plan. Each of those programs has or will produce information that is or will be useful to the State in identifying priority chemical risks that warrant reduction actions, without requiring the significant administrative infrastructure, costs, and burdens associated with a comprehensive chemical regulatory regime. DTSC has an important opportunity to consider how it can promote "green chemistry" by leveraging the significant work already done by many different organizations related to chemicals in commerce. ACC believes that in the vast majority of cases, information on particular chemicals, uses, or exposures is or can be readily available from a number of sources. Well-conceived options for additional regulatory authority should address how California can identify priority risks, appropriate information on manufacturing, import and use, and information on available risk reduction measures. We also want to be clear that if DTSC determines that it needs its own regulatory program specific to California, ACC is recommending that DTSC suggest narrowly drawn regulatory authority that assures that appropriate risk reduction strategies are developed and implemented for key chemical priorities. For example, a number of commentators to the "Conversation with California" have suggested that California needs to have a complete record of all chemicals in California commerce, whether manufactured or imported as discrete chemicals or as components of preparations or articles. ACC believes that such an approach is unrealistic and impractical, particularly given the relative benefit of such a system compared to its costs. Other commentators have made the simplistic suggestion that California should adopt Europe's REACH system. Those suggestions are made with little knowledge of the REACH legislation and its likely impacts. Few understand that REACH does not begin to operate until June 2008, and that the registration component will not be completed for 11 years. Few understand that the estimated costs of simple registrations and the use-specific licensing component of REACH (authorization) are now three times higher than they were when REACH was first being negotiated. Few understand that REACH does not result in a complete evaluation of all chemicals in commerce. And fewer still comprehend fully just how complex an 850 page regulation, and its

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	more than 4,000 pages of guidance, really is. DTSC must fully understand REACH before it commits to proposing such a regulatory system for the State. On the basis of the "Conversation with California", however, the debate over REACH in California has been long on rhetoric but short on detail, and it would be premature at best for DTSC to include a REACH recommendation in its options. As ACC has noted in prior submissions, Canada, Mexico, and the United States agreed in August 2007 on a cooperative program to accelerate screening level risk management decisions for chemicals in commerce in North America. The program, commonly referred to as the Montebello Agreement, will result in decisions on a faster pace than REACH. The Montebello commitment is to complete the work by 2012. More importantly, that effort should produce information that California can access and use as the State reviews priority chemicals. III. Compliance and Enforcement DTSC's "emerging options" document contains several recommendations aimed at compliance and enforcement issues. In general, it will be difficult to enforce broad concepts of "green chemistry," largely because what constitutes "green chemistry" (or green engineering) will differ depending on the product, process, company, or industry involved. To the extent that regulatory actions are recommended by DTSC, appropriate enforcement measures will likely need to be considered. It is critical that those enforcement measures be capable of uniform application. In addition, ACC believes that California should address what steps might be necessary to deter false claims of "green-ness" that mislead consumers and distort the market. IV. Data/Information As ACC has noted in other "Conversation with California" submissions, California does not need information on each and every chemical in commerce, it needs information on chemicals considered priorities by the State. A number of sources for supporting information already exist, and we urge DTSC to rely on existing information as a first, but necessary, step. Only when potential data gaps are understood can approaches to filling specific data needs be addressed. Many of those sources are already being linked in broader web-based portals, by institutions such as the Organization for Economic Cooperation and Development (OECD). Moreover, those information sources are complemented by data and information provided by industry in programs like the High Production Volume (HPV) Challenge, and the Voluntary Children's Chemical Evaluation Program (VCCEP). In submissions to the "Conversation with California," some have suggested requiring extensive new laboratory animal testing, while others have opposed testing altogether. ACC encourages the use of alternatives to animal testing when these alternatives are scientifically valid and predictive and acceptable to regulatory bodies. Furthermore, experience has shown that arraying toxicity tests in a tiered framework, drawing upon standardized study protocols to develop data on toxicologically relevant endpoints for assessing human health hazards, applying this information to groups or series of similar chemical substances provides scientific rigor and at the same time provides flexibility to account for differing chemical toxicities and to address specific concerns associated with existing or anticipated exposures to specific chemicals. In this manner, tiered testing focuses efforts to collect data where it is most needed, promotes screening of the greatest number of prioritized chemicals (or classes of chemicals) and, where indicated by specific toxicity results, indicates which substances pose a particular concern and points to the specific, more complex test that should be considered. Thus, tiered-testing and risk-based approaches are both efficient and effective in protecting human health. ACC also believes that the Montebello Agreement recently concluded by Canada, Mexico, and the United States deserves considerable attention by DTSC. Under the Agreement, the U.S. Environmental Protection Agency has committed to completing screening level risk management decisions on nearly all chemicals in commerce. More importantly, the commitment is to complete those reviews by 2012, thereby providing a basis for identifying chemicals that pose priority health or environmental risks. That information will include both hazard and exposure related information, and will be an important data source that California should rely on. ACC believes that DTSC should not wait for the conclusion of the CGCI to engage in discussions with U.S. EPA and the Canadian government on how the State can coordinate with and leverage those programs in support of the CGCI. Several options outlined in the "emerging options" document suggest that California should adopt a "no data, no market" approach. While the approach

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	may initially seem attractive, the scope of the requirement will obviously determine its potential utility and impact. ACC believes such a requirement implies that California wants all information on all chemicals, and as we have stated earlier, there are significant resource implications from that approach. Perhaps more to the point, for the vast majority of chemicals, such a requirement will have little or no marginal benefit for health and environmental protection. Under the Canadian Chemical Management Program (CMP), for example, some 19,000 chemicals did not meet the criteria used for categorization and do not need further action at this time. A simplistic approach to a “no data, no market” requirement has the potential to require a significant duplication of effort for both the State and the regulated community. V. Education/Outreach ACC concurs with many of the comments reflected in the “emerging options” document on education and outreach about “green chemistry.” There are several dimensions to the education and outreach issues. First, there is a need for education that the broad scope of “green chemistry” includes “green engineering,” and that it is not limited to simplistic hazard substitution. Moreover, a concerted effort to disseminate appropriate information on the accomplishments, best practices, costs, and benefits of “green chemistry” would help assure that all interested stakeholders understand the concept and limitations of the approach. ACC believes that suggestions to require that manufacturers publicly disclose the chemical content of their products could be considered in circumstances where it is clear that proprietary information is not compromised. We have made clear in other submissions to the “Conversation with California” that ACC members believe health and safety information should never be considered proprietary or confidential information. Second, there have been a number of excellent recommendations for enhancing academic curricula, particularly at the post-secondary level, to cover topics related to green chemistry. Expanded training opportunities in toxicology (both human and environmental), exposure assessment, life cycle analysis, and risk assessment make sense. Third, ACC agrees that one option to establish California as a locus of “green chemistry” may be the creation of a separate organization, perhaps one affiliated with the University of California system or other academic institution. However, it should be recognized that a number of similar institutions already exist throughout the world, and California should have a complete understanding of the purpose and objectives of such an institution before recommending its creation. VI. Incentives ACC also agrees that a series of well-conceived and well-executed incentive programs can help create a better understanding of and commitment to “green chemistry.” Many of the options discussed through the “Conversation with California” warrant additional consideration. For example, there have been several suggestions that California should subsidize the market for “green” chemical products. While notionally attractive, ACC believes that there needs to be clear criteria for what constitutes a product or process that qualifies for support, and clear criteria for assessing whether there are market failures that such support can remedy. Suggestions for fee rebates appear to be based on an assumption that industry will be paying fees, although for what remains little understood. Other options, such as low interest loans, or grants, or tax incentives (like tax “holidays”) may also be appropriate. ACC disagrees that it is necessary to strengthen product liability law to provide a greater incentive for consumer protection from potentially harmful toxic exposures. California (and indeed the United States in general) already has a robust civil liability system that provides significant incentives to manufacturers (not just those located in California) to take steps to protect consumers from potential exposures to harmful chemicals. VII. Research/Technology One of the most exciting components of the Green Chemistry Initiative is the potential to greatly expand research and development. As California no doubt recognizes, the chemical industry invests billions of dollars each year in fundamental research and development. One out of every four U.S. patents

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	are related to chemistry, an indication of just how robust R&D is in the field – and an indication that the business of chemistry is in fact the Nation's most innovative business segment. ACC believes that a set of clear criteria and objectives for partnerships with California (either businesses or academia), and an understanding of how California would approach the ownership of the intellectual property associated with such research, would help assure that companies are aware of the opportunities for support for R&D activities. VIII. Voluntary Measures ACC believes that any regulatory or legislative proposals suggested by DTSC should include an explicit acknowledgement of the value of voluntary programs – and an explicit compliance exemption for companies that comply with programs that meet certain criteria. In particular, California should explicitly recognize those industry-wide programs that have credible, publicly-reported performance metrics, and credible, third-party assessment and certification requirements. In some cases, compliance is a requirement of membership in an industry association or organization. Programs like these include management system approaches that address chemical product evaluations, including assessments of manufacturing processes and intended uses, among others. Explicit recognition of these systems will provide an important incentive for companies to demonstrate their performance in compliance, and would leverage scarce resources in both California and throughout the industry. IX. Funding ACC understood many of the comments in this category of the "emerging options" document to be directed at the question of how the State of California will fund their activities under a Green Chemistry Initiative, including regulation, compliance, and training programs, rather than funding incentives for cooperative research and development. ACC does not support the imposition of fees to support a Green Chemistry Initiative in the abstract. Similarly, ACC does not support the imposition of a surcharge on chemicals, or products made with chemicals, to fund activities to address long term environmental impacts. ACC believes the basis of a surcharge is problematic. For example, is the surcharge to be assessed on the first use of a chemical (or the use of virgin materials), or for the possible consequences of use of the product? Other suggestions in this area included fees on the mere use of toxic substances, which would then be used to fund government toxics use reduction activities, including data analysis and the provision of technical assistance. ACC believes that, should California believe there are general benefits to be obtained from government agency activities in "green chemistry," those activities should be funded by general tax revenue. * * * * * * * * Finally, ACC believes that given the broad range of public input solicited and gathered by DTSC throughout the "Conversation with California", the Department should consider providing an opportunity for public comment on its proposed recommendations to CalEPA and Governor Schwartzenegger. Publication of the proposed recommendations will provide a critical insight into how DTSC views the Green Chemistry Initiative and the opportunities to take short and long term action in the arena.
F-GC-24	ACC Proposals for Future Actions Related to California Green Chemistry Initiative The American Chemistry Council (ACC) is pleased to provide the proposals and rationale for those proposals outlined below for consideration by California as it moves forward with the Green Chemistry Initiative. PROPOSAL: INFORMATION ON CHEMICAL EVALUATION APPROACHES A company that manufactures chemicals in and/or imports chemicals into California should have a publicly available overview of the approach it uses for chemical evaluation and assessment. Companies should affirm to the state that the chemical evaluation and assessment approach is publicly available. RATIONALE: Responsible companies conduct systematic and rigorous evaluations of their chemical products to assure that these products deliver their intended benefits, while protecting public health and the environment. These evaluations should include characterizations of risk associated with the use of the chemical products and a determination of any risk management precautions and activities needed to address that risk. California public

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	stakeholders would benefit from a greater understanding of how product safety and management decisions are made. Implementing this recommendation would have a minimal cost-impact to the State. PROPOSAL: MANAGEMENT SYSTEMS A company that manufactures chemicals in and/or imports chemicals into California should have a management system that includes process and product safety elements. Company systems should be subject to third party certification by representatives of a nationally recognized auditing Board (e.g., Board of Environment, Health and Safety Auditor Certifications or ANSI-ASQ-National Accreditation Board). Companies should affirm to the state that the management systems are in place and that third party certification has occurred. RATIONALE: Industry and government experience in applying management system principles to safety and environmental issues has shown that this organizational approach is both prudent and effective. A management system is a recognized business management practice that allows an organization to strategically address its environmental, health and safety matters. System implementation reflects accepted quality management principles based on the “Plan, Do, Check, Act,” model using a standard process to identify goals, implement them, determine progress, and make improvements to ensure continual improvement. Properly implemented, a management system not only improves environmental and health and safety performance, but also increases overall efficiency and accountability. Implementing this recommendation would have a minimal cost-impact to the State. PROPOSAL: STATE RESEARCH & DEVELOPMENT CENTERS The state of California should establish research and development centers focused on sustainable chemistry and/or sustainable engineering within its University of California system, such as Centers for Excellence in Sustainable Chemistry at leading University of California campuses that are networked to address major sustainability opportunities and issues. RATIONALE: California should utilize its well-known and respected university system and professional associations in efforts to promote innovation through research programs in sustainability. These programs could include non-proprietary or pre-competitive work. PROPOSAL: CURRICULUM FOR CHEMISTRY DEGREES California should make risk assessment, including toxicology and life cycle thinking, part of the required curriculum for chemistry and/or chemistry related degrees conferred by State institutions. RATIONALE: California could be a leader in promoting appropriate and necessary curriculum for future chemists. This curriculum would ensure that as future chemists develop new products, they fully appreciate the potential impacts of such products on health and the environment. Dr. John Warner’s Green Chemistry graduate curriculum at the University of Massachusetts – Lowell is a possible example for consideration. PROPOSAL: FINANCIAL INCENTIVE AND RECOGNITION AWARD PROGRAM California should establish an awards program to provide financial incentive and recognition for innovations. This program should be open to all sectors of the chemistry enterprise – including manufacturers, users, academic and government entities. Options for such a program could include grants, licensing fees or other income to researchers who develop innovations in non-proprietary or pre-competitive work. RATIONALE: Innovation results should be encouraged through financial incentives and recognitions. PROPOSAL: VALUE CHAIN COMMUNICATION California should encourage companies in important value chain sectors to identify information needs of the value chain’s members (upstream and downstream companies) and to establish communication processes to meet those information needs RATIONALE: By facilitating the flow of hazard and safe handling information along the value chain, California will enable companies within a value chain sector to access and apply risk information for its own operations and for its own products PROPOSAL: REGULATORY PROGRAM BUILT ON LEVERAGED INFORMATION

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	If DTSC determines that it needs its own regulatory program specific to California, it should adopt the output of the Canadian Chemical Management Plan (based on Canada's categorization and prioritization of the existing chemical inventory) as a solid, scientifically sound foundation. The program should also leverage information that will be generated under the August 2007 Montebello Agreement between Canada, the United States and Mexico. If needed DTSC could establish a California-specific chemical evaluation process to address circumstances in which DTSC identifies uses of concern for priority chemicals that were not on the original CEPA categorization process or that will not be addressed under the Montebello Agreement in the timeframe required by DTSC. The process should utilize a tiered approach, in which chemicals and their uses are prioritized for further evaluation. The process should also utilize risk-based screening and should focus on potential "data needs" versus "data gaps". Producers and users of identified priorities should be engaged in a collaborative process to bring hazard, use and exposure information to improve decision-making. As DTSC proceeds with its process, it should leverage information already generated or that will be generated under regulatory or voluntary chemical evaluation programs. DTSC must be transparent in the processes used to make risk evaluation and risk management decisions. RATIONALE: In order for DTSC to conduct evaluation work in a timely manner, it cannot afford to work in isolation. Establishing an entirely new prioritization program would take years of development before implementation could even begin. Instead, DTSC will need to build from the foundation of an established process and to leverage evaluation work generated by other parties. Stakeholders in California have publicly supported the Canadian Chemical Management Plan based on Canada's categorization and prioritization of the existing chemical inventory. California's collaboration with Canada on this process will accelerate progress in both geographies. The August 2007 Montebello Agreement between the US, Canada, and Mexico will result in significant chemical evaluation work being completed in a relatively short timeframe. DTSC should take advantage of the upcoming work to be conducted by the US, Canada, and Mexico. This would clearly allow DTSC to save time and resources, while advancing the protection of health and the environment. It would also allow DTSC to be viewed as a global leader in integrating the Montebello evaluation outcomes into its own process. If DTSC intends to move forward in the most time-effective manner possible, it must also recognize that a prioritization of chemicals is essential. A set program, with a specific list of chemicals and uses to address in a tiered fashion will provide the structure needed to make progress. If everything is a priority, then nothing is a priority – and nothing gets accomplished in a timely manner. Recognizing time limitations, as well as stakeholder concerns with un-necessary animal testing, DTSC must be pragmatic in leveraging existing information that support the DTSC's overall program. This could include data submitted under regulatory programs, such as the 2006 Inventory Update Rule data that could be used to develop an initial understanding of volume, use and exposure and to assist in identifying uses of that raise the greatest concern. It should also include information generated under voluntary chemical evaluation programs, such as the High Production Volume Challenge.
F-GC-25	Sustainable Flame Retardant Design-Albemarle Corporation Sustainable Flame Retardant Design Albemarle is a responsible manufacturer and developer of specialty chemicals including halogenenated, phosphorus, and mineral flame-retardants. When developing new flame-retardants, Albemarle includes several sustainable design considerations during the development and commercialization of flame-retardants. The World Commission on Environment and Development defines sustainability as "meeting the needs of the present without compromising the ability of future generations to meet their own needs". Albemarle believes strongly that the world needs strong fire safety in our homes, workplaces, and transportation and that sustainable flame retarded materials should be available and can be developed to meet these needs. Sustainable Flame-retardant design starts with the basic guiding principle that substances that are bioaccumulative or toxic will NOT be considered as

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	candidates and will be screened out during the early developmental stage. Albemarle will develop effective flame-retardants that will remain stable and fully available to perform their fire safety task while remaining in the polymer matrix until such times that they are needed. For thermoplastic formulations these systems will be recyclable as the flame retardant will be stable in the polymer matrix and not degrade during many recycles thus allowing the polymer to be re-used in many applications. Green chemistry consideration is also a very important element of the Albemarle Sustainable Flame Retardant Product Design Process. 12 Principles of Green Chemistry * 1. Prevention of waste It is better to prevent waste than to treat or clean up waste after it has been created. 2. Atom Economy Synthetic methods should be designed to maximize the incorporation of all materials used in the process into the final product. 3. Less Hazardous Chemical Syntheses Wherever practicable, synthetic methods should be designed to use and generate substances that possess little or no toxicity to human health and the environment. 4. Designing Safer Chemicals Chemical products should be designed to affect their desired function while minimizing their toxicity. 5. Safer Solvents and Auxiliaries The use of auxiliary substances (e.g., solvents, separation agents, etc.) should be made unnecessary wherever possible and innocuous when used. 6. Design for Energy Efficiency Energy requirements of chemical processes should be recognized for their environmental and economic impacts and should be minimized. If possible, synthetic methods should be conducted at ambient temperature and pressure. 7. Use of Renewable Feedstocks A raw material or feedstock should be renewable rather than depleting whenever technically and economically practicable. 8. Reduce Derivatives Unnecessary derivatization (use of blocking groups, protection/ deprotection, temporary modification of physical/chemical processes) should be minimized or avoided if possible, because such steps require additional reagents and can generate waste. 9. Catalysis Catalytic reagents (as selective as possible) are superior to stoichiometric reagents. 10. Design for Degradation Chemical products should be designed so that at the end of their function they break down into innocuous degradation products and do not persist in the environment. 11. Real-time analysis for Pollution Prevention Analytical methodologies need to be further developed to allow for real-time, in-process monitoring and control prior to the formation of hazardous substances. 12. Inherently Safer Chemistry for Accident Prevention Substances and the form of a substance used in a chemical process should be chosen to minimize the potential for chemical accidents, including releases, explosions, and fires. * Anastas, P. T.; Warner, J. C. Green Chemistry: Theory and Practice, Oxford University Press: New York, 1998, p.30. By permission of Oxford University

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	Press from ACS Green Chemistry Institute Webpage When new flame retardant commercial targets are defined, our process development focuses closely to developing commercial processes that conform closely to the Principles of Green Chemistry. Most of our flame retardant processes are substantially “Green” and future processes will be even more so. Additionally, we are now also in the process of formalizing a metric in our internal evaluation of processes to prepare sustainable flame-retardants. Green chemistry process development is encouraged and rewarded. An important aspect of sustainable flame retardant design beyond the molecule or its process is the physical form of the product. We are now in the processes of developing new technologies to produce our existing powder products in a dust-free pelletized form. We are developing several new flame retardants for the future that have very attractive product forms that are largely dust-free and much easier for our customers to handle. Dust-free forms make it easier for customers to control their emissions to very low levels and thereby keep flame-retardants in the plastics and not in the environment at either point of manufacture of point of initial use. Finally, product stability is an important criteria for a sustainable flame retardant. Flame-retardants basically sit silently in the resins they protect, often for many years until such time they are needed. In most cases, their fire safety service is never required. But throughout the life of the product that they protect they must be fully available and largely unchanged from the day they were manufactured. The persistence of the product is therefore critical to its long-term effectiveness. This high degree of stability is also important as recycle and reuse of flame-retarded resins is becoming widespread. David W. Owens Director of Polymer Additives R&D Albemarle Corporation Baton Rouge, LA.
F-GC-26	Some Principles for Consideration BSEF FEEDBACK TO CA GREEN CHEMISTRY INITIATIVE The Bromine Science and Environmental Forum (BSEF) is an association of the bromine industry with a mission to generate scientific data that will allow informed discussion of bromine and bromine compounds. BSEF supports the California green chemistry initiative, and believes that the following issues need to be addressed in a workable policy. 1. A Science Based Process Decisions should be based on high quality scientific data. Many toxicological studies are long and complex, and the interpretation of results requires great experience. It is recommended that the target for significant studies should be GLP (good laboratory Practice) standard. We also believe that data from studies should be available to all, but this does raise issues concerning future use of data by third parties who have not shared in the significant costs often associated with test work. Within the process there needs to be a mechanism that does not allow a “free rider” to benefit from the work of others. As far as possible the data required for chemical evaluation should be harmonized with the data requirements of other regulatory jurisdictions. In practice we would suggest persistency, bioaccumulation potential, toxicity (PBT) characteristics, and carcinogenic, mutagenic and reprotoxic (CMR) characteristics form a suitable base line for decision making. Use of these factors makes most efficient use of data generated and avoids unnecessary additional testing. We support the goal of minimizing animal testing. 2. Risk and Benefit The decision making process should weigh risk against benefit. Simply identifying a hazard associated with a chemical, or detecting a chemical in the environment is not sufficient to justify replacement of a chemical. Risks need to be evaluated and full advantage taken of risk management measures to

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	allow continued use of materials that bring clear benefit to society. 3. Encourage Best Practices Throughout the supply chain and through the life cycle of a given good there should be positive incentives to drive best practice. An example of such best practice is the Voluntary Emissions Control Action Plan (VECAP) introduced by our industry to reduce emissions during manufacture and use of flame retardants. 4. Evaluate the merits of individual chemicals Keep evaluations focused on significant individual chemicals. It is not justified to apply a broad brush and try to regulate entire classes of chemical as has been suggested by some. 5. Informed Substitution When considering alternatives that might be used for a particular function it is important that the alternatives have also undergone a thorough evaluation. Failure to do this can reward lack of data, and may simply create new problems for the future. 6. Industry Self Classification The concept of self classification of chemicals by the producer or importer should be examined. This puts appropriate responsibility on producers and importers to assess the impact of their products. Proposed classifications should be open for final review and decision by CA EPA or panels appointed by CA EPA.
F-GC-27	Feedback from Albemarle Europe Stimulating Green Chemistry There is a lot of discussion around green chemistry & incentives around greening the world. One question which remains unanswered is what is the definition of "green"? Being able to define a substance as green would imply in-depth knowledge of the hazard properties of the substance, of the toxicological profile of the substance, of the risks the substance poses, of the impact the substance has through it's life-cycle on human health & the environment, and also detailed understanding of how the substance can best be managed - be that the case - taken into account it's profile of the substance. This initiative would provide an excellent platform to discuss in to greater detail the definition of green chemistry, in order to provide a common understanding applicable in an objective manner to all chemical substances
F-GC-28	Perspective of Affected Industries on California Green Chemistry Initiative The below listed organizations appreciate the opportunity to provide comments on the California Environmental Protection Agency's (CalEPA) Green Chemistry Initiative. Our organizations represent many of California's and the nation's leading industries and employers. We fully support science and risk based chemicals management policies which protect health and the environment while assuring product safety and efficacy and promoting innovation in the marketplace in California. Chemistry is at the foundation of a wide range of industries. The science of chemistry helps to make the lives of Californians and others throughout the world safer, healthier, and more productive. Chemistry goes into modern materials used to make insulation, weatherization equipment, firefighting and other emergency response equipment, lightweight vehicle parts, coatings, lubricants, and energy-efficient appliances. Just a few of the many industries that use chemical or chemical-derived products include farming, new residential construction, emergency response services, plastic bottle manufacturing, electronics and high-technology, consumer products manufacturing, upholstered furniture manufacturing, dry cleaning services, building services and health care. We support the statement of CalEPA Secretary Linda Adams that this "…strategy, and the policy it champions, must have at its core and be governed by sound science." Advancements in science make possible product innovations that meet consumer needs, while increasing knowledge about the safety of

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	chemical products and protecting the environment. A science-based assessment that evaluates human health and environmental considerations, performance, and cost and feasibility must include an examination of traditional and alternative technologies, materials and processes. Incentive-based approaches can allow companies to more easily and effectively share this knowledge, best management practices, and opportunities. Our industries and employees appreciate California's leadership in undertaking a comprehensive, scientific and risk based approach to this complex issue. Adhesive and Sealant Council American Chemistry Council AeA (American Electronics Association) American Sportfishing Association Association of Woodworking and Furnishings Suppliers California Chamber of Commerce California Circuits Association California Manufacturers and Technology Association California Paint Council Chemical Industry Council of California Consumer Specialty Products Association Flavor and Extract Manufacturers Association Fragrance Materials Association Grocery Manufacturers Association Independent Lubricant Manufacturers Association International Association of Color Manufacturers International Sleep Products Association IPC – The Association Connecting Electronics Industries National Association of Home Builders National Paint and Coatings Association NFIB – California Soap and Detergent Association Society of American Florists U.S. Chamber of Commerce

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F-GC-29	Use of existing data and tools to implement the Green Chemistry Initiative DTSC should look at the procurement and / or contractual use of existing data and software tools to implement the Green Chemistry Initiatives for the short-term and long-term program needs. Previous posts have indicated various available existing chemical data systems and tools, including Chemical Compliance Systems, the Canadian efforts, and the European REACH program. Use of these types of tools could facilitate implementation of voluntary and/or regulatory programs in the near future as a beginning effort and establishment of a foundation, to be built upon in future developments, meeting the Green Chemistry initiative goals and objectives. One example of a potential use of existing tools is the establishment of a product "green" certification program which would allow consumers to readily identify green products. This type of program is already available via use of Chemical Compliance Systems data tools that can provide an automated "Green" assessment of chemical products which can be readily tailored for use in California. The use of such existing programs can provide efficiency through the avoidance of "re-inventing the wheel" and expanding on proven technologies and / or approaches. Through the procurement and / or contractual use of existing data and software tools, DTSC should establish programs and/or partnerships by which these types of tools and data can be made available to other stakeholders (such as product manufactures, business and private consumers, other government agencies, etc.) on a free or lower-cost basis for the purpose of meeting or promoting the Green Chemistry Initiative goals and objectives.
F-GC-30	Comments from Albemarle Corporation ALBEMARLE FEEDBACK TO CA GREEN CHEMISTRY INITIATIVE Albemarle Corporation remains committed to the creation and supply of sustainable chemicals that contribute to the well being of mankind and the environment. As such we are supportive of the initiative in California to develop a clear process for the evaluation of chemicals and their application areas. We believe that a well-conceived process is necessary for sound decision-making that can address the concerns of the broad range of economic and environmental stakeholders. The following elements, we believe, are part of such a policy: 1. Decisions need to be based on high quality science, for example testing to GLP standards 2. Harmonization of data requirements with other regulatory jurisdictions 3. Decision making should be based on evaluation of risk, not just hazard . Ongoing minimization of risk is a target. 4. Benefits derived from a chemical's use should be factored into decision making. 5. There should be ready access to data used to support conclusions 6. All stakeholders should have opportunity to participate 7. There should be positive incentive for introduction of best practices 8. There should exist a framework for incremental improvement 9. There should be recognition and approval for products meeting acceptance criteria 10. Substitution decisions should be informed in terms of the characteristics and risks presented by potential alternatives The following addresses more specifically the four challenge areas identified. Cradle to Cradle The risks associated with a particular application area of a chemical need to be evaluated on the basis of a full life cycle assessment (LCA). Risk should be understood to take into account the inherent hazard possessed by a given chemical and the exposure that humans or the environment have to the chemical through the life cycle of its application. It is feasible that hazardous materials can continue to be used as long as the risks associated with their

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	use are acceptable. As an example, Swedish LCA assessment of televisions containing flame retardants compared with televisions containing no flame retardants showed that the FR containing televisions put less burden overall on the environment than televisions with no flame retardant. This was because the higher rate of fires, and any environmental impact of those fires more than offset the environmental burden from the flame retardant. A second example, might be that a chemical that allows ready recycling is to be preferred over one that does not, even though in isolation the eco-tox profile of the first chemical appears less attractive than the second. Even when risks are judged acceptable, there should be ongoing programs to minimize the risk. Fundamentally the goal is to drive risk to zero. This is achieved by a combination of hazard reduction and exposure reduction. At Albemarle Corporation we have programs in place with the goal of achieving zero emissions of chemicals from our production facilities and those involving our products at our customers. Green procurement policies at state and municipality level can be used to give the incentive to drive best practices to minimize risk. A major element in evaluating life cycle impact is end of life disposal of finished goods, and policy should drive and reward effective recycling. A major challenge facing us today is the how to deal with electronic waste. We believe that an integral part of the green chemistry initiative should address electronic waste disposal and the applicability of a product to recycle. To this end we believe that the opportunity for a collaborative industry / state initiative to develop solutions such as an in-state smelting facility should be explored. The technology exists for recovery of valuable metals, other chemical starting materials, and energy in the safe disposal of electronic waste. Stimulating Green Chemistry State procurement policies provide an effective vehicle for promoting green chemistry. Such economic incentive will be powerful in driving towards green targets. The creation of a “green chemistry scorecard” for suppliers would allow specific materials and their applications to be rewarded through favored purchasing policies. Such an approach also provides the opportunity for incremental improvement as producers demonstrate capability to meet more voluntary criteria beyond a minimum base line. As time passes the criteria can be reviewed and targets raised to drive further performance. As discussed above, the opportunity for California to work with industry partners to promote effective end of life strategies such as smelting or recycling of electronic waste can potentially provide an economically viable resource for California, and one that also provides a solution for other states in terms of disposal of their electronic waste. Toxics by Design The chemical industry or chemical importers should take the responsibility to describe the environmental characteristics of their products. The financial burden of testing chemical products appropriately lies with the producer or importer. Such testing should be carried out at independent test facilities, and it may be beneficial to California to encourage the creation of such test centers within the state – either as independent entities or as part of the CA University system. Self certification by the producer would be based on independently run tests of a chemical’s characteristics in terms of whether the chemical should be considered persistent, bio-accumulative, and toxic (PBT), or should be considered a very persistent and very bio-accumulative (vPvB), or should be considered to have significant possibility of being carcinogenic, mutagenic, or reprotoxic (CMR category 2). These classifications are well recognized in global regulatory systems, and the data necessary for such classifications can be clearly defined. The data and rationale behind the assessment shall accompany the submission. The submission would l be reviewed by the CA EPA and final determination of the chemical’s classification will lie with CA EPA. At the discretion of CA EPA, appropriate stakeholder involvement in this process can be encouraged. Materials classified as PBT, vPvB, or CMR category 2 should be subject to risk analysis. This is a primary focus for any policy – to address materials having clear areas of concern. If risk levels are judged too high, then industry should have the opportunity to introduce appropriate measures to reduce risk within a given time span, or face phase out of the material. Again the concept is to drive improvement where possible. Within a phase out strategy, the

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	potential use of alternatives must address any risks associated with such substitution. It should not be acceptable to propose substitution by a material for which there is little data on its characteristics. Fundamentally, lack of data should not be rewarded. Even when there are acceptable risk levels, continued risk reduction should be encouraged and rewarded. Incentives could be given to develop products with improved characteristics, e.g. non-PBT or polymeric chemical additives. Similary, improved stewardship, such as driven by the BFR industry's Voluntary Emission Control Action Program (VECAP) should be encouraged and rewarded. Materials not classified as above, should be approved for use, unless there is a clear concern identified. Ideally all materials should be subject to risk analysis, but this may not be practicable. Toxics by Accident The basic classification of a given material can be addressed as described in the preceding section, but the important difference here is that the hazard presented by a material is not associated with the primary chemical, but with by products that are not integral to the materials function. In such a circumstance the opportunity for risk reduction by means of by product elimination should form an important element of ongoing risk reduction strategy. Where risks are unacceptable this has to be a part of the risk management program to bring risk within acceptable levels. Where risk levels are deemed acceptable, continued improvement can still be driven by procurement incentives.
F-GC-31	Science base for moving to low hazard chemicals Maureen Gorsen Director Department of Toxic Substances Control California Environmental Protection Agency Dear Ms. Gorsen: Thanks for the opportunity to provide suggestions for how to move to a system that eliminates hazardous chemicals from homes, products, and environments. To move toward safer chemicals requires that we replace systems that are slow and ineffective with systems that are faster, more effective, and capable of integrating new scientific understanding. This is a big challenge, and it will be important to engage all of the State's expertise to this end. Key elements are noted below. I. Assessing and characterizing hazards of chemicals –-- As has been pointed out by many authors, neither the US nor the State is systematically assessing and characterizing the hazard traits of chemicals in use or proposed for use. Accurate characterization of the hazards of chemicals is needed to make choices that move toward greener and safer products, to distinguish between higher and lower hazard compounds. Several components can contribute to this. A. Address all of the hazards, not just a few –-- Accurate and reliable assessment and characterization must address all of the hazards of chemicals, not just a few of them. Right now assessment and characterization focuses primarily on cancer and reproductive/developmental toxicity. This is not consistent with current scientific knowledge. B. Adopt a proactive approach to obtaining data needed to assess hazard traits –-- The current practice is for the state to consult various lists and data sources to try to track down whatever information is available to assess hazards of chemicals. The information available varies enormously, and little is available for many chemicals. The State needs to have the authority to obtain the

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	information and test results needed to assess and characterize the hazards of chemicals. C. Develop approaches to testing that are informative for assessment –-- Testing requirements should be designed to produce consistent data to allow comparison between chemicals. Empirically verifiable test results should be converted into understandable characterizations efficiently and transparently. D. Incorporate scientific progress into approaches to assessment –-- As noted by the National Academy of Sciences in its recent report on toxicity testing, gains in scientific knowledge and improvement of methods are significant. However, many major methods in use are based on the scientific understanding of twenty years ago. Methods are needed to reflect current understanding of issues including the importance of timing of exposure and how effects at different life stages can differ; differences in susceptibility including the particular susceptibility of children; the importance of multiple exposures to multiple chemicals; and the significance of biological perturbations in increasing likelihood of diseases or disorders. Cal EPA should engage experts to work toward incorporating current science into better methods for assessing the hazards of chemicals. These would likely include use of genomics and related technologies and other high through put approaches. It would also include systematic validation. Such efforts should be guided by the policy goal to adopt the best currently available methods. Investment in incorporating current knowledge into methods is needed. II. Provide clear and transparent characterization of chemical hazards to the public. Many entities can make decisions and take action that contribute to adoption of safer or lower hazard chemicals and products. Case studies presented to this initiative have shown actions by businesses to adopt greener practices and products. To support such efforts, businesses, agencies, and the public need comprehensive, current, accurate, and reliable information about the relative hazard of different chemicals. This would allow them to select lower hazard chemicals that meet operational needs. Such information would also be of value to the state in its management and regulatory responsibilities. The State of California should develop a matrix of information about the hazard traits of chemicals in use or considered for use, presented in ways that are useful and understandable to various audiences. This matrix should also make clear when gaps in data exist, so that businesses and individuals can choose to avoid chemicals with unknown hazards as well as those that are higher hazard. Such information is necessary to allow for the selection of safer or lower hazard alternatives. III. Design continued improvement into the system. Science produces new understanding all the time. Any system that is developed should be designed to apply current scientific knowledge to respond to the policy need for the best available methods and approaches. It should also be designed to incorporate new methods or approaches as they become available. IV. Ensure scientific integrity. To develop a scientifically-based program, it is important to ensure the integrity of the scientific information and expertise that are engaged. Several unfortunate instances of potentially tainted science and related deliberations have come to light in the last couple of years. The State should adopt the highest standards for ethical conduct and independence of the experts upon which it relies. Standards recently adopted at the International Agency for Research on Cancer for its review of potential carcinogens provide a useful model. V. Ensure public accountability. Good public policy is transparent to the people. This is particularly important for topics that have a high degree of technical content that can be difficult for people to access. The program should incorporate principles of public accountability by ensuring that all information is available to the public and that all proceedings are conducted in the public view. It will be important to ensure that hazard information is not hidden behind claims of confidential business information, and a high standard for review of such claims is needed.

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	Thank you for your consideration of these comments and suggestions. Very truly yours, Amy D. Kyle
F-GC-32	GMA's Perspective on a Framework for Green Chemistry GMA's Perspective on a Framework for Green Chemistry The Grocery Manufacturers Association (GMA) represents the world's leading food, beverage and consumer products companies. The association promotes sound public policy, champions initiatives that increase productivity and growth and helps to protect the safety and security of consumer packaged goods through scientific excellence. The GMA board of directors is comprised of chief executive officers from the Association's member companies. The $2.1 trillion consumer packaged goods industry employs 14 million workers and contributes over $1 trillion in added value to the nation's economy. GMA appreciates the opportunity to participate in a dialogue on California's Green Chemistry Initiative with California's Environmental Protection Agency (CalEPA) and other interested parties. Our membership includes leading consumer products companies that produce safe consumer products that are protective of human health and the environment while improving the quality of life and protecting the public health against dangerous diseases, infestation, and unsanitary conditions. Green chemistry is sustainable innovation. It is built upon a foundation of companies using hazard and exposure analysis to address safety prior to marketing. It is about moving toward products with improved environmental quality that also improve performance and consumer value to better meet all consumer needs. It uses analytic tools such as life cycle assessment to guide real product improvement and to protect against burden shifting or regrettable substitution with unintended adverse consequences, such as occurred with MTBE. Background Our members are committed to thoroughly evaluating their products for human and environmental safety through rigorous safety-based assessments before they are marketed. Our members provide clear and meaningful labeling on consumer products to ensure that consumers use products in accordance with label instructions. Our members routinely apply green chemistry and green engineering principles in their operations and have been honored with awards for their efforts. The consumer products industry develops products that meet or exceed the safety requirements of all state and federal agencies in the United States and Canada charged with regulating those products, including the California Department of Pesticide Regulation, the California Air Resources Board, other state agencies, the U.S. Consumer Product Safety Commission, the U.S. Environmental Protection Agency, the

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	U.S. Occupational Safety and Health Administration, the U.S. Food and Drug Administration, Health Canada, and Environment Canada. GMA supports initiatives that continue to foster innovation and encourage universities, educational institutions, and industry to partner in developing effective “greener” ingredients that reduce environmental impact. We support company performed safety-based assessments of consumer products prior to the marketing of a product, considering all phases of the lifecycle of a product. Any chemicals management program must be based on sound scientific risk assessment to protect public health and the environment, and we support appropriate use-restrictions for chemical ingredients when those scientific safety-based assessments indicate they cannot be used safely in consumer product or use application. We support initiatives by companies, government and interested parties to promote consumer awareness of the importance of reading and following label instructions for safe product use, storage and disposal. We applaud collaborative efforts to encourage public and private partnerships, with a goal of developing greener products and environmentally responsible ingredients based on life cycle considerations, rather than mandatory and voluntary state labeling programs that endorse green products or programs that stipulate a single third-party certification of green products or numerical ranking. We encourage research that shows opportunities for the use of green chemistry in consumer products, as well as policies designed to overcome barriers to commercial application of green chemistry research and development efforts. We support initiatives that create incentives for innovative companies that develop greener products that are technologically and commercially feasible, and we encourage recognition for companies that develop sustainable business operations, processes and/or products. General Principles We believe that the Green Chemistry Initiative should ensure the safety of consumer products through the use of sound science in the decision-making process. It must foster innovation and encourage the development of new chemistry technologies. The Initiative should be designed to promote products that are technologically and commercially feasible to produce without compromising product efficacy, performance and usability. It should build on existing statutory and regulatory structures, voluntary initiatives and data development efforts. Finally, CalEPA should seek guidance from all stakeholder interests. Key Elements for the Green Chemistry Initiative We respectfully submit that the framework for the Green Chemistry Initiative should include the following elements: (1) A Systematic, Collaborative Process to Address Priority Chemicals: We support California’s initiative to move beyond a chemical-by-chemical approach and build a more systematic, scientific and collaborative process to address priority chemicals. As Governor Schwarzenegger recently stated: “I strongly believe there needs to be a systematic way to address these types of concerns where California’s scientists can work together with experts throughout the world to evaluate the health effects of chemicals, assess the risks they pose, and ensure that the safety of possible alternatives receives the same consideration.” It is eminently sensible for California’s collaborative effort to proceed in tandem with ongoing work by other government agencies assessing chemicals. The Canadian Government announced their Chemicals Management Plan on December 9, 2006. Numerous substances that have been in commerce for more than 20 years were assessed against rigorous scientific criteria. As a result of that process, Health and Environment Canada are now addressing priority chemicals as part of the Industry Challenge Program within the Chemicals Management Plan. Since Canada is undertaking this proactive approach for existing substances against the most modern science, we respectfully suggest that CalEPA collaborate with the Canadian government not only on the priority list of chemicals but the program in general. In our opinion, this collaboration would avoid needless duplication, inefficiencies and burdens, as well as take advantage of credible, high-quality scientific work already completed. This will help the government of California to meet its goals in a faster, more cost-effective way. Working with the Canadians and the Plan undoubtedly would foster greater results for the regulatory cooperation agreement for chemicals announced by the President and the leaders of Canada and Mexico this past summer. As part of the agreement signed in Montebello, the three countries agreed to

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	share data, information and safety assessments so that all North Americans would have continued access to safe and effective products with improved sustainability and environmental quality profiles. With California's expertise at the table, collaborating with the agencies involved could accelerate the benefits of this effort across the North American region. As indicated in Governor Schwarzenegger's comment, it is important that California proceed with a science-based approach that focuses on key information, including toxicity and exposure of chemicals and possible alternatives, so that sound safety decisions can be made in the context of scientific risk assessment. This process must be the tool for focusing resources and attention on a limited number of chemicals that are important to evaluate. The process should be collaborative and should include scientific experts in toxicity and exposure from academia, chemical manufacturers, product formulators, and nongovernmental organizations. The manufacturers of the chemicals and consumer products could provide toxicity and exposure/use data to determine whether the uses of "priority chemicals" are safe or should be restricted. (2) Ingredient Communication: Some consumers have expressed a desire to know what ingredients are in the products they use in their everyday life. These consumers are interested in having this knowledge in order to make informed product choices. We support providing accurate information to consumers through ingredient communication. Manufacturers of essentially every name-brand product have programs to respond to the information requests and needs of consumers. For example, we actively work with consumers who call our toll-free numbers or send emails. We are always looking for better ways to communicate. Some third party assessments and information available on the Internet or through literature searches can be inaccurate due to the reliance on sources or on assumptions that may not be as current as the information provided by the manufacturers or industry groups representing the products. Industry has the obligation and continues to improve the methods it uses to communicate product information to consumers, especially in its efforts to ensure the safe and appropriate use of the products. We would like to work with California to implement a means of ingredient communication that would provide consumers with the information they can use to make even better informed decisions regarding the products they use in their homes. (3) Product Safety Assessments: Our members are committed to thoroughly evaluating their products for human and environmental safety through rigorous safety-based assessments before they are marketed. We support the continual improvement of safety assessments and methodologies including conducting life cycle assessments to help understand the health and environmental footprint of products and possible alternatives through their lifecycle. Our members have staff that includes experts in toxicology and environmental science to work on these assessments. CalEPA could work with scientific experts to examine best practices and to develop a toolkit for safety assessment programs and for safety assessments. Companies also could make a description of their safety assessment process available on the Internet. This could help provide context for product ingredient communication. In addition to product safety assessments, companies could adopt programs to ensure the safety of raw materials and packaging, operations, storage and distribution, and the use and disposal of products. (4) Supporting Innovation: The Green Chemistry report argues that there is a need to close the "technology gap" through market-based incentives to support green chemistry. This could include funding for university research grants, scholarships, and similar programs, as well as awards for innovation, tax credits, low-interest loans, and other incentives. These positive incentives should be open to all companies that are innovators and sell products in California -- not simply be limited to companies located in California. * * * * *

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	Chemicals are useful and essential ingredients for many products that protect public health and improve the quality of our lives. We appreciate the importance of a scientific approach based on an evaluation of hazard and exposure information to determine the safety of these products that improve the well-being of the public.
F-GC-33	Taking A Step Back Taking A Step Back Before embarking on an initiative, it would be well to consider whether there is an underlying problem that needs to be addressed. With respect to chemical policy, the question might not be so much: What can California do to stimulate a green chemistry transformation in the design of products and processes? The question may well be: Is there a problem with the current usage patterns of chemicals in California to begin with? Consider, for example, that life expectancy has been increasing for over a century. Public health has dramatically improved since World War II. This improvement has occurred during the very time period when chemical usage expanded dramatically. As Gregg Easterbrook has observed, "it cannot be true that Americans are being poisoned and growing healthier simultaneously." Releases of hazardous substances to the environment peaked in the 1960s and 1970s, and trends have been downward following reforms in the pesticide and hazardous waste laws. Again paraphrasing Gregg Easterbrook: If the "poisoning of America" was ever going to occur, it would have occurred in the 1960s and 1970s. The high point of risk from chemical exposure passed 25 years ago. Consider also the most recent Annual Report to the Nation on the Status of Cancer, published by the Centers for Disease Control in October 2007. The Report concludes that overall cancer death rates decreased by 2.1% per year from 2002 through 2004, nearly twice the decrease of 1.1% per year from 1993 to 2002. Total cancer incidence rates have also been declining since 1992. It is true that there are more cancer deaths now in the US than there were fifty years ago. But the population is much larger now and people are living longer. Cancer prevalence increases steadily with age, as it always has. Adjusted for population size and age, cancer mortality in the US was essentially unchanged over the last 50 years of the 20th Century. When cancers attributable to smoking are taken out of the equation, cancer mortality has actually been in decline for 50+ years. It is this decline in cancer mortality, combined with medical advances on other diseases, that has resulted in the increase in life expectancies in the US over the past century. There may be a popular perception that chemical exposures are responsible for many, if not most, cancers. In reality, however, this is not the case. Large epidemiological studies show that it is unlikely that environmental factors account for much more than 2% of all cancers. There may also be a popular perception that humans are now, for the first time, being exposed to innumerable chemicals throughout their lifetimes. In reality, humans have always been exposed to chemicals, whether from the soot and combustion products from wood-burning stoves and campfires or from foods. All plants contain some level of toxins, which is an important evolutionary survival mechanism for plants. Over 99% of the pesticides we consume are naturally occurring. We do not know how dangerous or benign these natural pesticides may be because so few of them have been tested. What studies have been done suggest that naturally occurring pesticides are toxic to essentially the same extent as manufactured pesticides. In the late 1600s, women were hanged as witches following trials at which experts opined that their behavior patterns were causally related to witchcraft. In the early 1900s, 60,000 people were forcibly sterilized based on the opinions of eugenics experts as to who was the potential parent of socially

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	inadequate offspring. In the late 1900s, Bendectin was driven from the market by a litigation frenzy despite the fact that no scientific studies showed that it caused birth defects and no liability verdicts were ever upheld on appeal. Human nature sometimes allows popular perceptions to displace the truth. Some may believe that the expert speculations of today are the scientific truths of tomorrow. However, history teaches that expert speculations often have nothing to do with the truth and policy based upon them can have unjust consequences. Humans are at their best when they make decisions founded upon sound evidence and we would do well to insist upon rigorous proof before we begin to remove useful products from the marketplace. Public policymaking in the area of chemical safety regulation has an uneven track record. Every effort to quantify risks and prioritize problems has shown that much more societal benefit could be achieved by focusing more resources on general public health issues, such as increased pre-natal care for the economically disadvantaged, increased regulatory pressure on smoking, and outreach to increase the rate of organ donation. Numerous commentators have shown that if the goal is general social well being, increased attention to prevention of exposure to toxins in the environment is difficult to justify based on current scientific knowledge. Justice Stephen Breyer observed over a decade ago that a "vicious cycle" of risk misperception among the public and policymakers has led to over-regulation in this area. Numerous regulatory programs are already in place. The federal pesticide statute and pesticide registration regulations have dramatically reduced exposure to "hard" pesticides. State and federal hazardous waste regulations have dramatically reduced uncontrolled disposal of hazardous wastes. The federal Superfund law and similar state laws have created enormous economic disincentives to the careless disposal of hazardous substances. The Toxic Release Inventory has created pressure on users of chemicals to decrease their usage. Private and public research has identified many safer alternatives to current chemical uses and more research will undoubtedly yield further results. When public health issues arise due to exposure to toxic substances, the impacts are generally not obscure and the policy response generally makes common sense. When it became clear that asbestos caused mesothelioma, asbestos insulation was banned in most applications. When the impacts of lead exposure on children came into focus, lead was removed from gasoline and from paints. When the full impacts of smoking started to become clear, numerous actions including restrictions and taxes were imposed. These types of actions had a direct, measurable impact on public health. The Department should carefully consider whether proposals forwarded to it in connection with this Initiative will have similar impacts.
F-GC-34	Senior Health Scientist, ChemRisk Inc. November 16, 2007 Ms. Maureen Gorsen, Director Department of Toxic Substances Control P.O. Box 806 Sacramento, CA 95812-0806 Re: “California Green Chemistry Initiative” Comments Dear Director Gorsen: As a Senior Health Scientist at ChemRisk® I am pleased to submit the following general recommendations to the Department of Toxic Substances Control for the “California Green Chemistry Initiative.” ChemRisk® is a consulting firm providing state-of-the-art toxicology, industrial hygiene, epidemiology, and risk assessment services to organizations confronting public health, occupational health, and environmental challenges. I am interested in providing these comments to fellow practitioners and stakeholders involved with this Initiative who recognize the importance of: (1) ensuring the integrity of “Green Chemistry’s” science; and (2) applying robust risk assessment techniques to the Initiative’s chemicals policy. There is indeed great promise in “Green Chemistry” to maintain scientific integrity in its approach to investigating and communicating the potential benefits, risks, uncertainties, and tradeoffs of using both traditional chemicals and their replacements. To that end, Green Chemistry’s presentation of

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	hazard and risk information for human or environmental health should not only be relevant to real-world situations, but also be transparent, comprehensive, risk-based, and ultimately understandable so that its significance, uncertainty and variability are easily identifiable. The significance of environmental monitoring and biomonitoring data should also be put in a context relative to potential health risk. As the State of California moves forward with their “Green Chemistry Initiative”, I would like to recommend that they consider applying a balanced approach that considers the many factors involved with each product’s science, technology, performance, and environmental health and safety profiles. Specifically, I recommend the use a balanced view of “Green Chemistry” that takes into account not only sustainability factors (e.g., societal, economic, and environmental) but also equally considers risk, benefits, and tradeoffs that are grounded in solid science. Additionally, the information base supporting “Green Chemistry” should be objective, peer-reviewed, accurate, and complete. To achieve such a base, I recommend reviewing the best available state of the science, giving due consideration to statistical and biological significance, and weighing supporting evidence. Evaluations of alternative or substitute chemicals should not abandon risk concepts such as real versus perceived risk, association versus causation, and potential for unintended consequences. Evaluation of costs and benefits, performance, and other tradeoffs also should not be ignored. No readily available “drop-in” replacement chemical typically exists, and even when substituting one chemical for another, differences in compatibility and performance must be taken into consideration. As such, analysis of the potential tradeoffs of proposed alternatives and substitutes should include the following considerations: costs/benefits§ relative risk§ impact on§ physical/mechanical/aesthetic properties of product or component level of§ performance (i.e., equivalent or better) efficiency (i.e., higher or lower§ loading/concentrations to impart same level of performance and function) § safety (e.g., flammability) levels of testing and knowledge (i.e.,§ physical-chemical and toxicological testing, occupational, human and environmental health) levels of exposure and release potential (e.g., via§ leaching or volatilization) timing needed to validate into product§ development process potential to restrict trade or prevent innovation, and§ product stewardship and life cycle factors (e.g., end of life recycling).§ Such a tradeoff analysis is critical to not only prevent replacing one risk for a larger and possibly unintended one, but also to prevent discriminating against chemicals without any scientific justification that a substitute is “better” or “safer” than the original. I would stress that even “greener” chemicals differ from each other significantly in their physical and chemical properties and in multiple ways that can influence their hazard and risk. Each chemical should therefore be evaluated specifically on its own merits based on its unique structural, physical, chemical, and toxicological properties. Risk from chemicals is a function of the chemical’s inherent toxicity potential (based on structural, physical, chemical properties), exposure (i.e., dose, route, duration, life stage), and use patterns and interaction with potential receptors. California “Green Chemistry Initiative” should therefore balance the risks posed by these separate factors in order to determine whether the green chemical is really a “better” substitute. The Royal Society of Chemistry provides an illustrative table as a qualitative example of such balancing of a couple of different example endpoints (toxicity, ecotoxicity, and volatility), a task which can take place prior to the step of risk analysis (http://www.rsc.org/ScienceAndTechnology/Policy/EHSC/ChemicalSub.asp). Thank you for the opportunity to share some general recommendations as you work toward finalizing the “California Green Chemistry Initiative.” Please do not hesitate to let me know if you have any questions.

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	Sincerely, Len Sweet, PhD, MPH, MSc Senior Health Scientist ChemRisk, Inc.
F-GC-35	Manager, Corporate Communications Dear Secretary Adams: The California Environmental Protection Agency's Green Chemistry Initiative outlines many of the same goals as the American Chemistry Council's Responsible Care® Management System (RCMS). "A Responsible Care management system offers an integrated, structured approach to drive results in seven key areas: community awareness and emergency response; security; distribution; employee health and safety; pollution prevention; process safety; and product stewardship." This system requires companies to measure and publicly report performance. It requires that companies take responsibility that their employees, products, facilities, transportation, etc., are safe and secure. It requires that companies take responsibility for their products from "cradle to grave" and it requires third party verification that all of these processes have been completed. The RCMS framework is designed as a system of continuous improvement. The RCMS framework should be applied on a global basis, and we suggest that California should also embrace these goals. Rather than legislating additional rules and regulations, Carus Corporation encourages the state to support the green initiative by looking at their current industrial facilities and chemical use and support the companies that are committed to and can demonstrate that they are working towards, or have achieved, these goals. If California were to alter their purchasing practice and not fall victim to the "cost-based processes" (pollution-based model), it would have a huge impact on the way other manufacturers do business in the state. The surest way for California to make a difference is to lead by example and provide tax incentives, state contracts, and other incentives to the companies that are currently practicing "sustainable manufacturing processes" (green chemistry) using the RCMS framework. Carus Corporation has a strong belief that in order to be a sustainable company, our manufacturing processes must be environmentally friendly and cause minimal impact to the environment. One way to compare a "sustainable manufacturing process" to a "cost-based process" is to look at the amount of greenhouse gases (CO_2) produced during the manufacture of permanganate, our core product. Carus Corporation uses a totally enclosed, extremely efficient, process that produces very high yields while generating about four tons of CO_2 (greenhouse gas) per ton of permanganate produced. A "cost-based process," such as the processes used to produce permanganate in China, generates significantly more CO_2. In fact, it is estimated that the Chinese permanganate production produces 60 tons of CO_2 (15 times more than the Carus process) for every ton of permanganate produced. These

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	inefficient processes contribute TWO MILLION additional tons of CO2 more than necessary, and the environmental impact cost is deferred to future generations. Having a “sustainable manufacturing process” also requires a company to spend more to make their product than just the cost of raw materials, production, labor, and logistics. Additional costs incurred by companies using green chemistry include constant monitoring to determine environmental impact, worker and plant safety, worker health, and consumer health, safety, and environmental issues. “Cost-based processes” defer these costs to future generations because they have placed very little value on their resources. There is no doubt that these sites will ultimately have to be cleaned up and these costs bore by future generations. Carus Corporation is a chemical manufacturer located in LaSalle, Illinois, a rural area in north central Illinois. The company was founded in 1915 and is still owned and operated by the Carus family. We have about 220 employees and are one of the larger employers in the area. Carus’ core products include permanganates, manganese catalysts, and phosphates. These products are all primarily used to protect human health and the environment by improving the quality of drinking water, treating wastewater, cleaning up contaminated soil and groundwater, as well as preventing air pollution. Carus has been a member of the American Chemistry Council for more than 60 years. We have maintained this long-term relationship because we believe in and subscribe to the same principles, i.e., to protect public health and the environment while producing chemicals that will have a positive and beneficial effect on the lives of the people who use them. We are an active participant in the American Chemistry Council’s Responsible Care® initiative to continuously improve our health, safety, security, and environmental performance. In fact, Carus’ Vision Statement is “No Accidents, No Injuries, No Harm to the Environment.” Because of our role in the community and the surrounding farming area, protecting the environment and contributing to the betterment of our community are key priorities for the company. Our commitment to the betterment of the community is demonstrated in many of the policies and benefits our company provides. Carus has a volunteerism policy that encourages our employees to get involved. We provide every employee eight hours of paid time off each year to donate his or her time and talent to educational and other beneficial causes. In addition, Carus has many company-sponsored events, and our employees routinely provide hundreds of hours of volunteer time to schools, fire departments, community events such as Labor of Love, Junior Achievement, to name just a few. Carus is an education advocate, and we expend significant resources to educate children, teachers, and the public about the chemical industry and our responsibility as a chemical manufacturer. Some of the educational programs Carus offers include: - Career Days at the Chicago Museum of Science and Industry in conjunction with the Chemical Industry Council of Illinois (CICI) - Summer Science Camp for Kids, a chemistry camp for junior high students in the area - “You Be the Chemist” Challenge in conjunction with the Chemical Education Foundation - National Chemistry Week demonstrations to area schools - Teacher Enrichment Workshops with CICI - “Work in the Real World” Career Night with North Central Illinois Works - “Scientific Work Experience for Teachers,” a summer employment program that gives science and math teachers an opportunity to work in a chemical manufacturing facility. They learn how the concepts they teach are applied in the real world, which in turn, benefits the students. - Tuition reimbursement for employees and their children Most of our employees live, work, and play in this community. Our goals as a Responsible Care® company are to have a positive impact on the community, both environmentally and socially. Our environmental footprint needs to be small, and that can only be achieved by a constant commitment to a “sustainable manufacturing process.” California has an opportunity to send a message to facilities already manufacturing in the state, to new businesses that want to locate there, and to companies importing their products into the state. The message is simple. Purchase only from companies that follow a Responsible Care® Management

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	System. Fairly and adequately enforce the rules already on the books. Provide quantifiable incentives to companies to practice “sustainable manufacturing processes.” Brenda K. Veronda Manager, Corporate Communications Carus Corporation (815) 224-6682
F-GC-36	Ecolab, Inc. Comments Regarding California's Green Chemistry Initiative California Green Chemistry Initiative Ecolab, Inc. is pleased to offer input regarding the development of California’s Green Chemistry Initiative. Ecolab Inc. is the leading developer and marketer of premium cleaning, sanitizing, pest elimination, maintenance and repair products and services for the world’s hospitality, food service, health care and industrial markets. We are committed to providing the most effective and efficient cleaning, food safety and infection control programs available. Sustainability is inherent in our products and services. From concentrated, solid formulations to innovative packaging and dispensing methods, our products are designed to help increase safety, lower the use of water and energy, and reduce the chemicals and waste released to the environment. Strengthened by the expertise of our associates and combined with our dedication to social responsibility, these offerings provide value to our customers and the global economy – and help foster a more sustainable world. Company Certification: The following components encompass suggested conditions for an organization to obtain a ‘green certification’ as a company from the State of California. These prerequisites would ensure the products produced by a green certified company would meet safety and environmental standards. This process would also serve a dual purpose. A certified company would agree to act in a responsible and environmentally friendly manner in the creation and utilization of its products and the regulatory review process would be thorough yet manageable for a certified company to operate effectively and efficiently. Condition #1: ISO 14001 Certification - Environmental Management Systems The International Organization for Standardization (ISO) 14001 environmental management system is a voluntary system for managing environmental aspects of business operations, somewhat similar to the ISO 9001 quality system. This sought-after designation includes guidelines for how organizations work to prevent pollution, conform to legal requirements, minimize impact on the environment and continuously improve environmental performance. In Europe, Ecolab maintains ISO 14001 environmental management certification for 12 operational units (11 production sites and our European headquarters in Düsseldorf, Germany). Ecolab is in the process of developing a global implementation program for ISO 14001 environmental management systems. This will result in ISO 14001 certification of our North American facilities in the near future. Condition #2: Access to established and centralized ingredient database To comply with the spirit of the California Green Chemistry Initiative, it is absolutely necessary that formulators use standardized ingredient properties and criteria. At this time, one of the most difficult aspects of Green Formulation is access to, and the variability of, data describing the potential hazards of

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	chemical ingredients. The ingredient database would characterize the human health, environmental, safety, and regulatory aspects of ingredients used in formulated products. Key to the database is that all relevant scientifically sound properties are included, while non-sound or controversial properties are excluded. A centralized database would provide the following advantages. • Enable companies to make sound decisions based on good science. • Enable compliance with all applicable laws and regulations. • “Level the playing field” between companies. All would be using the same set of data. • Scientifically unsound data would be excluded from the decision making process. • Enable companies to move faster to provide environmentally compatible product offerings. • Enable companies to rank the environmental compatibility of each formulation. Ecolab urges the State of California to fund development of the ingredient database. Without such a centralized database, it will be impossible for the Green Chemistry Initiative to succeed. There have been proposals that chemical manufacturers must provide certain environmental health and safety data on their MSDSs and labels. Implementing these Green Chemistry Principles will require significant toxicology resource commitments by chemical producers and formulators. The challenge for companies will be the inevitable disharmony of classification resulting from a lack of pre-defined criteria for the interpretation and evaluation of toxicology data for regulatory purposes. While there may be disagreement on how a database may be utilized, it is evident that most interested parties desire solid data from which to base future decisions upon. Chemical manufacturers will be responsible for gathering and evaluating relevant data on chemicals and mixtures they produce. Dependence on high quality and consistent data is critical to the success of this program. The challenge for California and companies will be: • The available toxicology data vary in quality and consistency. • There is no rating system recommended for evaluating the quality of the toxicology data. • The knowledge of individuals conducting hazard classifications will vary widely. The California Proposition 65 list of chemicals known to cause cancer or reproductive toxicity is an example of a program with pre-defined criteria for identifying carcinogens and reproductive toxins. There is no equivalent peer-reviewed program for evaluating data for acute toxicity endpoints (oral and inhalation LD50s, environmental LC50s), ecosystem health (endocrine disruption, biodegradation, bioaccumulation), allergic sensitization, and chronic toxicity endpoints such neurotoxicity and organ toxicity. The GHS discussion distributed by the Society of Toxicology is relevant to an evaluation of data that would be required to comply with Green Chemistry Principles. Again, the development of a centralized ingredient database is crucial to the success of the California Green Chemistry Initiative. Condition #3: Established Regulatory Review Process Ecolab's extensive regulatory review processes and procedures demonstrate the already thorough and comprehensive methods we undertake to ensure our ingredients and products meet all regulatory and product stewardship requirements necessary before entering the commercial market (Regulatory flow charts and procedural documents are available for review). Ecolab Packaging Perspective Ecolab Package Engineering leads the development and efficient implementation of innovative and cost effective packaging solutions that protect Ecolab

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	products, the environment and our customers throughout the life cycle of the package. We are responsible for the efficient and effective delivery of our chemistries to our customers. Our engineering challenge is to ensure that our products are packaged efficiently to meet our economic, environmental and social goals, so that they may be transported safely, and used as they are intended. We start with a thorough understanding of our manufacturing capabilities and of our distribution environments. We also build our package designs around our customer needs and wants. Our overriding requirements when designing any package are: 1. The package must meet and exceed all of our regulatory requirements. 2. The package must contain the least amount of material that is possible. 3. The package must contain the highest percentage of recycled content that is technically and economically feasible. 4. The package must be re-usable wherever possible. 5. The package must be robust enough to survive global supply chain environments. Our regulatory obligations are at the forefront of our thought processes throughout the development of a new package design. We comply with all international, federal and state regulations as appropriate. This includes regulations developed by: 1. US Department of Transportation 2. Transport Canada 3. US Food and Drug Administration 4. Health Canada 5. US Environmental Protection Agency 6. US Drug Enforcement Agency 7. UN Animal and Plant Health Inspection Service 8. International Maritime Organization 9. International Civil Aviation Organization 10. California Integrated Waste Management Board 11. Oregon Department of Environmental Quality 12. Coalition of Northeast Governors Many of these regulations are performance based, so we typically subject packages to extensive testing protocols before we ever fill them with any product. These protocols simulate some of the hazards seen in our distribution environment such as drops, vibration and compression. Over and above this regulatory testing, we subject our package designs to batteries of tests design to ensure that requirements 2-5 listed above are met. Those tests include industry accepted standards from: 1. American Society of Testing and Materials International (ASTM) 2. International Safe Transit Association (ISTA) 3. National Motor Freight Classification (NMFC) 4. International Standards Organization (ISO) In closing, please accept these suggestions as an effort to create a positive working relationship between the State of California, its residents and industry. Ecolab is keenly aware of the importance of serving our customers in the most responsible manner and operating with environmental sustainability as an ever-present goal.

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F-GC-37	ExxonMobil Chemical's Thoughts on California's Green Chemistry Initiative ExxonMobil Chemical is one of the world's leading petrochemical companies with the responsibility to produce chemicals that the world needs in an economically, environmentally and socially responsible manner. We recognize the need to balance economic growth, social development, and environmental concerns in how we operate our business and promote our products. ExxonMobil Chemical is encouraged by DTSC's efforts to get a broad range of feedback on the Green Chemistry Initiative, and we look forward to working with the department as this initiative develops. ExxonMobil Chemical is committed to using a science-based approach in manufacturing. We subscribe to a life-cycle approach of our products as outlined in ISO 14000 and its guidance on reducing the impact of products and processes on the environment. ExxonMobil Chemical contributes to environmental solutions within its own operations through energy efficiency, reduction of emissions, and minimizing our footprint. Through disciplined molecule management, we continually strive to bring to society the highest value disposition of every molecule we process. Through implementation of our Global Energy Management System (GEMS), ExxonMobil is focused on improving energy efficiency. This program utilizes a common methodology and is comprised of a comprehensive and rigorous set of energy-saving practices that are applied across our global manufacturing operations. Energy efficiencies introduced through GEMS are already preventing greenhouse gas emissions of about 8 million metric tons each year, which is roughly equivalent to removing about 1.5 million cars from U.S. roads. Additionally, ExxonMobil is a leader in cogeneration technology and have cogeneration facilities worldwide with a combined capacity of 4300 MW of power (enough to power approximately 2.8 million US homes), reducing global CO emissions by 10.5 million metric tons annually, which is equivalent to removing another two million cars from US roads. Our long-standing commitment to energy efficiency reduces emissions while reducing our costs --- a clear win-win. One of our core priorities is product stewardship. We use science to understand the potential risks associated with the products we sell, we work to reduce those risks, and we communicate those risks to our customers and society at large. We are committed to product stewardship and making health, safety, and environmental protection an integral part of the development, manufacture, handling, use, and recycling of chemical products. In support of our efforts to thoroughly understand the health and environmental risks of our products, ExxonMobil employs a staff of more than 100 full-time scientists to perform rigorous toxicology and environmental impact studies. In fact, over the last 10 years, ExxonMobil has proactively invested nearly $100 million on safety testing and evaluations to ensure that our products are safe for their intended uses. Our technology efforts focus on advanced processes and products. In the area of product technology, efforts are focused on developing new products whose characteristics are environmentally preferred. These products span many chemical families and end uses. Examples include technologies that enable lighter but stronger plastics, longer-life and improved air retention tires and lower toxicity/lower reactivity fluids. Our technological advances continue to allow us to bring higher valued products to market in an effort to continue to make our way of life possible. In the process of developing the Green Chemistry Initiative, we would encourage DTSC to consider what the industry is already doing to provide high value products with the least environmental impact and to use a risk-based science approach.

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	First Steps in Green Chemistry The First Step to Green Chemistry: A Model Program Institute for Research and Technical Assistance (IRTA) Introduction and Background DTSC has been charged with developing a new approach to viewing and handling chemicals and products that pose health and environmental problems. The agency has been developing a Green Chemistry initiative which would focus on chemicals and products using a cradle to cradle rather than an end of pipe regime. DTSC is the obvious agency to develop this innovative approach because of the agency's focus on pollution prevention which encompasses Green Chemistry concepts. DTSC is seeking input from all stakeholders to design the Green Chemistry approach that will ultimately be adopted. Much of the discussion to date has focused on the chemicals industry. The chemicals industry has made their position clear: they would like DTSC to adopt a voluntary program that will build on measures the industry has already taken. Many of the ideas for the program proposed by stakeholders are vague and, indeed, it is a difficult task to formulate a comprehensive policy that would apply to all chemicals that pose health and environmental threats. Because developing a comprehensive Green Chemistry approach is complex, confusing and overwhelming, DTSC should start by conducting a scoping study that would focus on very specific issues and outcomes. This specific study could serve as a model for the overall comprehensive program design. Overall Concept We are all familiar with the notion that chemicals enter the market without toxicity or environmental testing. They are used widely in some cases and later, during their use, health and environmental problems emerge. At times some of these chemicals are regulated by California agencies for various reasons and other chemicals or products are used in their place. There is little information on the new chemical and product substitutes and, because they are unregulated, they are used in an uncontrolled manner. Problems with the substitutes arise and still other chemicals and products are introduced to replace them. The pattern continues and there is never any systematic attempt to deal with the issue comprehensively. When the agencies try to regulate the chemicals or products, industry argues that there are no alternatives. This is a major issue because the industry itself will not focus on or develop alternatives unless there is a regulation. This results in a "chicken and egg" problem and the chemicals and products that pose problems continue to be used, exposing workers, people in the surrounding communities and consumers. The U.S. has relied on TSCA to prevent toxic chemicals from entering the market. Rarely, if ever, are manufacturers asked to conduct toxicity testing before their introduction. The EU has started developing the REACH program that will eventually require manufacturers to conduct toxicity testing of certain priority chemicals. DTSC can establish a program that will eventually use the results of the toxicity testing under REACH. As a first step, IRTA suggests that DTSC sponsor a project that focuses on a candidate set of chemicals that poses health and environmental problems to establish a model before adopting a complex and political comprehensive program. An important feature of this model program should be the work on alternatives. The current suppliers of chemicals or products to a particular industry have no incentive to develop alternatives without a regulation. The manufacturers of the chemicals are not always familiar with how their chemicals are used; they sell the chemicals through distributors and product manufacturers who, in turn, sell to other distributors or formulators and finally, to the users. Regulatory agencies are caught in a bind since they rarely understand the industries they regulate in depth and know little about what possible substitutes there might be. It is important to use or establish independent entities with detailed technical knowledge and experience, to find, develop, test and demonstrate viable and cost effective alternatives. The industries using the candidate chemicals or products must work with the independent entities to test potential alternatives. The health and environmental characteristics of the potential alternatives must be investigated and the alternatives must be safer than the original chemicals and products they will replace.
F-GC-38	The Institute for Research and Technical Assistance (IRTA) is a nonprofit organization established in 1989 to identify, develop, test and demonstrate safer

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	alternatives in a variety of applications. IRTA's particular focus has been solvents used in a variety of applications including cleaning, dry cleaning, paint stripping, thinning, coatings, adhesives and lubricants. IRTA has successfully worked on a number of government sponsored projects over the last several years to find, develop and demonstrate effective safer alternatives. Agencies have passed a number of regulations as a result of IRTA's work. IRTA is a very small organization that is a model for the independent entities that need to be established to conduct work on alternatives for the Green Chemistry initiative. An example that illustrates the complexity of eliminating unsafe chemicals from products is automotive aerosol cleaning products. Chlorinated solvents, notably 1,1,1-trichloroethane (TCA), was used extensively in these products. TCA production was banned in 1996 as part of the Montreal Protocol because it contributes to stratospheric ozone depletion. It was replaced with perchloroethylene (PERC), a carcinogen, a Hazardous Air Pollutant (HAP), a Toxic Air Contaminant (TAC) and a listed RCRA waste. PERC was used for many years in automotive aerosol cleaners until CARB banned chlorinated solvent use in these products. At that stage, the industry began formulating cleaners with hexane which causes peripheral neuropathy. IRTA successfully conducted a project to identify, develop and test safer alternatives. Based on IRTA's project results, CARB adopted a regulation last November to set a very low VOC content limit of 10% in these products by 2010. This action will reduce VOC emissions from the products by 10 tons per day. Because chemicals like hexane and various other toxic solvents are classified as VOCs, the alternatives used after 2010 should be much lower in toxicity than the current and historically used cleaners. Because the regulatory process is cumbersome, the substantial reduction in hazardous materials used in automotive aerosol cleaners will have required more than 14 years to achieve. Another example is repair and maintenance cleaners used in auto repair and industrial facilities. In 1997, IRTA completed a project sponsored by EPA to identify, develop, test and demonstrate water-based cleaners for repair and maintenance cleaning. Based on IRTA's work, SCAQMD passed a regulation that became effective on January 1, 1999 that established a low VOC content for these cleaners. Most companies converted to water-based cleaners and the regulation resulted in a reduction of VOC emissions of 18 tons per day. Because the regulation restricts the VOC content of the alternative cleaners, a number of companies are using an alternative, called D5, that is exempt from VOC regulations. D5 has caused cancer in laboratory animals yet it is not regulated by Cal/OSHA or any other agency and can be used in an uncontrolled manner. D5 is marketed under the tradename Green Earth in the dry cleaning industry where hundreds of dry cleaners in California have adopted it as a "safer" alternative to PERC. These examples, and there are many others, demonstrate that there is no comprehensive method of eliminating chemicals that pose health and environmental problems. Some dangerous chemicals can be eliminated if alternatives are developed and proven but it takes many years under the current regulatory regime and they are often replaced by other chemicals that also pose a problem but in a different way. There are also huge roadblocks to eliminating new chemicals, like D5, from use because they are not on any regulatory lists. It is very time consuming and, in some instances, impossible, to get new chemicals placed on these lists. Indeed, the air regulatory agencies often encourage and promote the use of these alternatives because they are exempt from VOC regulations. Specific Scoping Project The project IRTA is proposing would involve: selecting a chemical class; evaluating the health and environmental information on the chemicals to determine whether it is adequate as a basis for eliminating the chemicals; identifying, developing and demonstrating safer alternatives with the industries and in the applications where the chemicals are used; analyzing the performance, cost and cross-media implications of using the alternatives; and describing a plan for phasing the chemicals out. It would also include an assessment of the industries and applications where the chemicals are used and an evaluation of the health and environmental effects of the potential and safer alternatives. This project would serve as a model or a template for DTSC for future policies and actions under the Green Chemistry initiative. A good candidate chemical class for the project is chlorinated solvents. These materials are ozone depleters, global warming chemicals, carcinogens and some are listed on Proposition 65, the HAP list, the TAC list and are listed hazardous wastes. Some of the chlorinated solvents are major contaminants of

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	soil and groundwater. There is general agreement that this class of chemical is dangerous. Although these solvents have been phased out in some applications and future phaseouts are already planned, there are still applications where they are used. Some of the chlorinated solvent alternatives are other solvents that also pose health and environmental problems. A model project could take this into account and look at the alternatives and potential alternatives in all of the chlorinated solvent applications as well as the chlorinated solvents themselves. The chlorinated solvents either have been or still are used in a variety of applications including vapor degreasing, cold cleaning, automotive aerosol cleaning, handwipe cleaning, dry cleaning, paint stripping, maskants, spotting chemicals, coatings, reaction mediums, and laboratory uses. In some cases, like dry cleaning for instance where PERC is the major dry cleaning solvent, there are future phaseout dates that have been established by the state. Some of the alternatives, including D5 described above, have problems as well. In other applications, the laboratory and chemical production uses, the chlorinated solvents are still used fairly extensively and no alternatives are currently available or even envisioned. The proposed scoping project would focus in on chlorinated solvents. It would examine the history of use of the solvents and determine the alternatives that have been used to replace them. The project would evaluate the toxicity information for the chlorinated solvents to assess whether it is sufficient to call for a phaseout of the class of chemicals. It would also involve examining the toxicity and environmental impact information for the alternatives that have replaced the chlorinated solvents as they have been increasingly regulated. The project team would investigate the remaining uses of the solvents and determine what the alternatives are. In some cases, no alternatives have been identified and the project team would identify, develop, test and demonstrate alternatives with the industries still using them. The alternatives found for the remaining applications would be evaluated for their health and environmental characteristics, their performance and their cost. The results of the project would lay out an approach and methodology for phasing out use of the chlorinated solvents altogether. It would also describe the best methods for ensuring the alternatives that are adopted are safer. This same approach would be a template for considering and phasing out other chemical classes. It would establish a model for DTSC to adopt for the Green Chemistry initiative. The advantage of this approach--selecting a chemical class and working through it to find a methodology for dealing with problem chemicals and products--is that it is specific. There are so many chemicals and classes of chemicals that require attention that the approach to establishing a Green Chemistry is daunting. Working though this specific case will highlight decision points and complexities that will arise in a larger program with a broader focus under the Green Chemistry initiative.
F-GC-39	Educating the Chemists of Tomorrow: The Current State of Green Chemistry in Academia (POSTED 3X) As a chemist pursuing a PhD at UC Berkeley, I am particularly interested and excited by the current discussion of Green Chemistry going on in the California Legislature. Although I have heard the phrase “green chemistry” more frequently at academic talks recently, I am not convinced that the chemists on the ground have a clear picture of what green chemistry research looks like. The 12 principles put forth by Paul Anastas and John Warner are good guiding principles to evaluate chemical processes, and I would like to review what I perceive as the current status of these ideas within the context of a chemistry education. The principles that I do see being put into practice throughout the academic training of chemists are: Atom Economy, Reduce Derivatives, Catalysis, and Inherently Safer Chemistry for Accident Prevention. These principles are taught in undergraduate courses and practiced and discussed in undergraduate laboratories, preparing students who continue their education to practice these principles of synthetic design and chemical safety in their own research positions. I have seen a few other examples of these principles gaining traction at the graduate research level including: Less Hazardous Chemical Syntheses and Safer Solvents and Auxiliaries which are both motivated by chemists desire to reduce health and safety risks in the lab and also labs increasingly taking into account the design of synthetic methods for Energy Efficiency. I know of a limited number of labs around the country working on promoting the Use of Renewable Feedstocks, Designing Chemicals for Degradation, and Real-Time Analysis for Pollution Prevention. This is good news, for the prospects of incorporating green chemical design into industrial applications, but there is still room for improvement. Most

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	immediately work needs to be done to promote Waste Prevention as part of experimental design, and a serious effort needs to commence to encourage the education and research around the Design of Safer Chemicals. The basics of chemical toxicology are not taught at any point during the training of chemists not at the undergraduate level and not even offered in chemistry departments at the graduate level. This is not to say that chemists don't know how and when to work with dangerous chemicals, but this knowledge is gained through laboratory experience, and not formally taught. This also means that the design of new chemicals with important industrial applications rarely, if ever, takes into account the idea that chemical products should be designed to minimize their toxicity. Part of the reason for this knowledge gap is the complexity of biochemical interactions, and the current lack of easy to understand guiding principles to teach at an undergraduate level. This means that if we want to require safer products to be introduced to the market, we need to start by incorporating toxicology into the formal training of chemists, and also invest in toxicology research which could be of fundamental interest to chemists. All twelve of these guiding principles can be incorporated into chemistry research, but their assimilation into basic chemical knowledge is a hierarchical process. It starts at the research stage, where through targeted funding and positive press, new knowledge, procedures, and products are developed. Then, as the ideas become accepted and followed by the research community they will be adopted as part of the graduate level curriculum. Lastly as chemists come to believe that this is how chemistry has always been done it will be adopted as part of the core values/ideas that are taught to undergraduates in chemistry. Although this can be a lengthy process, research funding and legislative pressure on the chemical industry certainly has the power to accelerate the adoption of these ideas by the chemical community. The problem that is in dire need of funding and support is the incorporation of toxicology into the research and training regimen of chemistry students. Also in need of further support are those ideas which are still on the fringes of research and teaching including Use of Renewable Feedstocks Designing Chemicals for Degradation, Waste Prevention and Real-Time Analysis for Pollution Prevention. Industrial chemicals and chemical processes are increasingly a part of our daily life, and as we have seen in Europe the public is demanding higher standards. California has the intellectual resources to lead the way if the proper investments are made. Sincerely, Martin Mulvihill 5th Year Graduate Student John Arnold and Peidong Yang Labs Department of Chemistry UC Berkeley
F-GC-40	Bayer MaterialScience's Comments on California Green Chemistry Initiative At Bayer MaterialScience we share society's values of developing, producing and putting into the marketplace products that are both beneficial and safe for humans and the environment. We respect and support the objectives of Responsible Care® along with sustainable development as a commitment for management and as a responsibility shared by each employee. We at Bayer continue to address green chemistry objectives through innovation and product stewardship. Innovation is essential to driving green chemistry and sustainability in markets such as automotive, green building and alternative energy. Products and their uses are evaluated to help assure intended benefits to society while also protecting public health and the environment. We follow the American Chemistry Council's Responsible Care® program, with a management system that is certified by third-party auditors. We integrate knowledge of potential hazards of chemicals with an understanding of potential use and exposure in our risk management programs. We appreciate the California Green Chemistry Initiative's request for comments on the program and support an approach that addresses the following points:

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	• Look at the chemical information that is already available to California. • Make it clear that the Green Chemistry Initiative process will be governed by a risk-based science approach. • Support an understanding of both the benefits and the burdens of new regulatory proposals. • Consider process technology as part of a green chemistry program. Look at the chemical information that is already available to California: We believe that California should consider existing data and information already available to California and the public before making judgments on additional chemical specific data and information needs. There are existing programs such as the High Production Volume (HPV) Challenge Program and the Extended HPV Program, which have provided valuable toxicology and exposure information that is publicly available. Hazard information from such sources can be used in light of exposure scenarios to evaluate potential risk and ensure appropriate risk management. In addition, the information from the recent evaluation and categorization of chemicals on the Canadian Domestic Substance List (DSL), Canada, should be considered by California. Make it clear that the Green Chemistry Initiative process will be governed by science with a risk-based approach: We believe that the Green Chemistry Initiative must be based on sound science with a risk-based and weight-of-evidence based approach. Objective and reproducible scientific methodologies are the keystones upon which regulatory policy should be based. Everything can be toxic at some level; the key is to minimize potential risks (risk = hazard x exposure). The Green Chemistry Initiative should be based on the principles of risk. That is, minimizing the use of toxics in light of the exposure scenarios, along with considerations of efficiency and economics. Support an understanding of both the burdens and the benefits of new regulatory proposals: To most efficiently use resources, we believe that consideration should be given to existing chemical management systems. Many existing regulatory and voluntary programs promote innovation and advances in chemical technology, govern areas of product life-cyle, and also promote pollution prevention and research into the use of less hazardous substances. We believe that the Toxic Substance Control Act (TSCA) is a comprehensive chemical management statute. Criticisms of the TSCA to protect human health and the environment often overlook the real need for resources to properly administer the statute. Without the proper staffing and financial resources, any regulatory program will have limited effectiveness. Innovation is critical to green chemistry. Rather than imposing regulatory burdens, innovation through green chemistry can be promoted with positive incentives and partnerships. Green Chemistry should be encouraged through the sharing of expertise, financial support for research, information exchange, and public education. Incentives could be offered for companies to pursue and foster Green Chemistry and Green Engineering. Consider process technology as part of a green chemistry program: Green chemistry is an important consideration in efforts that lead to sustainable development, but it is only part of a potential solution. In a broader sense, green chemistry programs should include process technology considerations as alternative chemistry is being evaluated. This technology can have a significant impact on minimizing potential adverse health or environmental effects of a chemical substance. Process technology can reduce both human and environmental exposures to chemicals, for example, through enclosed systems, recycling of by-products, and controlling potential environmental releases. Use of these process technologies can eliminate the need for substitution of critical raw materials. In conclusion, we believe that a green chemistry initiative must be based on sound science, be risk-based, leverage validated existing health and environmental information, and consider engineering and processing technology. We feel that innovation and partnership with industry should be encouraged. Industry should be brought in as a critical stakeholder in this Initiative as it develops. On behalf of Bayer MaterialScience LLC

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F-GC-41	Comments on Green Chemistry from Rohm and Haas Company When assessing the safety of chemicals and products, the focus should not just be on the hazard of a chemical, but also on the likelihood of exposure or risk. Risk may be predicted as a function of how hazardous a substance is and the expected exposure to the substance. This approach relies on risk management, as well as hazard management. Hazard x Exposure = Risk It is important to determine the current level of safety expected by health or environmental end that is desired at the moment with the intent for continual improvement in safety over time. This is in recognition that there is no possibility of 100% safety for even very safe materials. Such an approach can be illustrated by a consideration of cancer as an end point where there is a tacit agreed societally that a level of safety around cancer equivalent to 10-5 to 10-6
F-GC-42	Comments from Rohm and Haas Company Green chemistry, by definition, is a chemical philosophy that encourages the development of products and processes that reduce or eliminate the use and generation of hazardous substances. Green chemistry not only encourages the development of new 'greener' products, but also may include the revision of existing products and processes for safety or an environmental gain. Market incentives would drive the development of Green Chemistry more successfully than a regulatory scheme. Rohm and Haas Company strives to create not only products that are useful and profitable, but also may provide an environmental benefit. The Rohm and Haas Company has committed to direct 50% of our Research and Development budget to sustainable, environmentally advanced technologies within the context of market incentives as a driver for Green Chemistry. Rohm and Haas Company has shown its commitment to Green Chemistry through the development of the following products: • The Aquaset™ product line is a pioneering technology platform made without formaldehyde or formaldehyde-generating materials for use in industrial nonwovens, including fiberglass webs for roofing, flooring, insulation, and filters. • SEA-NINE® 211N antifouling agent represents a significant ecological advance for marine paints because of its environmentally acceptable properties. It degrades rapidly in sea water and sediment, does not bioaccumulate in marine species, and is not a chronic or reproductive toxin. • The AVANSE™ product line is a high-performance, low VOC waterborne acrylic resin binder technology for use in Industrial Maintenance segments: primers, topcoats and direct to metal (DTMl) finishes.
F-GC-43	Green Chemistry Initiative Public Comments Fossil-fuel-based plastic use in our society continues to grow at an exponential rate, creating a plethora of environmental impacts for California, the oceans and, increasingly places like Lianjiao, China (see http://news.sky.com/skynews/video/videoplayer/0,,31200-greenbritain_china_p222,00.html). The State of California has one of the most impressive recycling mandates in the country but I am very concerned about where our recycling, especially our plastic, is going. Most consumers believe that their fossil-based plastic, once placed on the curbside for recycling has been taken care of in a way that renders any potential problems with plastic waste solved. Myself and my colleagues at Green Sangha have been working over the past 2.5 years educating the public regarding plastic waste issues including pollution in the ocean. The central Pacific Gyre contains a plastic waste mass that has been measured to be larger than the state of Texas. Because plastic does not biodegrade, plastic entering the oceans remain there unless it is deposited on a distant beach. Fossil fuel-based plastic has entered the marine food web at many trophic levels impacting countless marine species (birds, salps, marine mammals, etc…please see:

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	http://www.algalita.org/pelagic_plastic_mov.html) Small bits of plastic in the central Pacific Gyre outweighs zooplankton at a ratio of 6:1 (six pound of plastic for every pound of plankton!), according to research published by the Algalita Marine Foundation. Of greatest concern for my organization and me right now is what is happening to our plastic waste once it leaves the US shores not as litter but as commerce. At the link, http://news.sky.com/skynews/video/videoplayer/0,,31200-greenbritain_china_p222,00.html please find some news footage shot by Sky News in the UK. This news story highlights the situation that Californians don't know about and never see. It is the story of the dark side of plastic downcycling that all policy makers need to see, we believe. This short news piece is of great importance regarding plastic policy here in California. The plastic industry continues to repeat the mantra that plastic is fine; we must continue to use it but we need to do a better job recycling. I'd like the Green Chemistry Initiative to first acknowledge that fossil plastic is downcyclable not recyclable. And that most of our fossil plastic waste is being shipped overseas and being handled under conditions that are harming water, air, public health and the land surrounding so-called recycling facilities. In the video workers are exposed to mountains of unsanitary plastic waste. They melt it down and/or burn it; smoke and ash fills the air. Untreated polluted water runs into local streams turning them dark grey; they too are littered with plastic and ash. Workers are subjected to toxic fumes and heavy metals where PVC is downcycled without any idea that their work is dangerous…. Needless to say, there are no health or environmental standards in places such as Lianjiao, China. Our continued embrace of plastic needs to be looked at with a cradle-to-cradle perspective, which requires a close look at what is happening overseas. The Green Chemistry Initiative is for California, but for the initiative to have integrity in cannot be part of exporting waste that is causing great harm overseas. We in California need to develop closed-loop safe and just ways of handling our waste. The current model of exporting plastic to countries such as China needs to be stopped if California is serious about its Green Chemistry Initiative. Andy Peri Green Sangha Further information provided: a link to the short online version of the video described above and some articles regarding waste exports to China. on behalf of Andy Peri
F-GC-44	Harmonization of Regulations Chemicals, through the different steps from their production to their handling, transport use and final disposal, are at each of the aforementioned steps a potential danger for human health and the environment unless handled constantly with appropriate way . Persons of countries using many different procedures, regulations and terms of reference are daily confronted to chemical products (chemicals, pesticides, etc.) which may cause them and their environment some harm. Current Regulatory situations e.g. US TSCA, EU Risk Assessments, REACH, RoHS

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	and as witnessed by some individual states are potentially taking unilateral precautionary approach through incorporating legislations and bans on some chemical products in absence of scientific evidence or waiting for research findings with respect to such chemicals impact, or extent of impact or even level of risk if it is acceptable or not in the absence of alternatives. Examples are decaBDE and the proposed ban on TBBPA by Norway. In view of this reality, a harmonized set of regulations developed consistently around science-based research, standards for testing, classification, labeling certification and handling of various chemicals, a set that is widely understood and Internationally recognized within a common framework and under unified terms of reference is needed to ensure the safe use, transport and disposal of chemicals. Once countries have consistent and appropriate information on the chemicals they import or produce in their own countries, the infrastructure to control chemical exposures and protect people and the environment can be established and managed in a comprehensive manner. A new system, aimed at developing a single, globally harmonized system to address classification of chemicals, labels and safety data sheets etc, which is called "Globally Harmonized System of Classification and Labeling of Chemicals (GHS)", addresses classification of chemicals by types of hazard and proposes harmonized hazard communication elements, including labels and safety data sheets. It aims at ensuring that information on physical hazards and toxicity from chemicals be available in order to enhance the protection of human health and the environment during the handling, transport and use of these chemicals. The GHS also provides a basis for harmonization of rules and regulations on chemicals at national, regional and worldwide level, an important factor also for trade facilitation. Ahmad Khalifeh Managing Director Albemarle Middle East & General Manager of Jordan Bromine Comapny, both affilaites of Albemarle Corporation.
F-GC-45	WHY ARE WE DOING THIS? As we near the end of this first phase of California's Green Chemistry Initiative, we have accrued a broad range of options on how to assure a higher margin of safety in the use of chemical products. Looking forward to the challenge of integrating these into coherent programs, it is useful to revisit a

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	fundamental question: Why are we doing this? Certainly the enhancement of protection of the environment and human health is the major driver, but the real challenge of this process is to both protect and to enable. The science of chemistry (and its dramatically evolving interfaces with biology and physics) will be a key to delivering a more sustainable future not only in California and the rest of the developed world, but throughout a developing world poised at the threshold of advancing well-being. In a sense, the next phase of this Green Chemistry Initiative is taking on a challenge that was the focus of a 2005 conference of the US National Academy of Sciences "Sustainability in the Chemical Industry: Grand Challenges and Research Needs." Mike Wilson referenced the Report on these proceedings in his 2006 paper that has triggered so much of California's interest in Green Chemistry. I referenced it as well in my blog submission of last spring. It is worth revisiting, however, as we enter the stage where we must integrate options into a package that advances our interests in both a higher level of protection and in enabling advances toward sustainability (the Report is available at: http://www.nap.edu/catalog/11437.html). The Academy's Report focuses on the "protection" challenges. These include advancing our understanding of Toxicology, application of principles of Green and Sustainable Chemistry, and extending the use and sophistication of the Life Cycle Analysis integral to green chemistry. Importantly, this broad agenda of challenges for which the society is depending upon an agile and innovative chemical industry (and to which this California Initiative should contribute) also includes "enabling" chemistry's contribution to broad societal needs in: • Renewable Chemical Feedstocks • Renewable Fuels • Energy Intensity of Chemical Processing • Separation, Sequestration and Utilization of Carbon Dioxide • Sustainable Education Why are we doing this? We are not engaged in this process simply to "protect" – we must "enable" at the same time. The next phase of our effort will require more from us. That is why these are, indeed, our "Grand Challenges."
F-GC-46	Professor of Political Science, Rensselaer Polytechnic Institute In studying the green chemistry movement for the past decade from the perspective of political science, I have been impressed with both the technoscientific ingenuity and the political-economic naivete of most participants. The key issue is funding to replace outmoded plant and equipment. Worldwide detoxification of the industry will cost something on the order of $10 trillion, perhaps $500 billion in California alone. There is only one reliable source for such funding: an excise tax on chemical sales to create a Chemical Trust Fund analogous to the Highway Trust Fund paid for by gasoline purchasers. Create a large pool of funding and all else will follow; fail to do so, and chemical greening will continue to lag no matter how many deliberative processes and other talk-oriented activities well-meaning people engage in. In this respect, the chemists who implicitly or explicitly argue for sole reliance on voluntary action are actually a barrier to implementing the very green chemistry they are developing and advocating
F-GC-47	Green Chemistry and Beyond: Sustainability, Safety and Continual Improvement GREEN CHEMISTRY AND BEYOND: SUSTAINABILITY, SAFETY AND CONTINUAL IMPROVEMENT INTRODUCTION Earlier this year, California kicked off its Green Chemistry Initiative with the stated goal of taking a collaborative approach to significantly reduce the impact of toxic chemicals on public health and the environment. The Soap and Detergent Association provides the following comments on behalf of its members so that California may consider new ways to manage chemicals towards the continual improvement of public and environmental health. The Soap and Detergent Association (SDA) is the non-profit trade association representing manufacturers of household, industrial, and institutional cleaning products, their ingredients and finished packaging; oleochemical producers; and chemical distributors to the cleaning product industry

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	(http://www.cleaning101.com/). SDA members produce more than 90 percent of the cleaning products marketed in the U.S. SDA members strive to meet the commitments of a sustainable industry: 1) advancement of social well-being, 2) advancement of human health and environmental quality, and 3) economic growth. Cleaning products have been an integral part of the dramatic advancements in public health and longevity, and the decline of communicable diseases throughout the world over the past two centuries. SDA and its members have been at the forefront of research on the environmental and human-health safety of their products for the past 50 years, and a culture of innovation and continuous improvement among its members has resulted in a robust industry that is a leading contributor to the public health across the country. SUSTAINABILITY Social Sustainability SDA members are committed to contributing to a better quality of life for our consumers, business partners, employees and the communities in which we operate, and to maintaining a high level of product stewardship throughout the chain of commerce. As such, we believe that decisions of preferability and substitution should be based on the comparative life cycle impacts of a chemical and its potential substitute. While a safety-based characterization scheme may focus on toxicity, persistence and bioaccumulation, there are a number of other parameters which are relevant to the sustainable use of a particular chemical in a formulation such as raw material sourcing and carbon footprint. All relevant aspects of sustainability should be taken into consideration for a potential substitution decision. Similarly, any plan to consider substitution of chemicals should require that the efficacy and benefits of that compound be considered as any diminution of efficacy may negatively impact public health and well-being through reduced hygiene and sanitation. Environmental Sustainability Cleaning products are chemical formulations, and generally each ingredient in a formulation will have some measurable toxicity. However, the use of cleaning products generally is well understood, leading to sound characterizations of exposures and risks. SDA members are committed to the enhancement of human health and quality of life through the responsible formulation, production and sale of cleaning products and ingredients, and their proper use. SDA members only market products that have been shown to be safe for humans and the environment, through careful consideration of the potential health and environmental effects, exposures and releases that will be associated with their production, transportation, use and disposal. In determining the safety of cleaning products, toxicity of ingredients to humans and wildlife is studied. Economic Sustainability The cleaning products industry is an important component of this nation’s public health infrastructure and a contributor to the nation’s economic well being. As such, it is important that the Green Chemistry Initiative not compromise this industry. SDA members are committed to innovating to improve products both in terms of performance and environmental impact. The Green Chemistry Initiative must ensure that product efficacy, performance, and usability are not undermined, and that the ability to innovate is not compromised. In fact, California is uniquely well positioned to foster innovation in Green Chemistry and product formulation. With a strong educational system including world-class research university and a robust high technology sector, California has the means to lead the world in developing and commercializing alternatives to high priority chemicals of concern. The Green Chemistry Initiative should include a significant component related to research and development of alternatives for high priority chemicals which leverages California's intellectual resource. Through such efforts, California could facilitate the development and application of chemicals that will reduce negative impacts to the citizens of California. SUGGESTIONS FOR CALIFORNIA Confirming the Baseline Safety of Chemicals in Commerce In order to affect the impact of toxic chemicals on public health and the environment, the inherent hazards and potential for exposure should be integrated into a risk framework, and risks should be managed appropriately. Currently, there are several national and international programs designed to evaluate

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	and manage the risks of chemicals. California should leverage existing efforts and customize results to meet their needs. For example, in Canada, Environment Canada completed a prioritization exercise of 23,000 chemicals on their Domestic Substances List (DSL) in 2006. Using information from Canadian industry, academic research and other countries' data, Government of Canada scientists worked with partners in applying a set of rigorous tools to the 23,000 chemical substances on the DSL. They were categorized to identify those that were: inherently toxic to humans or to the environment and that might be persistent and/or bioaccumulative, and substances to which people might have greatest potential for exposure. From this exercise there were over 4,000 chemical substances identified as needing further attention, and about 19,000 (over 80% of the total) were set aside as not needing further action based on their hazard and exposure profiles. Among the chemicals needing further attention, 500 were high priority, 2600 were medium priority and 1200 were low priority, and most of the low priority chemicals were eliminated from consideration. Additionally, about 150 of the high priority chemicals were determined to not be used in Canada and were restricted from further use without an evaluation. In the end, Canada has moved forward to consider about 350 high priority chemicals and 2700 medium priority chemicals. California could focus on the 500 high priority substances identified in Canada's program. To address unique circumstances that might exist in California, the State could have a process to add substances to the high priority list, as necessary, based on hazards, uses and exposures to workers and consumers in California. Once the high priority chemicals are identified, use and exposure should be considered to determine whether there are impacts on human health and/or the environment. The State could work in coordination with other North American initiatives (e.g., Canadian Domestic Substances List prioritization, EPA and OECD High Production Volume Chemical programs, Security and Prosperity Partnership (SPP) of North America Regulatory Cooperation Framework) in order to assess the risks of the highest priority chemicals. In undertaking such programs, SDA urges the State to proceed with any chemical assessments in a manner that would avoid unnecessary animal testing. In cases where real impacts exist, risk management strategies should be implemented in order to reduce those impacts, including use-specific restrictions where there are unacceptable risks. Continual Improvement of the Safety Profile of Chemicals in Commerce California can continually improve the safety profile of chemicals in commerce in the State by focusing on the high and medium priority chemicals in use, and using Green Chemistry and other tools to facilitate informed substitution with chemicals having an improved safety and life cycle profile. There are a number of opportunities for California to apply its resources towards traditional Green Chemistry activities. California could leverage the universities in the State and the high-tech business sector towards the development of alternative chemicals for those of the highest priority, and development of alternative manufacturing processes for those with high discharges of hazardous waste. For alternatives identified, there should be a separate Life Cycle Assessment by an outside party, or state-funded Center for Excellence in order to confirm that there is no loss in performance with the alternative, to avoid unintended consequences, and to assist in commercialization. The State also could develop a Cooperative Extension-type program to assist companies in Cradle-to-Cradle product design/formulation and assist in adoption of new alternative chemistries and processes. In order to facilitate informed substitution of high priority substances towards those with a more favorable environmental and human health profile, the State could develop database of chemical alternatives that compares a number of sustainability parameters: performance, price, human health and environmental (e.g., toxicity, bioaccumulation, persistence) including carbon footprint and source sustainability. Additionally, the State could map the flow of chemicals in California using information drawn from existing sources such as EPA's Inventory Update Reporting (IUR), the data received by Canada during its data call-ins for high priority chemicals, and other contributions from the public. In order to assess the performance of these programs and measure the impact of these reforms, the State should monitor metrics that will assess releases of chemicals to the environment and exposure to humans. Increased Transparency and Access to Information on Chemicals in Commerce California could expand access to information on chemicals for consumers, businesses and regulators by leveraging its preeminence in data management and mining in order to organize the world's chemical data. For example, the dossiers for the EPA High Production Volume (HPV) Chemical Challenge

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	program, and the related European program are often difficult to find and the data difficult to extract. By partnering with the information technology sector (e.g., Internet search firms), the State could expand access to chemical information, support its local industry and raise awareness of chemical safety information currently available. Additionally, California could expand product-specific chemical ingredient disclosure for consumer products which currently do not have that requirement. To increase transparency and improve the management of chemicals in the workplace, California should adopt the 16-section Material Safety Data Sheet (MSDS) described by ANSI Standard Z400.1-2004. Recognition and Rewarding Success As California's Green Chemistry Initiative unfolds, it will be important to recognize efforts and reward successes. The State could establish a registry for companies seeking to align their business practices with the Green Chemistry principles and acknowledge their intent. Similarly, the registry could accumulate examples of product development decisions and substitutions that have resulted in reduced waste produced and energy inputs. The registry could be the basis for recognition of successes in reducing impacts from chemical exposures similar to the Presidential Green Chemistry Challenge Award, but focusing on results achieved through implementation of a program or application of a new chemistry rather than development of a new technology. SUMMARY California's Green Chemistry Initiative should emphasize all three components of sustainability: the social benefits of chemicals and products, the economic contributions through innovation and improved performance, and the environmental and human safety. California can confirm the baseline safety of chemicals through a prioritization based on hazard and exposure, assessment of risk, and management of risks including use-specific restrictions where necessary. California can drive innovation, the benefits of products and the continual improvement of the safety profile of chemicals by leveraging the State's expertise, and applying resources to the application of Green Chemistry research and development. California can expand access to information on chemicals in order to improve decision-making by taking advantage of their data management industries to organize the world's chemical data, and by increasing the disclosure of chemical ingredients in consumer products. Once California has implemented its Green Chemistry Initiative, it should recognize the efforts of those industries seeking to apply the principles of Green Chemistry and provide recognition to those that have had notable success.
F-GC-48	Director General of the Jordan Instituation for Standards and Metrology The Jordan Instituation For Standards and Metrology is pleased to make input to the discussions about California's Green Chemistry Initiative. The chemical industry is very important to Jordan. Jordan has considerable economic interest in the development of chemicals based on our natural phosphorus and bromine reserves. It is also recognized that it is necessary to address societal concerns over the safety and environmental impact of any given chemical. It is to be hoped that California can provide a lead in developing policies and regulations that provide an objective process for the evaluation of chemicals that will give confidence to the public that the chemicals in use are safe; and to industry that such chemicals have a sustainable future which allows for ordered economic development. In addition, the initiatives in line with SAICM could provide an important way forward, with emphasis on the management of chemical substances, through better knowledge and understanding.

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	To this end we would emphasize the need for policies and regulations based on solid scientific data that address the risks associated with the use of a given chemical in its applications."
F-GC-49	Green Chemistry Should Incorporate an Alternatives Assessment Decision-Making Process I encourage DTSC to incorporate the alternatives assessment decision-making process, which Mary O'Brien has written about in her book, "Making Better Environmental Decisions: An Alternative to Risk Assessment." It would help tremendously if DTSC initiated a serious consideration of Ms. O'Brien's suggested approach to environmental decision-making. Ms. O'Brien recommends (1) the consideration of a full range of options, (2) the consideration of the potential adverse effects of each option, (3) the consideration of the potential beneficial effects of each option, and (4) whenever the public might be affected, a genuine public process that provides the public a say in the outcome of the environmental decision. As opposed to relying upon risk assessments and risk management decisions, this approach (1) focuses us on identifying a range of sustainable actions, (2) allow us to identify options that minimize harm and maximize benefits, (3) allows all sectors of society to participate in decisions, not just risk assessors, (4) avoids the methodological problems associated with trying to perfect risk assessments, (5) encourages creativity, (6) holds those who pollute responsible for identifying better ways to proceed, (7) maximizes economic benefits for the general public, and (8) encourages forward-looking approaches and long-term solutions. November 14, 2007 | Joe Lyou As part of the critical alternatives assessment process, we must all be aware that current OSHA PELS permit workers to be exposed to toxics including carcinogens and developmental toxicants at levels much higher than allowed in the general environment. A Just Transitionto Green Chemistry should include closing this 'allowable exposure' gap and providing medical surveillance for exposed workers

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F-GC-50	AWFS Comments on the Green Chemistry Initiative The Association of Woodworking & Furnishings Suppliers® (AWFS®) is a California based trade association of manufacturers and distributors of machinery, hardware, lumber, upholstery materials, bedding components, wood products and other supplies to furnishings, cabinet and other wood product manufacturers. AWFS® appreciates the opportunity to comment on Governor Schwarzenegger's Green Chemistry Initiative. AWFS® members support science and risk-based chemical and product regulation. As manufacturers and suppliers to US-based wood product and furnishing businesses, AWFS® is concerned with government regulations that are not fairly or adequately enforced on consumer products or components from overseas. Two recently adopted sets of regulations serve as examples. The first is the new fire retardant regulations adopted by the California Bureau of Home Furnishings and Thermal Insulation (BFHTI) and the second is a recently adopted Air Toxics Control Measure for formaldehyde in composite wood products used in furniture by the California Air Resources Board (CARB). These regulations, in theory, are to be enforced at the manufacturer, distributor and retail level. BFHTI and CARB have the capability to inspect domestic manufacturers, however, neither have demonstrated the ability to enforce the rule against products coming from overseas either at the distribution or retail level. Domestic manufacturers are spending time and money to comply with the regulations. The added costs of compliance will affect every business in the supply chain, including wood processing companies, machinery companies, fabric and filling companies as well as manufacturers of finished goods. Domestically made products will meet the new standards at a higher cost, while there is no guarantee that imported products will meet the same standard and will be sold at a lower cost. The effect of both the FR regulation and the CARB regulation on AWFS member companies and the many companies located in California that utilize their products will be played out in the coming years. It is important that the California Environmental Protection Agency and its departments recognize that environmental regulations and rules be enforced equally between domestic and imported products and that provisions for doing so are built into the regulations rather than tacked on as an afterthought.
F-GC-51	Feedback - California Green Chemistry Initiative The following is feedback to the questions provided by the Department of Toxics Substances Control. After over 16 years of environmental engineering experience working for the Department of Defense (DOD), two tools have been identified that require coordination and work to fully implement. These tools are standardization of the LCA process as feasible covering most products and the Chemical Compliance Systems (CCS) quanlitative analysis database programmed with data to rank any chemical relatively to the universe of chemicals (quantitative analysis) and compare to the regulatory limits using the standardized environmental performance characteristic data provided by EPA and CAL EPA. With some work, these approaches would significantly improve the environment. At DOD and with those I interface with in the DOD and industry, it not a question of the intention to improve the environment and work "beyond compliance," but is a question of providing key data to the chain of industries moving product to market. This is now possible utilizing the CCS tool or similar applied to the LCA stages. Beyond the work, is a key to require manufacturers of chemicals, substances and products to provide both the hazardous chemicals in the Materials Safety Data Sheet (MSDS) and the nonhazardous chemicals so that a valid green rank score and comprehensive report may be provided via the web on-line automatically and real time. The report contains all the CALEPA and FED EPA environmental characteristics of concern with a normalized Environmental SCORE organized by the key areas ECOLOGY, HUMAN HEALTH and HUMAN SAFETY. Utilization of the IS0 14001 Environmental Management System (EMS) continual improvement for the environment of sustainability is an active process in DOD and city municipalities in whole or part that provides the management approach. Key is feedback to the manufacturers of chemicals, academia, industry, consumers etc so that the best choice for the environment may be made by all.

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	This will mitigate the predicted increase of toxic pollution in the environment by CAL BERKLEY (see www.ucop.edu/cpre) "Special Report" Green Chemistry in California despite all the effort. Beyond Compliance is normal standard practice by DOD and industry. The key is quality real time information feedback to make the best choices by all involved in the "Cradle to Cradle" process of manufacturing-construction-R&D. As a team much is possible. Playing this in parts and pieces is not efficient. Further comments on Cradle to Cradle, Green Chemistry and Toxics in Products by Design. on behalf of Ray Paulson, P.E. Fleet Readiness Center Southwest North Island
F-GC-52	The Green Chemistry Initiative Should Consider All Existing Programs That Regulate Toxicity, Risk Management and Reporting The importance of chemicals and our reliance upon them in our everyday lives has led to myriad programmatic requirements. Today, the chemical industry and industries that use chemicals in production or manufacturing are one of the most heavily regulated industries in the State. These programs take many forms, but can be grouped by those that focus on chemical toxicity, those that manage exposures and risk and those that require extensive reporting. These programs have had great success in reducing or eliminating environmental, occupational and public health risks. Originally passed in 1986 by California voters, Proposition 65 prohibited contamination of drinking water with chemicals known to the state to cause cancer or reproductive harm. Companies are also required to post public notices of any known potential exposure to a chemical known to the state to cause cancer or reproductive harm. This law has had a fundamental impact in the selection of input chemicals, reuse, recycling and other treatment of waste streams to remove chemicals covered by it to avoid any water discharge and reduce potential exposures. Since 1987, the California legislature, through AB 2588, has required stationary sources to report the use (both type and amount) of certain chemicals and to undertake a risk assessment of potential offsite risks posed by their use. In 1989, California enacted the Hazardous Waste Source Reduction and Management Review Act of 1989 (SB 14) in an effort to reduce the generation of hazardous waste and to also prevent the release into the environment of chemical contaminants. Since the enactment of SB 14 California companies have significantly reduced the generation of hazardous waste and eliminated the costs involved in managing those wastes. In addition to California specific reports, businesses are also required to file reports with various federal agencies. While sometimes similar to those filed with state agencies, more often than not these reports are separate and distinct, and sometimes duplicative, from what is filed with the State. Examples of these reports include the SARA 313 Toxic Release Inventory Determination Report and the Department of Homeland Security Chemical Facility Security. The following list categorizes some of the various federal and state chemical regulatory and reporting programs, offices and data repositories by their primary emphasis: Toxicity, Exposure and/or Risk. Note that several programs have overlapping jurisdictions, and there are also local programs with additional recordkeeping and reporting requirements. Each of these programs and individual requirements needs to be thoroughly understood and evaluated for significant gaps that need to be addressed to reduce a specific risk. This effort should be completed before any new program or data requirement can be assessed as part of this Initiative. Toxicity Toxics Substance Control Act Federal Insecticide, Fungicide and Rodenticide Act (FIFRA) Hazardous Material Release Reporting and Response Plans Hazard Communication (OSHA) Pesticide Contamination Prevention Act

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	National Institute for Occupational Safety and Health (NIOSH) CA DHS – Hazard Evaluation System and Information Service (HESIS) Office of Environmental Health Hazard Assessment (OEHHA) Consumer Product Safety Act Endangered Species Act - Biological Opinions and Jeopardy Assessments National Institutes of Health National Library of Medicine Databases Exposure Toxics Substance Control Act Pollution Prevention Act of 1990 Emergency Planning and Community Right to Know Act of 1986 Hazardous Materials Release Response Plans and Inventory Hazardous Material Release Reporting, Inventory and Response Plans Air Toxics “Hot Spots” Emissions and Assessment Office of Environmental Health Hazard Assessment Federal Insecticide, Fungicide and Rodenticide Act Hazard Communication Resource Conservation and Recovery Act National Institute for Occupational Safety and Health (NIOSH) Hazardous Waste Source Reduction and Management Review Act of 1989 (SB 14) Pesticide Contamination Prevention Act CA Hazardous Waste Management Regulations CA DHS – Hazard Evaluation System and Information Service (HESIS) Safe Drinking Water and Toxic Enforcement Act (Prop 65) Office of Environmental Health Hazard Assessment (OEHHA) Federal and State Clean Air Acts Clean Water Act Porter-Cologne Act Federal Safe Drinking Water Act Comprehensive Environmental Response Compensation and Liability Act (CERCLA) Food, Drug and Cosmetics Act Federal and State OSHA’s – Worker Safety Standards Site Mitigation and Brownfields Reuse Program Database Unidocs Hazardous Materials Online Inventory Project OSHA Integrated Management and Information System CDC National Occupational Exposure Survey Endangered Species Act – Biological Opinions and Jeopardy Assessments National Environmental Policy Act

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	California Environmental Quality Act National Institutes of Health National Library of Medicine Databases Risk Identification and Management Toxics Substances Control Act Pollution Prevention Act of 1990 Emergency Planning and Community Right-to-Know Act of 1986 Air Toxic “Hot Spots” Emissions and Assessment Federal Insecticide, Fungicide and Rodenticide Act Pesticide Contamination Prevention Act Hazardous Materials Release Response Plans and Inventory Hazardous Material Release Reporting, Inventory, and response Plans Hazardous Communication Resource Conservation and Recovery Act (RCRA) Hazardous Waste Source Reduction and Management Review Act of 1989 (SB 14) Nat’l Institute for Occupational Safety and Health (NIOSH) CA DHS – Hazard Evaluation System and Information Service (HESIS) Office of Environmental Health Hazard Assessment (OEHHA) Safe Drinking Water and Toxic Enforcement Act (Prop 65) Federal and State Clean Air Acts Clean Water Act Porter-Cologne Act Federal Safe Drinking Water Act Comprehensive Environmental Response Compensation and Liability Act (CERCLA) Food, Drug and Cosmetics Act Federal and State OSHA’s – Worker Safety Standards Site Mitigation and Brownfields Reuse Program Database Unidocs Hazardous Materials Online Inventory Project OSHA Integrated Management and Information System CDC National Occupational Exposure Survey Endangered Species Act – Biological Opinions and Jeopardy Assessments National Environmental Policy Act California Environmental Quality Act National Institutes of Health National Library of Medicine Databases As each of these specific program elements and specific data requirements is evaluated for purpose and benefit, a shorter list can be compiled of specific program elements that should be examined more closely. Additionally, gaps in programs that could lead to exposures that could give rise to unacceptable levels of risk should also be noted. The objective of this review is to focus further efforts on those topics where risks are not now managed at an

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	acceptable level. CCEEB believes that this can be an effective exercise if its focus is on the identification of programs that are not working effectively to achieve their original purpose or to identify gaps in program and data coverage. CCEEB urges the Agency to avoid suggesting the collection of data for data sake and to avoid recommending new programs that may be in place elsewhere that are not reflective of California's already robust regulatory program.
F-GC-53	Making the California Green Chemistry Initiative Workable The California Green Chemistry Initiative (GCI) is an innovative mechanism with the potential to influence the design of products in ways that reduce the use of harmful chemicals and generate less waste and pollution. The objective to create partnerships between industry, the public, and government agencies to bring about this change represents an interesting social experiment. The success of such partnerships will surely rest upon the ability to simultaneously meet the competing needs of all stakeholders. Chemical Compliance Systems, Inc. (CCS) believes we have unique resources that can effectively assist California result in successfully establishing GCI partnerships. CCS has compiled the largest and most accurate relational hazardous chemical/product and regulatory databases in the world over the past 22 years. These unique databases have been derived from over 1,000 sources and are currently comprised of approximately 75,000,000 data elements for 210,000 chemicals, 350,000 products and munitions, and 650 local, state, federal, international and nongovernmental organization regulations. These databases are maintained current, expanded on a daily basis, and are constructed to facilitate utilization of discrete elements in a wide spectrum of analytical compliance systems. CCS has currently developed 13 nonmunition and 10 munition Web-based analytical compliance software modules that utilize different elements from these databases and could immediately be implemented, or easily be customized, to support GCI requirements/needs. In addition, CCS has developed eight detailed concepts that will apply to more broadly defined GCI considerations. CCS has been working to "green" products and the environment for nearly 10 years. We currently have four separate, but equivalent, Web-based "green" analytical compliance systems for chemicals, products, processes and munitions. Each of these four modules utilizes the same 43 specific ecological, health and safety criteria to quantitatively evaluate the "greenness" of a chemical, product, process (including wastestreams), or munition. Each of these systems also includes alternative product/process constituent chemical data tables to facilitate the selection of a less harmful ingredient. In combination, the "green" product/munition and process modules provide a complete life cycle (i.e., "cradle to cradle") analytical capability. Each has product design and evaluation capabilities that enable chemists/engineers to design "greener" products/processes upfront, and acquisition, regulatory and ecological/health/safety professionals to assess, or compare, the "greenness" of the overall product/process (wastestream) to the level of detail they require. Each of these modules also simultaneously identifies the regulatory impact of the overall product/process, parts or components, or individual constituents. These tools will enable California regulatory agencies to partner with industry and the public to establish objective and quantitative "green" standards, or performance measures, for products and processes that can be incrementally increased over time and apply fairly to both small and large companies. The utilization of harmful chemicals will be reduced and less waste and pollution will be generated. The "green" standard will be a known, level playing field for industry, and the result will be greater protection for workers, the public, and for the environment. These "green" capabilities have also been incorporated into a Web-based Chemicals of Concern module that can quantitatively rank the concerns for a chemical/product inventory at a facility, thereby focusing alternative chemical acquisition, or research, on the worst offenders first, effectively accelerating pollution prevention. CCS regulatory compliance capabilities draw upon our List of Lists data that currently includes 650 state, federal, international, and nongovernmental organization lists and associated data. Our Web-based compliance capabilities are available as standalone modules, or incorporated into other analytical

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	tools (as described above). Compliance assessments can be applied to facility inventories, products/processes, waste classification, and/or CERCLA/RCRA site remediation. CCS is scheduled to develop a new, Web-based Health Risk Assessment module for the U.S. Army that will utilize our existing, Web-based Conceptual Site Model, and simplify RCRA Subpart X and CAA Title V Permit applications. Finally, CCS has conceptualized a Chemical Homeland Security System (C-HoSS) that will utilize existing facility chemical/product inventories to quantitatively rank resident chemical hazards, security risks and mortality risks by location at the facility. These three reports quickly prioritize inventory concerns. Entry of container accessibility constraints (i.e., storage conditions that control access) for chemicals of greatest concern enables C-HoSS to rank container vulnerabilities and identify accessibility requirements to nullify all vulnerabilities. C-HoSS concern levels are made proportional to the Homeland Security Advisory System daily risk levels. C-HoSS addresses all four levels in an effective security program (i.e., vulnerability assessment, corrective strategy, third party verification, and management system incorporation). C-HoSS will be a good tool for effectively eliminating terroristic chemical vulnerabilities at a facility. In addition, C-HoSS could have direct utility for preparation of California permit-required Security and Emergency Response Plans. Implementation of C-HoSS across the entire State of California can be accomplished “free,” utilizing a state grant for “equipment” from the Department of Homeland Security. CCS hereby offers to provide a remote demonstration of our existing Web-based capabilities and detailed concepts, at no charge, to any parties interested in their potential utilization in support of the California GCI, to achieve corporate “green” objectives, or to utilize in “green” product acquisition.
F-GC-54	Measuring the Greeness of Products My name is George Kopcsak. I am the former Deputy for Munitions in the Office of the Secretary of Defense. During that time efforts were initiated to accelerate the demilitarization (DEMIL) of approximately 1 million tons of old, outdated, unstable and/or incompatible munitions in our nation’s stockpile. Initially this was accomplished through open burn and open detonation techniques. More recently there has been much focus on more environmentally friendly means to destroy munitions or to recycle the components. Some of this work is done within the state of California. Within the past decade a small business organization, Chemical Compliance Systems (CCS), has developed a metric to determine the environmental impact when differing DEMIL techniques are utilized. This metric is called the Green Munitions Analytical Compliance System (G-MACS) and was sponsored and initially funded by the US Army. I’m happy to say that this tool now exists on the web. Since this tool evaluates the ecological, health and safety risks associated with munitions by breaking each down to the chemical level I have learned that the tool can also be used by munitions designers and producers to evaluate the environmental impact of specific chemicals used to make the devices. The designer now has a tool to change specific components within a munition design and determine its positive impact on the “Greeness” of the design. The idea can now be carried forward to look at designing munitions to ease the environmental impact of its anticipated DEMIL 20 years down the road. Since CCS has focused on munitions at the chemical level they have been able to broaden their “compliance system” tools looking at any and all products being designed, produced, or destroyed as long as the chemical composition is known. This looks like a good fit with the California Green Chemistry Initiative. I believe that you should seriously consider its use. As a final note, the web-based CCS tools (G-MACS, GP-CAS, and G-MACS) appear to have the capacity to look at chemical compatibility issues related to their close proximity with a product design. This may well become important when one considers the environmental impact of munition/product aging or temperature cycling. Please give these tools a look.

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F-GC-55	Dow Chemical's Comments on Chemical Management Systems The Dow Chemical Company (Dow) appreciates the opportunity to provide additional comments on a recent discussion initiated by the California Environmental Protection Agency on chemicals management policy. As a company providing products and services in over 175 countries, we comply with a broad range of chemical management policies and programs. Dow supports a consistent, coordinated regulatory environment for products at global, national and regional levels to complement industry voluntary efforts and to ensure a level playing field. Where new regulations are required, they should be based on established scientific risk assessment and risk management principles – predictable, flexible and capable of responsibly addressing society's economic, environmental and safety requirements. We recognize that regulatory systems will inevitably vary by country since they must work effectively within the broader statutory and regulatory framework for each country. Nevertheless, we generally support broad regional programs that provide the greatest consistency and uniformity for the industry as a whole. As a result, Dow is not an advocate for any particular program. Instead, we have developed a set of principles for effective chemical management programs. As governments select specific legislative or regulatory approaches to product safety or chemical control policies, we believe that certain principles should be adhered to, and we present them below. on behalf of Dow Chemical Company
F-GC-56	BSEF's Chemical Policy Recommendations The Bromine Science and Environmental Forum (BSEF) is pleased to offer the following recommendations to the California Department of Toxic Substances Control (DTSC) for your consideration in developing and implementing the Cal-EPA Green Chemistry Initiative. Summary: The guiding principle for this proposal is that it relies on successful management of chemicals already in the marketplace according to their characteristics and actual uses, rather than simply banning substances. This focus recognizes the important difference between risk and hazard, i.e., that hazardous substances properly managed may not pose actual risks, and would create a system that is based on successful management of indentified risks, as opposed to establishing prohibitions based on potential hazard. on behalf of the Bromine Science and Environmental Forum (BSEF)
F-GC-57	HIGHWAY MARKING PRODUCTS FROM CHINA: TOXICS IN PRODUCTS BY DESIGN Eureka! This term was used in the great Californian gold rush of 1849 and it has been shouted for the last several years in the boardrooms all across Corporate America. However, this time the rush is not to California but rather to China. A business can go to China, provide product specifications, and have the product produced and back in the US at much less expense than it would be to produce the product in the US. Why wouldn't a business do this? If you are with a publicly-traded company, you have to demonstrate quarterly that you are continuing to build shareholder value. So – Eureka! In order to build shareholder value, off to the Chinese gold rush we go. It sounded so good – much like it did to those who flocked to California in search of gold. So we did "go west young man, go west." More accurately, today we'll "go east young business executive, far east." In droves businesses have turned to China to stay competitive. In fact, it is very hard to find products that do not carry a "Made in China" label. Is there anything wrong with that? In the last few years, the ugly side of decisions to produce in China have been in the news. Widely communicated are Fisher Price and lead in toys for children, antifreeze in toothpaste and poison in pet foods. Almost daily there is a revelation that something from China is not exactly right and represents a risk to our health, children and/or well being. One issue revolving around a dangerous product from China has gone largely unnoticed. In the US and in a substantial part of the developed world, small glass beads are placed on highway markings to allow reflection of headlights (or any light) so you can see clearly when driving at night. Glass beads are a critical part of highway safety.

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	Recently, as evidenced by this website, California embraced the “Green Chemistry Initiative”. This initiative is an appropriate evolution of America’s environmental movement. It combines the realization that chemistry is necessary to perpetuate our culture with the challenge that as we use specific substances, we must do so in the safest manner possible. Should the Government demand safe products on behalf of the public trust? Absolutely! So let’s turn back to glass beads placed on our highways as a way of making it possible to drive safely at night. Last year in California, more than 10 million pounds of glass beads were applied to highway markings. On a very positive note, the entire US glass beads industry uses recycled flat glass as a feed stock for this product. In fact, the US recycles approximately 1 billion pounds of waste industrial glass every year for use in glass beads. This is truly a success for the environmental movement! Like other American products, glass beads are now coming from China. Like the other products in the news, Chinese-produced glass beads used on our highways contain significant levels of lead and arsenic. Arsenic is a known human carcinogen and a poison, and lead was identified as unsafe decades ago in the US. Glass beads produced in the US do not contain dangerous levels of lead and arsenic primarily because of the good work of the EPA and OSHA over the last 3 decades. Unfortunately, there appear to be no regulatory bodies pushing the Chinese glass-making industry past the need to use arsenic and lead when making glass. So there you have it they use it and we don’t. Much like the wooden match industry in Europe, which was shutdown in about a year by cheap imports from China, if the Chinese take over the glass beads highway markings market causing the elimination of the glass beads industry in the US, what happens? This is an appropriate question because it is so much cheaper to produce the glass beads in China – no pollution controls, no workers compensation issues, no worker safety issues, no controls on poisons, etc. A couple of things happen if the Chinese dominate the glass-bead industry – things that are not desirable for California or the US. As previously mentioned, the US glass-beads industry is a recycling industry. More than 1 billion pounds of industrial waste flat-glass is recycled into glass beads for use on our highways each year. Last year, more than 12 million pounds (of the approximately 1 billion pounds) of waste flat glass was recycled from California alone. Should the US glass-bead industry go away, those 1 billion pounds of waste glass will end up in our US landfills. Further, if Chinese beads totally replace US-produced glass beads, recent sampling of Chinese glass beads suggests that 6 million pounds of arsenic and 3.4 million pounds of lead will be placed on our highways each year. The flood of imports from China has the potential to close a recycling-based industry, shorten our landfills’ life spans significantly, and place materials known to be toxic to humans on our highways all because these imports are cheaper! How is this “green chemistry”? The threat is real and it is here – the lowest bidder for the next two years to supply glass beads to CalTrans is a distributor of Chinese beads! If we are going to promote green chemistry, then let’s do it! A glass-bead product for highway markings from China is available and for a cheaper price, but you also could get significant levels of lead and arsenic in the product as a result. Another glass-bead product is domestically produced and does not contain dangerous levels of these heavy metals. The decision is easy. Sincerely, Ufuk Senturk, PhD Research and Development Manager

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F-GC-58	the crux of the matter lies in the fact that once out of the bag, "near slavery" will win every time....because its cheaper....with no control mechanism in place to regulate greed, the problem will only get worse....don't blame china, blame our corprate laws that even allow for consideration of the purchase of such items...drug dealers don't have a job unless there are junkies to buy the "stuff"....once one company is allowed to outsource jobs, buy cheap forien goods, etc. the others will want to do the same so as to stay competitive....this ofcourse is the begining of the end...it is not sustainable....and it has already been allowed to happen...if not promoted...the glass beads are just one of the many products that will be allowed to destroy one more sector of american production and jobs, and ofcourse allow dangerous chemicals in as well...at no other time in history has greed, apathy,stupidity and lazyness converged in such a manner...people like to think happy thoughts...but they like their cheap goods better.
F-GC-59	Green chemistry is not regulation Green Chemistry is not regulation. It is innovation. It is continuous improvement by invention. It is more efficient, better working, higher value, less environmental impact. A set of Green Chemistry Principles already exists. California can further what is already accepted as green chemistry by removing barriers to innovation, funding green chemistry research and integrating green chemistry education into university chemistry curriculums. The state can't legislate creativity, but it can encourage it and become the cradle of practical green chemistry.
F-GC-60	Automated, Web-Based Assessment of "Green" Chemicals, Products and Processes for Procurement Rutgers University purchases thousands of chemicals and products for use in hundreds of buildings throughout our three campuses. We have implemented comprehensive acquisition processes to assure that the products we purchase are manufactured and distributed in compliance with all applicable laws and Rutgers standards. In the past six months, I have become aware of the Web-based "Green" Product Compliance Analytical System (GP-CAS) and the "Green" Process Analytical Compliance System (G-PACS) developed by Chemical Compliance Systems, Inc. (CCS). These two, quantitative, Web-based systems have been incorporated into a third party cleaning product certification program by the Chlorine Free Products Association (CFPA). Together, GP-CAS and G-PACS evaluate the entire life cycle of a product. Rutgers University is currently in discussions with CFPA and CCS about the possibility of incorporating these capabilities into our chemical and product acquisition processes. California may find these existing Web-based capabilities applicable to the objectives of your Green Chemistry Initiative. They certainly have the potential to achieve a voluntary product certification program that could increase the application of available chemical hazard information in a way that reduces labor and cost requirements for both the State and industry, while increasing the protection of the public and the environment.
F-GC-61	Public Participation in GCI Science Advisory Panel meetings Re: Public Participation at Green Chemistry Initiative Science Advisory Panel meetings As a member of the NGO community tracking the development of the Green Chemistry Initiative (GCI), we have recently learned of the debate within the GCI Science Advisory Panel (SAP) about whether the SAP meetings should be open to the public. I will confess to you I was somewhat shocked to hear that this was even a topic for discussion. The success of the GCI will depend on many things, but one of the most crucial in our view is a transparent and open process that fully involves all stakeholders. Indeed, the GCI has been consistent in its messages to date welcoming input from all quarters. Why would you now propose to meet behind closed doors? If you hope to build a robust network of supporters for the GCI, which we believe is critical, then conducting open meetings of the SAP with opportunities for public input and comment is an essential building block. I am convinced that the great majority of public interest organizations, not to mention the pubic itself, feels the same way. We are concerned that without a strong commitment to an open meeting process that welcomes participation from all, the GCI will severely damage its credibility and undermine its chances for success before it makes a single proposal about green chemistry. We have already submitted comments about the GCI as a signatory to the letter from Californians for a Healthy and Green Economy (CHANGE). Founded n 1976, Commonweal is a nonprofit health and environmental research institute in Bolinas, California.

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	Yours truly, Davis Baltz Commonweal dbaltz@igc.org 510 848-2714
F-GC-62	Dow Chemical's Comments on Educational Programs The Dow Chemical Company (Dow) is pleased to provide the attached paper on the role educational programs could play in California's Green Chemistry Initiative (GCI). We have appreciated the open, collaborative environment utilized for this process and have taken advantage of opportunities to participate in a variety of ways. Attached is a brief paper on educational programs where Dow has been engaged with the objective of improving science education and understanding of sustainability. This is intended to catalyze DTSC's thinking about the role education can play and the types of programs to consider. Dow believes that education must play a key role in California's Green Chemistry Initiative for the effort to reach its full potential. on behalf of the Dow Chemical Company
F-GC-63	Thoughts on a Framework for Green Chemistry The Consumer Specialty Products Association's California Green Chemistry Principles Belief Statement: CSPA members are committed to manufacturing and marketing safe products which are protective of human health and the environment while providing essential benefits to consumers. Background: • CSPA member products improve the quality of human life and are necessary to protect the public health against dangerous diseases, infestation, and unsanitary conditions. • CSPA members are committed to providing products that are thoroughly evaluated for human and environmental safety and go through rigorous safety-based assessments before they are brought to market. • CSPA members are committed to clear and meaningful labeling on consumer products, i.e., label instructions are written to ensure that consumers use products in accordance with label instructions. • CSPA members are committed to the development of green products that are safe for human health and the environment. CSPA members routinely apply green chemistry and green engineering principles in their operations and have been honored with awards for their efforts. • The consumer products industry develops products that meet or exceed safety requirements of all state and federal agencies in the United States and Canada charged with regulating those products, including the California Department of Pesticide Regulation, the California Air resources Board, and other state agencies, U.S. Consumer Product Safety Commission (CPSC), the U.S. Environmental Protection Agency (EPA), the Occupational Safety and Health Administration (OSHA), the U.S. Food and Drug Administration (FDA), Health Canada, and Environment Canada. CSPA Supports:

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	1. CSPA supports initiatives that continue to foster innovation and encourage universities, educational institutions, and industry to partner in developing effective “greener” ingredients that reduce environmental impact. 2. CSPA supports company performed safety-based assessments of consumer products prior to the marketing of a product, that take into consideration all of the phases of a product’s life-cycle. 3. CSPA supports a chemicals management program based on sound scientific risk assessment to protect human health and the environment. 4. CSPA supports appropriate use-restrictions for chemical ingredients when scientific safety-based assessments indicate that they cannot be used safely in a consumer product or use application. 5. CSPA supports initiatives among companies, government, and interested parties to promote consumer awareness of the importance of reading and following label instructions for safe product use, storage, and disposal. 6. CSPA supports collaborative efforts to encourage public and private partnerships with the goal of developing “greener” products and “environmentally responsible” ingredients rather than mandatory and voluntary state labeling programs that endorse green products or programs that stipulate a single third-party certification of green products. 7. CSPA supports initiatives that provide incentives for companies that innovate and develop technologically and commercially feasible products using green chemistry. 8. CSPA supports research that identifies opportunities for the use of green chemistry in consumer products and also supports policies designed to overcome barriers to commercial application of green chemistry research and development efforts. 9. CSPA supports recognition for companies that develop sustainable business operations, processes, and/or products. Essential Green Chemistry Program Principles: 1. Green chemistry should ensure the safety of consumer products through the use of sound science in the decision-making process. 2. A green chemistry program should be designed with guidance from all stakeholder interests. 3. A green chemistry program should be designed to promote products which are technologically and commercially feasible to produce. 4. Green chemistry must foster innovation and not limit the development of new chemistry technologies. 5. A green chemistry program must ensure that product efficacy, performance, and usability are not compromised or undermined. 6. A green chemistry program should build on existing statutory and regulatory structures, voluntary initiatives, and data development efforts.
F-GC-64	Stimulating Green Chemistry “Green Chemistry” is an intellectual framework that aligns technology innovation with improvements in the health and environmental “footprint” of materials used in our society. It requires inter-disciplinary collaboration among a variety of experts in chemistry, toxicology, and environmental science that work in business, government, and academia. Government cannot, and should not, dictate by statute or regulation precisely how this process for innovation and collaboration should occur. Importantly, a “Green Chemistry” program, in and of itself, should not be picking “winning” or “losing” products. Instead, it should be removing barriers and creating objective tools to allow companies to create new products and enable consumers to recognize and choose them. According to a March 28, 2002, publication of the Organisation for Economic Co-operation and Development (OECD) (of which the United States is a member) entitled, “Need for Research and Development Programmes in Sustainable Chemistry” (available at http://www.oecd.org/dataoecd/9/55/2079870.pdf), “For government, sustainable chemistry is a non-regulatory way of making regulations work more effectively.” OECD at 15. Member companies of the American Chemistry Council (ACC) are leaders in Green Chemistry and Green Engineering in their operations and have been honored for their efforts (e.g., see http://www.epa.gov/greenchemistry/pubs/pgcc/past.html for a list of EPA Presidential Green Chemistry Challenge

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	winners). Our members view both the American Chemical Society's (ACS) Green Chemistry Principles and the ACS Green Engineering Principles as useful approaches to resource efficiency, pollution prevention, and safety. These principles, however, were never intended to be applied as government mandates. In fact, prominently displayed on the home page of the Green Chemistry Institute is the statement: Green Chemistry differs from previous approaches to many environmental issues. Rather than using regulatory restrictions, it unleashes the creativity and innovation of our scientists and engineers in designing and discovering the next generation of chemicals and materials so that they provide increased performance and increased value while meeting all goals to protect and enhance human health and the environment. So, how can California encourage Green Chemistry rather than attempt to mandate it? Several actions may be taken to stimulate Green Chemistry in California and the United States broadly. For example, government can and should provide encouragement for Green Chemistry collaborations through the sharing of expertise, financial support for research, information exchange, and public education. In fact, a variety of federal agencies (including EPA and DOE), companies, professional associations such ACS, Non-Governmental Organizations (NGO), and universities are already working together to encourage Green Chemistry strategies. Additionally, government should consider offering incentives for companies to pursue and foster Green Chemistry and Green Engineering to help ensure these products/technologies can become economically viable and gain initial access to a competitive marketplace. These incentives might include tax incentives, low interest loans, awards, and marketing exposure. I. Education and Research/Development Industry is always working to drive down production costs. For specialties and fine chemicals, the synthetic chemists working in developing these materials have to know how to ask the Green Chemistry questions. This stands squarely in the realm of science education, especially in schools of chemistry. Not only do chemists and others involved in chemistry need to understand toxicology, but they also need to better understand the interaction between health and environmental protection, toxicology, and price. It is therefore essential that California support education in the methods and principles of Green Chemistry for all its state colleges and universities (and in its high schools and vocational schools, as appropriate). Anywhere that chemistry is taught, toxicology and Green Chemistry should also be taught. Additionally, California should encourage innovative research in Green Chemistry and Green Engineering. Research funding into new Green Chemistry methods is always welcomed by colleges, universities, and others, and should be an important part of any Green Chemistry program. According to the OECD (again referring to their March 2002 publication): Governments can promote sustainable chemistry R&D…by establish[ing] and fund[ing] programmes on sustainable chemistry R&D. … In addition, parts of industrial programmes are often supported by government funds. Governments, in general, can provide funds for basic and pre-competitive research. …Practically, governments can orient sustainable chemistry R&D programmes by adjusting the distribution of funds for fundamental and applied research or by commanding competitive and targeted funds depending on policies. OECD at 15. II. Incentives To further stimulate Green Chemistry and Green Engineering, California should consider the following incentives: (1) awards like EPA's Green Chemistry Challenge (see http://www.epa.gov/greenchemistry/pubs/pgcc/presgcc.html for more information); (2) tax incentives/subsidies/grants/low interest loans for research and development; and (3) marketing exposure for Green Chemistry processes and products. For example, when California purchases chemicals for state contracts, it could decide to pay a modest premium for a set period of time for new "green materials" that show promise. The goal of this subsidy would be to help a new material achieve greater economies of scale, but avoid locking in an inefficient permanent subsidy. California could additionally make capital available to companies at preferential terms, whether via grant or lower interest

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	loans, to encourage Green Chemistry and Green Engineering manufacturing process development. And California could also consider a marketing program (perhaps akin to the “California cows” and dairy ads currently on television) whereby the state would promote companies that are actively engaged in Green Chemistry and Green Engineering, and products that are the result of Green Chemistry and Green Engineering. The OECD suggests: [G]overnments can facilitate the consideration and application of sustainable chemistry R&D by supporting efforts which aim at educating and informing industry and the general public of the importance and benefits of sustainable chemistry. One possible role for government would be to identify incentives and disincentives for the promotion of sustainable chemistry and to use this information to modify or develop their policies accordingly. When appropriate, the use of incentives, such as a reduction in taxes or the use of subsidies, can be an effective way of supporting R&D by academia and industry in the field of sustainable chemistry. … It is essential that any sustainable chemistry technology or product be competitive in the marketplace, at least in the long term. However, some of those technologies, even if they are beneficial in the long term, will not be able to survive economically without incentives. Economic incentives, such as subsidies or tax reductions, could be effective in these cases. OECD at 15 and 17.
F-GC-65	A Modern Chemicals Policy For California CALIFORNIA MEDICAL ASSOCIATION A MODERN CHEMICALS POLICY FOR CALIFORNIA (2007) Introduced by: San Francisco Delegation Whereas, the state, national, and global scale of industrial chemical production is immense and is expected to grow four-fold by 2050, and the chemical industry is an important industry with wide contributions to health and human development; and Whereas, ever-expanding research confirms that many chemicals that are useful to society are also known to be hazardous to human biology and health, particularly in utero and in developing children; and Whereas, for new and existing medications, the Food and Drug Administration has long required pre-approval evaluation of safety as well as efficacy, and many industrial chemicals with known impacts on human biology are present in human bodies at levels similar to active doses of medications; and Whereas, numerous other nations including Canada and the European Union are adopting more proactive health-oriented chemicals policies, based upon scientific knowledge, assessment, and accepted public health principles; and Whereas, there are long-standing deficiencies in the federal regulation of industrial chemicals, most notably in the Toxic Substances Control Act (TSCA), as confirmed by the National Academy of Sciences and others, and the University of California documented in a 2006 report to the California Legislature that TSCA's deficiencies are important and can be remedied; and Whereas, these problems include the projected appearance of 600 new hazardous waste sites each month in the U.S. over the next 25 years; the appearance of hundreds of industrial chemicals in human tissues and fluids, including those of infants; and the development of chronic diseases caused by chemical exposures on the job among 23,000 California workers each year; and Whereas, the American Public Health Association's leadership has recently endorsed a policy titled "Calling on the U.S. Congress to restructure the Toxic Substances Control Act and implement a modern, comprehensive chemicals policy", to be considered for adoption at the annual APHA meeting in November; Therefore, be it Resolved: That the CMA calls upon the State of California and United States to implement a modern, comprehensive chemicals policy in line

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	with current scientific knowledge on human health, and which requires a full evaluation of the health impacts of both newly developed and existing industrial chemicals now in use; And be it further RESOLVED: That this matter be referred for national action (AMA). REFERENCES: http://www.healthandenvironment.org/science/papers on behalf of the California Medical Association
F-GC-66	Check out This Tool that Will Work!!! Last week I attended the Western Regional Pollution Prevention conference in San Diego and had a chance to see a demo of a software tool that would be incredibly effective in addressing some of the concerns here. In fact I understate my excitement because it is so eye-popping to see to see the software in action, I can only hope to do it justice here. The software is very sophisticated but unlike other solutions I've seen, this one is actually very user friendly. It is the first real tool I've seen that can be used by industry experts, academia and the general public. Wow, let me say that again…the general public can actually use this tool it is that user friendly. The implications for Compliance Managers, Risk Assessment Departments and Purchasing agents are enormous. In addition to these individuals who must regularly make decisions that affect their organization, colleagues, and communities, there are also many in the medical profession, biotech, agriculture, ecologists and yes even economists (!) can plug in use this tool to get the results they need. Those of us posting here can dig into the inner workings of the software, because behind the easy-to-use interface is a complex, meticulous database that has been so well tested and refined that it is virtually bulletproof with respect to passing peer-based reviews. Dr. George Thompson has spent 25 years creating a chemical database of 75 million data elements for more than 210,000 chemicals, 350,000 products complied from over 1,000 sources. His software can generate a score that can accurately and effectively measure the toxicity levels in a given chemical recipe, process, or product and give specific information about the impact on Health, Safety and Ecology. Not only that, it is possible to cross reference information regarding the chemicals, CAS numbers, regulatory lists, (very exciting!) and can eliminate redundant data so that it's easier for departments to work together and get things done faster. There is much more detail that I can go into, however what's more important is that you, as you're reading this, get curious enough to check out Dr. Thompson's tool. It is worth the time to take a look, and even more than that, I would be thrilled to see the technology implemented as part of California's comprehensive solution. For this reason, I'm getting the word out on the other forums too. We need to be looking at this solution. There is no more time to wait. We must involve people at the business and community level. We must give people at the business and community level a tool that will work for them. No just us. Check out www.chemply.com

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	Read more about this man's work. It is phenomenal!!!!!!
F-GC-67	Product Stewardship Innovation and Environmentally Friendly Technologies Airgas, Inc., the largest U.S. distributor of industrial, medical, and specialty gases, and hardgoods, such as welding equipment and supplies, and the second-largest manufacturer and distributor of liquid carbon dioxide in the United States is committed to product stewardship innovation and to promoting environmentally friendly technologies. This is why we have long advocated the use of refillable refrigerant cylinders in servicing mobile air conditioning systems as well as stationary industrial, commercial, and residential refrigerating and air conditioning systems. Airgas led the industry in the late 1990s by introducing a 30 lb. refillable refrigerant cylinder to replace the standard size 30 lb. disposable cylinder. The use of refillable cylinders for refrigerants eliminates the emission of ozone depleting compounds and greenhouse gases remaining in disposable containers when they are discarded. Recognizing their significant environmental benefits, most developed countries, including Canada, the EU Member States, and Australia, have already banned the use of non-refillable cylinders for refrigerants. In addition to its atmospheric benefits, decreasing the number of cylinders discarded each year can also save tens of millions of pounds of steel (fostering conservation of an important natural resource) and hundred of thousands of cubic yards of landfill space nationally each year. The use of carbon dioxide (CO2) in environmentally friendly technologies is another area that Airgas strongly supports. With growing concerns over the environment and global climate change, and increasingly stringent regulatory requirements, companies are actively searching for alternatives for many of the coolants, solvents, and other chemical substances they currently use, which will be greener and have a smaller environmental footprint. The distinctive properties of CO2, combined with its environmental benefits, make it a cost- and performance-effective green alternative for other chemicals used in many industrial and commercial processes. Although CO2 is a greenhouse gas (GHG), it is generally obtained commercially as an industrial by-product from existing operations and, therefore, its further use in other industrial and commercial processes and operations does not make any further, or additional, contribution to global warming. The unique lubrication and cooling qualities of CO2 are the reason it is seeing increased use as a coolant / lubricant, in industrial machining operations. Its use in these applications doesn't generate any hazardous waste compared to the disposal of hazardous cutting oils and biocides typically used in metal machining, which is significant when considering the cumulative environmental waste from the myriad of machine shops. In metal machining applications, CO2 delivers considerable economic benefit via increased productivity and tool life, hence indirectly reducing consumption of other natural resources. In addition to being environmentally friendly, the use of CO2 eliminates worker exposure to many of the hazardous chemicals used in the machining industry today. Dry cleaning is another area where use of by-product CO2 provides an especially attractive, environmentally preferable, alternative. With pending regulation, perchloroethylene (Perc) in commercial dry cleaning operations is being replaced in California by alternative technologies. Hydrocarbon or petroleum-based solvents are currently the most popular choice when replacing Perc equipment. However, their environmental profile raises some concern, plus their cleaning performance is very limited as petroleum based solvents do not clean water based stains, which make up the bulk of stain types on clothing. Use of hydrocarbons is controversial because it increases Volatile Organic Compound (VOC) emissions. VOC emissions contribute to the formation of ozone in the lower atmosphere. Ozone has been linked to a variety of health effects including respiratory irritation, asthma, and premature death. Moreover, the environmental persistence of hydrocarbon solvent mixtures is mostly unknown and has the potential for contamination of soils and drinking water.

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	Carbon dioxide is non-flammable and non-toxic. Unlike Perc and hydrocarbons, waste disposal is not an issue with carbon dioxide dry cleaning systems as any waste generated is not classified as hazardous. Also, it is a win-win for customers as it can be used for cleaning sensitive articles like silk, linen, and leather and can extend the life of garments due to a less aggressive, gentler process, thereby conserving resources for textile manufacture (an environmental benefit through reduction in resource consumption). In addition to being environmentally preferable to Perc and the alternative hydrocarbon-based systems, carbon dioxide is a commercially and economically viable alternative. The higher capital purchase cost of a CO2 system can be offset by lower operating costs, improving its economic competitiveness. Short cycle times lead to higher throughput, improved productivity, and lower labor costs. Also, waste management costs are eliminated since process wastes are not considered hazardous. Airgas believes the concept of using by-product CO2 for dry cleaning is an excellent example of product stewardship innovation - one that warrants enhanced, innovative incentives to expand its use more quickly as a Perc replacement. Although financial assistance ($10,000 grants) for the dry cleaning industry to switch from Perc to non-toxic, non-smog forming alternatives like CO2 and water-based cleaning systems is offered in California's proposed legislation (AB 998), it may not be sufficient for small businesses to purchase a CO2 system which costs significantly more than alternative hydrocarbon systems. However, as more CO2 units are installed, the cost of the systems would be expected to continue to decrease. The State of California, by taking a leadership role in Green Chemistry and sustainable technologies, can foster broader stewardship and encourage further innovation through development of creative incentives for environmentally friendly technologies like refillable cylinders for refrigerant gases and CO2 for dry cleaning and metal machining.
F-GC-68	Thoughts About Substitution Contributions from chemistry bring many benefits to society, but there are chemicals which can pose risks to health or the environment in certain circumstances. Some argue that the most sensible approach to these chemicals is to replace them with substances considered less hazardous—a seemingly simple concept, but substitution is not always feasible and not always the right choice. American Chemistry Council (ACC) members, through Responsible Care®, regularly consider substitution as an option in their broader green engineering and process design efforts. When doing so, companies must closely examine the implications for the safety, functional performance, and cost of alternatives to avoid ineffective changes with unintended negative health and environmental impacts. A good cook knows that you cannot arbitrarily change ingredients in a recipe. Whole wheat, rye, all purpose, and pastry are just a few of the many different varieties of baking flour. Yet, bakers know that while all flour is similar, many cannot be substituted without creating a result nobody would want to eat. The same holds true for chemical processing. You cannot simply replace one chemical ingredient for another without impacting the final product. Therefore, significant problems would result if chemical substitution were mandated as the solution of first choice without careful consideration of potential consequences. This is very much the approach taken by an international group of experts to the Intergovernmental Forum on Chemical Safety (IFCS) earlier this year in talking about "informed substitution". (see the background elements of the IFCS paper available at http://www.who.int/ifcs/documents/forums/forum6/12_original_prop.doc) SUBSTITUTIONS MAY CHANGE THE NATURE OF THE PROBLEM RATHER THAN SOLVE IT Mandatory bans and forced substitutions often are not a complete solution because, as one issue is addressed, another set of concerns may arise. This is the difference between "informed substitution" and "regrettable substitution", with the goal of "informed substitution" being to avoid "regrettable substitution". For example, the health and convenience of our lives has been greatly enhanced by modern refrigeration. Refrigerators originally used ammonia, a toxic chemical, as a coolant. As scientific discoveries were made, chlorofluorocarbons (CFCs) replaced ammonia. While CFCs are practically non-toxic, they were later implicated in depleting the ozone layer and eventually banned. CFCs were then replaced with hydrochlorofluorocarbons (HFCs),

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	which have no impact on the ozone layer, are non-flammable, have low toxicity, and high energy efficiencies. Scientists have now learned that HFCs could contribute to global warming if released into the air. Alternative coolants such as hydrocarbons and carbon dioxide have been considered, but both need to be carefully examined because of the potential for emissions and the possible dangers from higher operating pressures. In another example, consider the Peruvian government's decision to stop chlorinating drinking water. The result in 1991 was a five-year epidemic of cholera which spread to nineteen Latin American countries, causing more than one million illnesses and 12,000 deaths. After the outbreak, U.S. and international health officials criticized Peruvian water officials for not chlorinating the entire water supply. An official with the Pan American Health Organization (PAHO) blames the inadequate chlorination, at least in part, on concern over disinfection byproducts. In a 1997 article in the Journal of the American Water Works Association, Horst Otterstetter states, "Rather than being abated by increased use of chlorination, the waterborne transmission of cholera was actually aided because of worries about chlorination byproducts." Substituting one material for another is never as simple or straightforward as it might at first appear. SUBSTITUTIONS MAY RESULT IN UNINTENDED ADVERSE CONSEQUENCES Trading in a fuel-hungry SUV for a moped may address energy efficiency concerns, but it's probably not a reasonable option for a mother of four. Like the moped, forced substitution, without full consideration of the potential impacts, is impractical and unwise. For example, some substitute chemicals require higher processing temperatures and greater pressure conditions in order to achieve the same result as the original chemical. Additionally, if the substitute chemical is not compatible with the processing equipment, it can cause break downs or failures. In some circumstances, the substitute is not as effective as the original chemical and more quantity must be used which results in larger amounts of waste materials and increased waste disposal management and risks. All of these factors can lead to increased safety concerns for the worker population, as well as increased energy consumption by the company. This unintended consequence of substitution was clearly demonstrated in Europe when energy companies decided that fuel derived from plants would be more environmentally friendly than fossil fuels. Those companies developed specialized generators for palm oil, which increased demand. To keep up with that demand, palm plantations cleared large tracts of land by draining and burning peat land, resulting in huge carbon emissions into the atmosphere. The production of the plant derived fuel had an unintended consequence of creating more harmful emissions than the fossil fuels they were intended to replace. SUBSTITUTION IS NOT THE ONLY VIABLE APPROACH TO CONTROL RISK The principle of risk reduction is and always has been part of the normal day-to-day operations for the business of chemistry. Industry's ability to innovate allows us to respond to society's evolving needs for better, safer products. Beyond substitution, the chemistry industry considers many other options to minimize potential hazards, such as operational management systems, engineering controls, modifications to the chemical product, and waste management innovations. The industry also provides specialized consumer training and works with communities to implement effective recycle/reuse programs. Through ACC's Responsible Care® initiative, ACC member companies go above and beyond government rules and regulations to continuously improve their environmental, health, safety, and security (EHS&S) performance. ACC members employ a rigorous EHS&S management system that is certified by third-party auditors. Among numerous other elements, auditors verify that our companies have systems to manage risk associated with chemical products including management of product development, transport, use, and disposal in a safe and secure manner. Companies are also audited on their programs to protect the environment and to conserve resources, as well as their efforts to dialogue with community stakeholders about the organization's impact on human health and the environment. Company performance under Responsible Care® is publicly shared through americanchemistry/responsiblecare.com. For more information on Responsible Care®, please visit http://www.responsiblecaretoolkit.com.

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F-GC-69	mike i actually agree with you on this one.. lets take my field of specialty for example.... oil based polyurethanes were the predominant finish for quite some time....voc mandates came along and forced industry change, industry then introduced poly functional azridine, iscocyanates, nmp etc. to create low voc water formulas....and while that's great for emissions, evidence is inconclusive regarding the health effects of those that use them....not that the oil base is great for you to obtain "the magic bullet" {the replacement} for each compound that needs replacement is one thing, understanding the psychology of why a certain compound is being used is another needs, wants, improvements, this is the basis for chemistry's promotion. take cfc as a propellant as a replacement for ammonia...why was a propellant used in the first place? virtually any fluid can be dispensed with a pump spray head {made from plastic :} } i believe the consumer considered holding down a button vrs. pumping it several times was a "need" that needed fulfilling. or in other words people are too lazy to pump there finger to dispense a product vs using a chemical to spray it out for them.... and or who gave them the option and why?....the application was conceived..."we need to spray this stuff out of this can"....chemistry came up with a solution{that's what we do} and sold the "need, want and convenience to the unsophisticated general public who is only concerned with simplifying their lives, who in general was not concerned or aware that certain chemical compounds were and or are harmful to them or the planet water /air.... to what cost are we willing to exchange convenience for destruction....our Pavlovian habits regarding chemicals and there acceptance to replace old compounds or physical labor are the root of the issue. lets take junk mail for a minute.....who likes their junk mail.....anyone.....common you guys know you love sifting through 25 junk letters to get to the two bills you actually need out of the stack of mail.....right.... well lets just say one had authoritarian power and could lay down mandates on society.... and lets just say you were going to mandate the elimination of junk mail....punishable by large fine and imprisonment.... so the junk mail stops....those that don't like sifting it will rejoice.... then there's the other side... those that proclaim the right, in a free society, their right to free market advertising...they would not like it then there's the paper manufactures and all the chemical compound supply companies that would not like it... and then there's all the printing ink companies...they would not like it all the delivery services they would not like it and then the recyclers they would not like it... so we have several jobs now effected as well as several raw material suppliers effected in this chain of events the mandate lays down... the questions....would it be worth it...do we need to waste these raw materials, do we need to produce and use all this ink, do we need to use all this fuel transporting and recycling this stuff?.....do we need it...or is it just perceived as the way it is with too many peoples lives effected by such a mandate? how did we get to the point of acceptance of such a thing as junk mail...why is it considered ok... again my point is that many of these perceived needs, wants, replacements are convenience based.....people have been encouraged to accept these improvements based on simplifying or improving their lives....there are several of these improvements that are trivial and should not have been allowed to be implemented in the first place, primarily based on consumer ignorance and or acceptance and industry greed. there are several examples such as junk mail that relate to chemical usage....usage relates to formulation in many respects. while the directive of the program here seems to be related to green chemistry, i would remind people that our usage habits and the understanding of the

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	psychology of how things have become the way they are regarding usage is just as important to reducing, using and wasting chemicals as eliminating certain ones October 29, 2007 | jesse goldstien oh' and furthermore.....you would agree that if a benign substitute were to be derived as a replacement....with none of the peripheral side effects you give as an example...that it should be encouraged as a replacement?....i assume?
F-GC-70	oh' and furthermore.....you would agree that if a benign substitute were to be derived as a replacement....with none of the peripheral side effects you give as an example...that it should be encouraged as a replacement?....i assume?
F-GC-71	CHANGE's Perspective on a Successful Program We write to you today on behalf of CHANGE, Californians for a Healthy and Green Economy. Ours is a broad-based growing coalition of approximately 35 environmental and environmental justice groups, health organizations, labor advocates, community based groups, parent organizations, and others who are concerned with the impacts of toxic chemicals on human health and the environment, as well as the lack of a regulatory framework that seeks to prevent exposures to toxic chemicals. We thank you for your leadership initiating the Green Chemistry Initiative and would like to take this opportunity to join the Conversation with California by offering our perspective on what would make the program successful in addressing the critical human and environmental issues related to chemical use. on behalf of CHANGE

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F-GC-72	Dow Chemical's Green Chemistry Thoughts The Dow Chemical Company (Dow) is pleased to provide the following comments on California's Green Chemistry Initiative (GCI). On June 29, 2007 Dow provided initial comments that represented our principles for sustainable chemistry at a corporate level. That letter spoke of Dow's accomplishments in sustainability, Dow's aggressive 2015 Sustainability Goals, and Dow's suggestions for framing California's GCI. We have engaged fully in the DTSC's process; Dow people have spoken at two of the three Green Chemistry Symposia and have participated in the workshops, including serving as break-out session facilitators. This current submission offers Dow's more-detailed thoughts in the specific areas of: § Life-Cycle Assessment § Eco-Labels § Consumer Choice § Environmentally-Preferred Purchasing § Incentives on behalf of the Dow Chemical Company
F-GC-73	Time may not be on our side.. Green Chemestry Idea.. The ideas I am describing below may seem to you to be more of an applied scientific/research issue combined with the need for advanced engineering, modeling and simulations to solve the problem (abstract written by me as if the theoretical scientific issues had already been resolved / matured). As a native of San Diego and a Tau Beta Pi Engineering Graduate of the University of Illinois, it (the discussion below) by me is really the only reference frame from a professional scientific standpoint that I currently have to communicate these thoughts. (It may appear to you to be written more in the form of a requirement than an abstract). So I hope you will bear with me on this and also feel free to provide any comments back to me, as you set fit. If these ideas seem far fetched to you, then I apologize. However, I am not sure the exact leading edge of the state of the art of research in this particular arena. Sincerely, Leslie M. Millholin III _____ Background discussion: I have heard a lot of interesting ideas bantered about these past few years to deal with the issues associated with climate change and global warming. However, I am now not sure that time is on our side, that is, to first become carbon neutral and to then start reversing the effects of excessive CO2 in our atmosphere. Now, thinking back to the turn of the (20th) century, a little over 100 years ago today. What would be the result then if you talked to the average person of that day about semi-conductors or quantum physics? Well, their reaction would probably be, 'What good is that?.. we (people of the 1900's era) know about conductors and insulators, but a semi-conductor?" Again, if you talked to folks of that era about quantum physics, they would probably respond back in the following manner: "We today (in 1900) understand what Sir Isaac Newton was trying to tell us. But a new science field of quantum physics? What good would that be?" So, fast forwarding 100 years to today, we could extrapolate this discussion and focus it into the paradigm that I am trying to describe here. _____

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	Technical discussion/abstract: To begin with, if in the near future, we had a new advances in the area of "integration of the ecological, economic and social drivers of biodiversity change", that is "bio-sustainability" to leverage, then I believe this would make mankind's existence of this planet compatible with the thought of having a less destructive effect on our ecosystems. The idea for 'bio-sustainability' means basically to me as I view the future, "advanced biotechnology with other non-natural sciences factored in to the equation". Thus, giving one possible real world example of how to proceed with this endeavor, we could leverage work done in the area of bio-degradable materials, as well as your areas of on-going research. It could then be possible to develop a new set of 'semi-organic' materials, not dissimilar in their process of creation, but possibly a reverse process to the creation of bio-degradability, that is, the known formula for making bio-degradable products (such as bio-degradable DDT, more commonly know as the pesticide pyrethroid), again as one possible example/postulation of how to proceed with this idea. So we have (once the science and engineering is resolved) a new set of 'semi-organic' materials that are really not alive, per se, but still maintain all their present non-organic properties. However, they would also have the ability to absorb CO2 directly from the atmosphere. To follow on with this thought/technical thread and also to start thinking about some of their possible future uses, if we quickly review some of the current day common building and construction materials which may include but are not limited to the following: Stone, rock, cement, steel, composites, adobe, concrete, asphalt, copper, aluminum, stucco, glass, hay bales, fiberglass, ceramics, tin, plexiglas, brick, plastics, wood, hybrid construction materials like new winterized road surface emulsions which contain embedded anti-freeze compounds, that is winterized road paving with antifreeze admixtures (e.g., residue from dressing bauxite is mixed with NaCl (calcined bauxite) and ground; polyurethane foam is ground and mixed with CaCl.sub.2 ; a silicon organic compound and quartz powder is added to one or both of the ground mixtures; the grains are embedded in bituminous material or asphalt to be used for making a surface road, being protected against frost by these salts) etc... Reviewing this list of materials, it then becomes obvious that the technology for multi-purpose, multi-function construction materials is already progressing at a fairly fast pace, but with the intended purpose of mitigating some of natures most un-wanted effects. Now if mankind is to truly co-exist with nature in a more bio-friendly way, then I think consideration of the possible advance to the bio-sustainability arena I have postulated above, which, if scientifically possible, could at least partially replicate the natural photosynthesis process and therefore, eliminate or reducing the need for larger, more cumbersome scientific and engineering solutions for producing the same CO2 mitigation effect/results within our earth's atmosphere. Therefore, I believe this abstract should be given serious consideration as a possible means of CO2 reduction in our atmosphere. I know most CO2 mitigation studies and scientific concepts are today focused on the upper atmospheric regions and above, however this abstract focuses on a unique 'ground-level' solution to offset the current and on-going climate change effects to our planet and its atmosphere. _____ Conclusion: The idea here overall would be to research, engineer, design and manufacture a set of 'semi-organic' set of materials that would eventually take the place of the traditional building and construction materials that I have listed above and then use these as replacement materials while at the same time having them absorb CO2 directly from the atmosphere in addition to their existing functions/properties/roles. Exploring this possibly complex new area of science and engineering endeavor may require extensive collaboration with the scientific community as well as academia, the construction industry, and many of the major engineering builders of today's society.

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F-GC-74	Chemistry is Essential To California Chemistry is essential to California. When the science of chemistry is applied, it helps make the lives of Californians and others throughout the world safer, healthier, and more productive. American chemistry also plays a fundamental role in helping the California economy be more energy efficient. Our products go into modern materials used to make insulation, weatherization equipment, firefighting and other emergency response equipment, lightweight vehicle parts, coatings, lubricants, and energy-efficient appliances. ACC members are proud to be doing our part to reduce greenhouse gas emissions and intensity and improve energy efficiency. In fact, we've improved energy efficiency by 46 percent since 1974 and reduced absolute greenhouse gas emissions by 10 percent since 1990 – exceeding the Kyoto Protocol's target and deadline. In addition to the 84,802 jobs directly created by the chemical industry in California, a total of 524,584 jobs in California are generated indirectly by chemical industry activity in California and other states. For every chemical industry job in California, a total of 4.5 jobs are created within the state, a total of 300,627 jobs. In total, 609,386 jobs in California are supported by the chemical industry. These jobs generate $30 billion in earnings and $1.7 billion in state and local tax revenues. Industries that use chemical or chemical-derived products include: farming, new residential construction, emergency response services, plastic bottle manufacturing, upholstered furniture manufacturing, dry cleaning services, building services and health care, to name just a few. In California, more than 4.9 million jobs (or 31.8% of all California jobs) are dependent on chemical products. These jobs generate $230.8 billion in earnings and generate state and local tax revenues of $13.4 billion. The principles of sustainable chemistry are at the heart of our everyday business of producing chemical products. ACC member companies incorporate Green Chemistry and Green Engineering in their operations, and have been recognized for their efforts; having won 9 Green Chemistry Challenge Awards issued annually by the US Environmental Protection Agency. For California, American Chemistry is essential to producing the products, jobs, and innovations that will help us achieve a more sustainable future.
F-GC-75	American Chemistry Council President and CEO Jack Gerard expressed deep regret that California Governor Schwarzenegger chose to sign a bill banning certain phthalates from some toys and childcare articles, but expressed the hope that the act would not imperil the state's future plans for addressing chemical health and safety issues in a rational and science-based way. "This law is the product of the politics of fear. It is not good science, and it is not good government," said Gerard. "Thorough scientific reviews in this country and in Europe have found these toys safe for children to use. California businesses will now be obliged to take products off the shelves that their customers need and want." "Next year, we hope that policy makers and special interest groups will abandon their chemical-by-chemical, attack strategy and put their support behind the state's Green Chemistry Initiative. Public health and safety is best protected by decisions driven by the experts, and based on the evidence." Though positive carcinogenic findings exist, negative findings have appeared in tests with several species. Thus, the actual carcinogenicity of DEHP to humans is uncertain. Assuming that the positive findings indeed provide a basis for extrapolation to humans, the estimation of equivalent human doses involves considerable uncertainty. Because of an inadequate understanding of the mechanisms of carcinogenesis, a scientific basis has not been developed for selecting among several alternate dose-response models, which yield widely differing results. Apart from the risk via ingestion, risks may result from either dermal absorption or inhalation of DEHP. However, toxicological data corresponding to these routes are not available for extrapolation purposes. For the general population, exposure to phthalates, as indicated by exposure to DEHP, results primarily from food ingestion. By comparison, water ingestion and inhalation of ambient air account for much less exposure. The combined exposure level for an average individual (average in that the person has a normal diet and average water drinking habits) would be about 0.27 mg/day DEHP. The maximum exposure could be as much as 10 mg/day. Certain subpopulations might have significantly greater exposure to phthalates. Persons who work in plastics manufacture or in formulation, calendering, or other processes in which phthalate esters are used, might have exposures as high as 6.3 mg/kg/8-hour exposure. Note that this is a worst

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	case exposure value reported in the literature and may not represent current manufacturing processes. hospital patients who receive large quantities of blood, or who are dialyzed regularly, could also receive fairly large exposure to DEHP or other phthalates. These populations are probably small. Another worst case consists of a small population who eat primarily a high fat content diet of prepacked foods. In the example presented here, the person's diet was assumed to be equivalent to 2 kg/day and containing 10% fat. This represents an upper level exposure for this subpopulation (11 mg/day). The consideration of fate mechanisms indicates that export of DEHP is the primary fate mechanism in water. The U.S. EPA model (EXAMS) predicts that neither chemical (oxidation, hydrolysis, and photolysis) not biological processes will determine the fate of DEHP. It has also been demonstrated that volatilization is unimportant. Laboratory studies suggest that biodegradation by fish and microorganisms may be more important that the model predicted. Phthalate esters are concentrated in lower aquatic organisms. However, fish appear to be able to metabolize these chemicals. Adsorption is not an important loss mechanism in a steady-state system, although DEHP is concentrated in sediment. The results presented above also suggest that DEHP will be more persistent that the other phthalates, especially DMP. The primary fate mechanism for DMP in rivers is export. In all other aquatic ecosystems, however, biodegradation dominates. The fate of phthalate esters in air is expected to controlled by hydroxyl radical attack. Adsorption onto particulates and rainout is not expected to be important. Although large amounts of phthalate esters are disposed of in landfills, the original products retain the greater part. Available phthalates would be subject to biodegradation and leaching. Evidently little coupling occurs between the air and water compartment because, in the case of DEHP at least, very little volatilizes from the water and very little rains out of the air. The water fraction is largely exported to the ocean, and the air fraction is degraded relatively quickly by reactions with the hydroxyl radical. In summary, phthalate esters have extremely low concentrations in water and air. Esters other than DEHP are biodegraded and hydrolyzed more rapidly in both the water and fish compartment. Rapid degradation in air holds the concentration levels in the atmospheric compartments to relatively low values. Soil and sediments are areas requiring further experimental and field investigations. Because of their relatively high partition coefficients, the larger phthalate ester molecules may tend to accumulate in these media. Phthalates esters are not commonly found in natural waters at concentrations that effect most aquatic organisms. However, data on aquatic effects are limited, and water quality criteria have not been set for phthalate esters. The U.S. EPA has stated that acute and chronic toxicity to freshwater aquatic life occurs at concentrations as low as 940 ug/l and 3 ug, respectively, and may occur at lower levels for more sensitive species. Based on a review of the data available, concentrations of the phthalates affecting aquatic organisms were usually greater than 1000 ug/l, ranging from 1900 ug/l to over 100,000 ug/l. The lowest concentration of DEHP found to affect aquatic organisms, 3 ug/l, inhibited reproduction in Daphnia by 60%. The lowest effective concentration of DBP was 100 ug/l, which limited growth of dinoflagellates, marine organisms. Many locations appear to have water concentrations of DEHP that could affect Daphnia populations. The effects concentrations of 3 ug/l are very close to the detection limit for DEHP. Therefore, wherever the chemical was measured and detected, it could potentially have an effect on these organisms. However, the reported effects at 3 ug/l should be confirmed, since this level is relatively low compared with other observed effects. The lowest effect concentration reported for DBP of 100 ug/l is not commonly reached in ambient concentrations; however, two river basins reported a significant number of observations at this concentration or higher. For the most part, however, concentrations affecting fish were normally not found in ambient waters. Also, concentrations having acute effects on aquatic invertebrates are not commonly detected in the environment. It is difficult to determine what impact reproductive impairment in Daphnia would have on the higher organisms feeding on them. Thus, the indirect risk of "important" aquatic species through the decline of, or contact with, contaminated daphnid population cannot be assessed in this work. Insufficient monitoring and effects data are available on the remaining phthalates, DNOP, DEP, and DMP. Reported environmental concentrations tend to be few, and these concentrations are low. Assessment of the risk of these phthalates to aquatic organisms is not possible because of the insufficient data, although it appears from the data available that present levels of DEHP in the environment may pose a risk to some invertebrates. DEHP appears to be the most persistent of the phthalates and the most ubiquitous in the environment. The effects data for DEHP do not deviate greatly from those for other phthalates. Therefore, the other phthalates (DNOP is not included because of the lack of effects data) probably pose less of a risk to aquatic organisms than DEHP. The salmonid fish species, which are usually more sensitive to pollutants than other fish

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	species, have not been studied extensively for their susceptibility to phthalate esters. The limited information available does not indicate that they are more sensitive to any of the phthalates than warm water fish. DEHP has very low solubility; it is probably that in cold water it is even less soluble than under laboratory conditions, which are normally conducted at 25øC. Any effects of DEHP in a cold water system, therefore, may be mitigated by the low temperature. Monitoring data of phthalates concentrations in cold water systems are not extensive enough to support speculates on risk to salmonids. The only information available on toxicity to aquatic organisms through ingestion of phthalates measured subacute effects of DEHP on zebra fish and guppies. Concentrations in the food of 50 ug/kg and 100 ug/kg slightly reduced reproduction in zebra fish and guppies, respectively. Guppies feed primarily on aquatic invertebrates. Apparently, many species easily accumulate much higher concentrations than those reported above. The concentrations reported in those species representing food sources may affect fish reproduction. Unfortunately, no information was available on acute effects through ingestion. Section 6.1 suggest, however, that phthalates are rapidly metabolized and clearly by fish when ingested. High concentrations in food sources, therefore, may have little effect on aquatic organisms that eat them. Only speculations can be made at this point until further investigation is conducted in this area. Phthalates, at least DBP and DNOP, do not appear to pose an acute risk to birds through ingestion of contaminated food because of the high concentrations required to produce acute effects. No effect information was available for other phthalates. The highest concentration of any phthalate reported in water or biota (and assuming it to be a potential food source) was 7.2 mg/kg. It is unlikely that concentrations of these two phthalates are high enough in the environment to cause acute effects. Because DEHP is abundant in the environment and appears to be most slowly metabolized of the phthalates, an assessment of its risk requires data on the effects on avian species. Also, phthalates may have subacute effects on birds at lower concentrations that could conceivably be attained through bioconcentration. Further investigations on the acute effects of other phthalates and subacute effects are required to determine realistically the risk phthalates pose to birds. gee mike.....it don't really sound like a desert topping....does it? i deeply regret your acc point of veiw.....
F-GC-76	The American Chemistry Council is a top trade association representing North American chemical manufacturers. ACC represents represents nearly 150 companies and has a $100 million budget. The group spent more than $2 million on lobbying in 2003. History ACC merged with the American Plastics Council in 2002. Formerly know as the Manufacturing Chemists' Association, then later renamed as the Chemical Manufacturers Association, ACC adopted its current name at its June 2000 membership meeting. Battling Precautionary Principle In November 2003, the Environmental Working Group released a leaked memo drafted by Tim Shestek, a lobbyist with the ACC. The memo outlined the key features of a campaign proposal from Nichols-Dezenhall to counter growing support for the precautionary principle in California, which it argued could create a national trend. Fighting Over Gas According to a June 1, 2004 article in The Hill, the organization has been facing an internal struggle between the interests of its members, particularily over the increased price of natural gas. ACC member companies that primarily manufacture plastics or chemicals use natural gas for heating and electricy and were upset with ACC weak lobbying position on natural gas prices. But ACC also has integrated oil and gas companies as members who benefit from high natural gas prices. Kids on Pesticides In October 2004, ACC gave the Environmental Protection Agency $2 million to help fund a study exploring the impact of pesticides and household

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	chemicals on young children. Messaging and PR Greg Lebedev left his position as president and CEO of ACC on June 1, 2004. The Hill reports, "[L]obbyists who spoke on condition of anonymity said the group's governing board effectively pushed Lebedev out, in part because members thought he had not moved swiftly enough to cut costs or develop a coherent association message." In 2003, Lebedev had proposed a PR campaign for ACC to boost the industry's image. Initially pushing for a $60 million campaign, the effort is reported to have been scaled back to $20 million after complaints about the project's value. In the fall of 2005, the ACC launched "an integrated public education campaign to raise the chemical industry's image and reputation," called "essential2." ACC hired Ogilvy Public Relations Worldwide, APCO Worldwide and Ogilvy & Mather for the campaign, which is expected to cost $35 million over two years. Part of the "essential2" campaign is a new website, americanchemistry.com. In a press release, Ogilvy & Mather's David Fowler said essential2 would be a "360(degree) communication effort," including "press, television, public relations, online and employee communications." [2] In the same release, ACC President and CEO Jack N. Gerard was quoted as saying, "'essential2' makes a powerful statement about how connected we all are and how central chemistry is to the health and growth of our nation. For example, the chemistry industry is America's leading exporter, accounting for 10 percent of all U.S. exports, and we generate more than half a trillion dollars for the U.S. economy each year." [3] While promoting the chemical industry as vital to the economic health of the nation the ACC simultaneously lobbied against the Toxics Release Inventory (TRI), a public right-to-know program. Under TRI, the U.S. Environmental Protection Agency annually reports on what industries release into the air, water and land. The ACC "has urged less frequent reporting since 1999." ACC's Michael Walls said, "Just because we're used to doing something doesn't mean we should accept the inherent high costs or burden of doing it." The Bush administration supports changing the TRI so that fewer releases are reported, less frequently. EPA officials say they will "likely spend another year weighing the pros and cons" of the proposed changes, after the public comment period ends on December 5. According to federal records, the EPA "previously solicited comments from industry groups." ACC Programs Responsible Care ACC Affiliates American Solvents Council Chlorine Chemistry Council CIIT Centers for Health Research European Chemical Industry Council or CEFIC Hydrogen Fluoride Panel International Council of Chemical Associations Phosphate Forum of the Americas Phthalates.org Synthetic Organic Chemical Manufacturers Association hmmm....something stinks.....do you smell that?

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F-GC-77	Some ideas for what California can do to start advancing chemicals policy Here are some ideas for what California can do to start to advance chemicals policy and promote green chemistry. They are derived from ideas I have presented at several GCI forums, but I wanted to add them into the mix being collected via the Conversation. What can California do? • Ensure access to information gathered by others – Negotiate for access to confidential business information (CBI) submitted under the European Union's REACH Regulation and under the Canadian Environmental Protection Act (CEPA) – Require companies making/importing chemicals in California that are subject to REACH or CEPA to submit the same information to California officials – Enhance existing IT infrastructure to receive and share the large volumes of REACH data • Set clear criteria to identify chemicals of concern – Can be hazard-based (e.g., PBTs) and exposure-based (e.g., chemicals detected through biomonitoring) – Use these criteria to drive further assessment and control of chemicals meeting the criteria – Require adherence to clear timelines for conducting assessments and making control decisions • Map the flow of chemicals in California by developing and sharing production/use info – Require California producers/importers and users to submit and update information on production and processing (amounts, facility locations), uses (including in products), and post-use management – Require updating of MSDSs to reflect all available data (US HPV Challenge, REACH, Canada) – Require disclosure of chemicals in consumer products • Could focus initially on priority chemicals (Canada priority list, REACH Substances of Very High Concern (SVHC) list) • Advance the science – HPV, REACH data sets use 20+ yrs. old tests ("old toxicology") – Fail to account for: > Emerging issues, e.g., endocrine disruption, development neurotoxicity > Emerging science, e.g., low-dose effects, timing of exposure during development > Emerging methods, e.g., toxicogenomics, high-throughput screening and mechanistic assays > Perpetual concerns: e.g., cumulative, aggregate exposures, susceptible subpopulations – California is well-positioned to help move toxicology into the 21st century – Can help to develop, road-test and share new methods, testing strategies – Utilize biomonitoring data and methods to advance dose and exposure measurement – Press industry, federal government to move forward – Collaborate with universities Why do this? • Casts a broad net – to identify not only "bad actors" but also chemicals of low concern • Influences and informs chemical and product design decisions • Identifies and fills gaps – information (data and safety) and technology gaps • Empowers a range of actors – government, industry, academics, public – to advance knowledge and make better decisions about chemicals

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F-GC-78	Limitations to Risk-Driven Approaches to Chemical Prioritization [NOTE: This post is based on a paper I published in the OECD Series On Testing And Assessment, No. 51, Approaches to Exposure Assessment in OECD Member Countries: Report from the Policy Dialogue on Exposure Assessment in June 2005, Chemicals Committee, Organization for Economic Cooperation and Development, p. 109, available at http://appli1.oecd.org/olis/2006doc.nsf/linkto/ENV-JM-MONO(2006)5. It is provided in part to respond to the American Chemistry Council's comments arguing for sole reliance on risk-based evaluation for chemicals.] While both hazard and exposure are clearly relevant in determining chemical risks, there are critical differences between our ability to assess hazard and exposure that have implications for the development and application of risk and exposure assessment policies. And real-world experience in chemical assessment programs that have attempted to rely on exposure information to prioritize chemicals also offers lessons for exposure assessment. In this paper I first address these issues, and then discuss their implications for risk and exposure assessment policies. Critical differences between assessing hazard and exposure Approaches to integrating exposure assessment into regulatory decision-making need to acknowledge and account for a number of critical differences between the nature of hazard and exposure information and their relative extent of availability. While both hazard and exposure are clearly relevant in determining risk, certain characteristics of exposure information pose serious challenges to sound decision-making: 1. Hazard is largely inherent to a chemical, and doesn't fundamentally change over space or time, whereas any exposure information necessarily represents only a "snapshot" in both space and time. A chemical's hazard is relatively intrinsic, largely or entirely independent of how the chemical is used, where or how it enters the environment, or other factors that vary with time and place. Hazard data are therefore relevant (i.e., necessary though not sufficient) in characterizing risk whatever the use of a chemical, and hence are useful in understanding any and all potential uses of or exposures to a chemical -- and what kind of exposure-reducing efforts may need to be taken. Just the opposite is true for exposure, the potential for which changes depending on how a chemical is produced, used, transported and discarded. Conditions that determine exposure can and often do differ enormously for every setting and point in time that a chemical is present. And even if a "snapshot" of current exposure were able to be assembled, the next new use or activity leading to a release would alter the exposure picture. The variable nature of exposure poses a major challenge to exposure (and risk) assessment: It means that exposure assessment must be an ongoing activity, with the scope and frequency of its measurement sufficient to characterize the variation in as well as magnitude of exposure. 2. Voluntary and regulatory mechanisms for generating and collecting exposure information are undeveloped relative to those for hazard information. Extensive international consensus exists as to how to test a chemical for most hazardous properties. Detailed government-sanctioned procedures, guidelines, criteria and standards are already in place for conducting hazard tests, for assuring the quality and reliability of the results, and for determining whether the results constitute evidence of a particular hazard. Moreover, these measures allow that results are reproducible and can be independently verified. In contrast, virtually none of these mechanisms are in place to assure that exposure information is complete and accurate. Debates over what constitutes adequate exposure assessment and how to address the "moving target" nature of such information are far from resolved. Government-sanctioned procedures for generating, evaluating the adequacy of and interpreting exposure data have yet to be developed or validated, including testing and measurement standards, guidance, methods and tools. Even use and exposure information reported in sufficiently qualitative terms or sufficiently aggregated form so as to eliminate any confidential business information (CBI, see next bullet) concern is rarely systematically collected and made public. For the first time, beginning in 2006, USEPA has begun to require the reporting of basic information relevant to understanding uses of and exposure to chemicals, although it will be limited to several thousand

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	chemicals, and will be collected only once every five years – despite enormous documented variability in these chemicals' production volumes that presumably reflects changes in their underlying use patterns. 3. Differential access to both exposure data and the means to generate them severely limit the "reproducibility" of such data. In addition to the variability and absence of agreed-upon procedures noted above, other factors limit "reproducibility," that is, the ability to readily and independently measure or verify exposure data. Most exposure data and the means to generate them reside virtually exclusively with industry. It must be acknowledged that industry has a strong interest in maintaining that exposure to its products is low, so the ability to independently measure and verify exposure data is critical. Yet physical access to many exposure "settings" (e.g., workplaces) is very limited and infrequent at best, even for government officials. Broader access to exposure-relevant information is even more restricted: Wide latitude is typically provided to claim chemical use and exposure information as CBI, preventing even its review outside government; this situation is often in contrast to that applying to hazard data, which is more likely to be deemed ineligible from designation as CBI. Finally, even chemical manufacturers have incomplete access to and information on their customers and how their chemicals are used. Intermediaries (vendors, brokers, distributors) are a formidable information flow bottleneck, as is the often-proprietary nature of information concerning downstream use and competition among suppliers. These factors serve to impede information-sharing even within supply chains, which in turn affects the extent and accuracy of exposure-relevant information that any one entity in a supply chain can provide if asked or required to do so. For all of these reasons, we believe that risk and exposure assessment at this time are simply too uncertain and unreliable to serve as a basis for deciding for which chemicals hazard data should be developed. While ultimate decisions concerning risk identification and management need to account for exposure as well as hazard, in all but the most exceptional cases, chemical prioritization approaches should be hazard-, not risk-driven. Difficulty of using exposure information in chemical priority-setting: OECD experience as a real-world example The ongoing work of the OECD Existing Chemicals Program vividly illustrates the limitations to available exposure information – and to efforts to prioritize chemicals based on such information. In that program, chemical-by-chemical assessments of high-production volume (HPV) chemicals are conducted. Typically, industry collects existing information and conducts any testing needed to fill gaps in the required set of hazard information. Industry then prepares draft assessment documents, which are reviewed by health and environmental agency officials in member countries. While the primary emphasis is on hazard assessment, program procedures currently allow for exposure information to be included to "place the hazard information into context." As we have documented in detail elsewhere, in practice this exposure information is routinely being used to decide that chemicals that have been identified as possessing clearly hazardous properties are nevertheless low priorities for further work based on "anticipated low exposure." Unfortunately, the exposure information typically being relied upon has truly massive deficiencies with respect to scope, quality and completeness. Such information typically is: • very limited in scope, and hence incomplete or even haphazard in its coverage of potential exposures, because it: - covers only a portion of known production and use; - covers only a subset of relevant activities, e.g., production, transport, storage, processing, use by customers, use in consumer products, product disposal, waste management; - covers only a subset of exposed entities, e.g., workers, consumers, the general population, sensitive populations, and wildlife; - addresses only a subset of relevant routes of exposure, e.g., by inhalation, ingestion or dermal contact; through food, water, air; - rarely is based on ongoing or sufficiently frequent measurement to address variation or changing conditions; • unverified, unpublished, rarely peer-reviewed and of uncertain or undetermined quality;

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	• frequently based on judgment or speculation, rather than on actual measurements, monitoring or validated methods of exposure modeling. Some of these deficiencies are related to the limited requirements under the program governing what exposure information is to be provided. However, others reflect the fundamental characteristics of exposure information described in the first section of this paper, as well as limitations on the extent and quality of information actually available and the capacity for effective review, and the lack of agreed-upon measures of scope, quality and completeness. The OECD ing Chemicals Program has wrestled repeatedly with this problem over its history. Indeed, because of what many saw as an over-reliance on exposure-related considerations in the absence of an agreed-upon approach, the program went through a major refocusing to return to a primary focus on hazard characteristics as the primary driver for the program. However, despite the refocusing effort, inconsistent and insufficient exposure-related information – more than any other factor – drives the recommendation process for chemicals being assessed through the program. Implications for risk and exposure assessment policy All of the factors discussed above mean that assembling a complete and reliable exposure picture even for a single point in time faces obstacles and has proven exceedingly difficult in practice. So how should risk and exposure assessment policies – and practices – address these current realities? Guidelines development: We continue to strongly support the development of comprehensive guidelines for collection, analysis, validation and presentation of exposure information, as the much-needed foundation of any exposure assessment policy and practice. In our view, the OECD program needs to invest at least the same effort in developing a process for exposure assessment as was invested in developing the hazard screening program. There remain a number of substantial obstacles that must be solved in order to ensure that adequately robust data on exposure can be gathered. Resolving these challenges will not be easy. These obstacles include: • lack of agreement as to what exposure information is relevant and needed; • lack of consensus as to the framework and methodologies needed to conduct an exposure assessment; • limited availability of and access to internationally accepted, comprehensive measured exposure information or models for predicting exposure; and • limited information available on all uses and other exposure pathways of chemicals. Guidelines need to ensure that the measured and modeled or estimated data address and are representative of the full range of actual and potential exposures that can or do occur. Procedures are needed to govern, for example, the minimum number of samples, the frequency of sampling, and other parameters so as to ensure that the results of any exposure measurements are both statistically meaningful and representative of the spatial and temporal variations present in the sampled environment. Quality assurance/quality control procedures to ensure data quality are needed. Where data are available for only a subset of production sites/release points/exposure sources, procedures are needed to determine whether and if so how extrapolations from available data can be used to characterize exposures arising from the missing sources. Adequate expert review: Policies need to provide for thorough review of exposure information. This starts with ensuring exposure-related expertise among reviewers is sufficiently diverse to address each of the various relevant exposure settings (workplace, consumer, environmental), and data generated through direct measurement as well as modeling. The review process should yield an explicit assessment of the scope, completeness and quality of the exposure information, in which any conclusions are qualified to accurately reflect the actual extent and nature of exposure information provided and hence the degree of associated uncertainty. Specific factors to be assessed should include: • Scope and Completeness: geographic, temporal extent of applicability and associated limitations; to what fraction of total production and use, to what uses, and to which specific facilities, processes, activities and products the provided information applies; which activities associated with the chemical's full lifecycle (production, processing, storage, transport, use and disposal) are covered; whether information on releases and exposures relate to workers, consumers, public or the environment; whether information is based on measurements, modeling, judgment, extrapolation. • Quality: extent of documentation provided/cited; reference to/description of procedures used; representativeness of sampling underlying any measured data; validation of any model used; peer review and extent of access to underlying data; assignment of measures of reliability; reproducibility.

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	Accounting for the variable nature of exposure: Policies need to acknowledge and account for the inherent variability in exposure over time as well as space. For example: • For new chemicals, the nature or extent of production, use and exposure needs to be tracked and revisited/reassessed over time, not only as a chemical enters commerce but as its production level and range of uses change. During the initial review/approval process, conditions should be included that require reporting of any changes in the nature and extent of production and use and other exposure-relevant factors, and such reports should trigger a reassessment of exposure potential. • For existing chemicals, policies should also be responsive to changes in the production level or use profile of a chemical. One recent illustration of this need in the U.S. is the change that has accompanied the phase-out of pentabromodiphenyl ether and its replacement with a different chemical, the production and use of which has increased dramatically as a result. Data verification and model validation: To the extent data from industry are relied on, policies need to incorporate mechanisms to ensure and demonstrate that such data are accurate and representative, and wherever possible, to be able to independently verify such data. To the extent that modeled as opposed to measured data are relied on to provide exposure estimates, policies need to outline procedures to be employed to validate the models, provide public access to the models and their underlying data sets. Just as for measured data, policies also need to ensure that models effectively account for variation in exposure over time. Differential access: The differential access to exposure-related information (as discussed above) is a serious barrier to public confidence in both industry- and government-derived exposure assessment. In addition to adopting and abiding by comprehensive guidelines covering all aspects of exposure assessment, government needs to develop and implement mechanisms to demonstrate that it can independently verify the reliability of industry-generated exposure information; and industry needs to be encouraged or required to implement its own measures to increase confidence in the information it provides, including routine third-party review and a commitment to make information public whether exculpatory or not. In addition, policies need to consider means to break through the supply-chain bottlenecks that effectively prevent development of a full understanding of chemical processing and use. In our view, one of the key innovations offered by the European Union's REACH regulation is its intent to compel information-sharing up and down the chemical supply chain. Finally, in our view, serious reconsideration of the currently overbroad broad allowances for CBI claims related to exposure-relevant information is warranted. Transparency: Policies should ensure that any descriptions of exposure information are clear and transparent in describing the scope and nature of the information and its limitations, including by addressing all of the elements specified above under Scope and Completeness and Quality. Policies should require that conclusions or recommendations be carefully written and explicitly qualified so as to limit their perceived and actual applicability to those settings for which information has been provided and deemed sufficient to warrant the conclusion or recommendation. Furthermore, the degree of uncertainty associated with a conclusion or recommendation should be stated and should reflect the extent of exposure information available. Lastly, policies should ensure that in the absence of good exposure information, exposure should be assumed possible or likely. Additional challenges Cumulative and aggregate exposures: A common limitation of exposure assessments in practice is to examine exposures only to single chemicals at single points in time, or from single sources or products, as if they occur in isolation from other exposures that are in fact relevant to understanding the true nature and magnitude of exposure. While understandable given the complexity involved in going further, this frequent failure to consider or even acknowledge the need to ultimately examine cumulative and aggregate exposures undermines the credibility of an exposure assessment. Policies, therefore, need to ensure that an accurate context is provided within which to judge a particular exposure assessment, one that accounts for factors such as:

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	• production, processing and use of the same chemical by multiple entities; • multiple uses of the chemical leading to actual or potential exposures; • multiple routes of exposure (direct, indirect) to a chemical; • continuous or periodic release of or exposure to a chemical; and • exposure to multiple chemicals producing the same/similar effects and/or acting by the same/similar mechanism(s) Biomonitoring/environmental monitoring/health tracking: The ultimate arbiter of the value of exposure assessment is the extent to which its findings comport with reality. It is relatively rare for extensive data from actual environmental and biomonitoring to be available, and rarer still for health tracking statistics to be available that can be linked to particular exposures. Nonetheless, exposure assessment policies should ensure that such data are examined and incorporated where available, and should encourage the development of and public access to such data. Susceptible subpopulations: In addition to variation over time and space, exposure to a chemical or the effects arising from such exposure may differ among particular subsets of human or ecological populations. This variation may be due any number of factors, such as inherent differences in the subpopulations themselves (e.g., children's respiratory rates are higher than those of adults), differences with respect to proximity to, or reliance on activities associated with, particular sources of exposure (e.g., occupational exposure, dependence on a diet high in fish or groundwater as a drinking water source), or differences in sensitivity to a substance (e.g., sensitization, genetic susceptibilities). (Less understood at present are the analogous differences in ecological subpopulations.) Policies need to account for such variations and ensure protection of the most susceptible and sensitive sectors of potential exposed populations.
F-GC-79	I do not understand the message of this post. It seems to be saying that it is often hard to estimate exposure potential for a particular chemical. This is undoubtedly true. However, hazard information is meaningless without exposure/dosage information. Most things are hazardous at some dose.
F-GC-80	Director, Environmental Sustainability Programs Ecolab Inc. supports science and risk-based chemical management policies that balance the 'triple bottom line' of sustainability: protection of the environment, assurance of product safety and promotion of innovation in the marketplace. Ecolab encourages the members of the California 'green' committees in the following specifics: • Understand both the burdens and benefits of new regulatory proposals. • Find a way to successfully manage both toxicity and exposure (i.e., risk) while providing the solutions California needs. • Utilize risk assessment methods that integrate knowledge regarding potential hazards of chemicals with an understanding of their uses and exposures. • Look for product stewardship and risk management programs that establish mechanisms to assure exposures remain in the safe region for typical uses and foreseeable misuses; and • Enact laws and regulations that: • are science-based, • balance potential risks with benefits, • factor in existing scientific knowledge as well as reasonable uncertainties, and • consider the degree of risk to people and the environment." We encourage California to study the availability of data now, particularly the availability of both hazard and exposure data, so that risk determinations can drive decision making. Please coordinate information needs with other governments and other sources of information. Do not reinvent the wheel. Ecolab is in the process of evaluating products/services to evaluate the 'greenness' and 'sustainability' of our products. One of the companies we have

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	evaluated is Chemical Compliance Systems, Inc. (CCS) which specializes in ecological, health and safety compliance, chemical security, and hazardous material management services. CCS has a database containing 220,000 chemicals and more than 75,000,000 data elements comprising 43 key environmental metrics. I first became aware of CCS on June 28, 2007 when I heard Dr. George R. Thompson, President & CEO, giving a presentation called "Web-based Databases That Facilitate Chemical, Product and Process "Green" Assessments and Automated "Green" Cleaning Product Development or Acquisition Assessments" at the 2007 Green Chemistry & Engineering Conference, Washington DC (www.GCandE.org) For products we submitted to them, they organized the results in three categories Ecology, Human Health and Safety in their default product 'report card' which weighs constituent chemicals and and their percentages in the formulation. They evaluated and produced 'report cards' on both concentrates and ready-to-use solutions on a number of our products, showing the sensitivity of their approach. The following procedure was used to produce each report card. For each metric, the chemical that is least sustainable/green is given a score zero and the most sustainabile/green is assigned 100. The scores in between are normalized so that each chemical (all 220,000) has a quantitative normalized score. They also have a Cross-Reference Dictionary & Regulatory Lists. The Chemical Cross Reference Dictionary contains 550,000 records of purified CAS numbers and their associated synonyms. This file facilitates accurate and complete materials management data searches and product substitution research. The Regulatory List of Lists file is comprised of over 650 international, federal, state and local regulated chemical lists and their associated data, as well as numerous CCS compiled lists (e.g., incompatible chemicals, hazard classes, etc.). CCS' modules compare a single chemical inventory file against these lists and generate a multitude of regulatory reports utilized by logistics, environmental/safety/ health, and chemical security professionals, as well as first responders. I strongly recommend California evaluate CCS's capabilities for application as part of California's Green Chemistry Initiative. I believe California's efforts will benefit from use of CCS's capabilities.
F-GC-81	lots of post's NO DIALOUGE i see many post's but no interaction between the poster's... could we perhaps have some interaction so as to stimulate ideas...? or is this site a reflection of the lack of cohesive cooperation needed to solve the problem
F-GC-82	The Chemicals Market Cannot Generate Green Chemicals Unless the Data Gap is Closed The Chemicals Market Cannot Generate Green Chemicals Unless the Data Gap is Closed Abstract The chemicals market is not a properly operating free market. Lack of publicly available information about the health and safety attributes of chemicals on the market – the Data Gap -- is making it impossible for those who buy chemicals to identify safer alternatives. When those who prefer green chemicals cannot identify and then purchase them, their demand cannot drive the market to supply green chemicals in favor of older, more hazardous chemicals. California has the capacity to take targeted steps to close the Data Gap, steps the state should take to foster a chemicals market that is capable of steadily innovating incrementally safer chemicals in response to market demand. Comments I am the Legal Director of the Science & Environmental Health Network (SEHN), a member of the coalition of NGO's called Californians for a Healthy And Green Economy (CHANGE). The prospect of comprehensive chemicals policy reform by California raises many issues. I wish to call more attention to one particular issue that is not commonly explored in debates over the regulation of chemicals, although it is raised by Wilson, M. P., et al. "Green Chemistry in California: A Framework for Leadership in Chemicals Policy and Innovation," California Policy Research Center (2006) (http://coeh.berkeley.edu/news/06_wilson_policy.htm) ("the

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	UC Report"). These comments are informed by my personal experience for over 15 years as an intellectual property attorney in the biotechnology industry and by my professional interest in the role of government in stimulating industrial innovation. One of the many lenses through which the UC Report views chemicals policy is the lens of the chemicals market. The UC Report clearly raises the following question: "Does the chemicals market, including the incentives provided by the legal and regulatory systems, adequately motivate industrial investment in green chemistry?" The answer to this question, which the Green Chemistry Initiative must squarely face, has to be "no." To reach this conclusion, one need do little more than consider the following two facts brought forth in the UC Report: • The 3,000 or so High Production Volume ("HPV") chemicals (those made or imported at over one million pounds per year) constitute more than 99% (by weight) of the chemicals in commerce in the U.S. • Of today's HPV chemicals, only 248 (about 8%) were introduced after 1979 (when the original TSCA Inventory of chemicals then in commerce was created). See UC Report, at p. 43; National Pollution Prevention and Toxics Advisory Committee, "Broader Issues Workgroup Thought Starter," at p. 4 (October 6, 2005) (see http://www.epa.gov/oppt/npptac/pubs/documents.htm). In other words, of the individual chemicals that together constitute over 99% by weight of the chemicals market, 92% were in the market 30 years ago. Of how many industries can it be said that its product line has changed so little in 30 years? The chemicals industry claims to be an innovative industry. If it is, it would seem that the industry is innovative not at developing new and safer chemicals, but mostly at finding new ways to use and formulate existing chemicals. This low rate of replacement of existing commercial chemicals is remarkable in view of the prevailing recognition that many of these chemicals, and not just a few, are likely to constitute some type of hazard. Basic research over recent decades has shown that many chemicals have a wide variety of adverse effects that often emerge many years after very low levels of exposure (including carcinogens, mutagens, reproductive toxins, neurotoxins, immunotoxins and others). The Canadian government has recently completed a review of the 23,000 chemicals registered for commerce in Canada and, despite data gaps, was able to identify over 4.000 chemicals as of sufficient concern to warrant further study (see http://www.ec.gc.ca/substances/ese/eng/dsl/cat_index.cfm). The European Commission, in developing REACH, concluded that 70% of the chemicals evaluated under its new chemicals program between 1981 and 2003 were shown to have one or more dangerous properties. European Commission, Extended Impact Assessment, COM(2003)644 final, SEC (2003) 1171/3 (October 29, 2003) ("EC Extended Impact Assessment"), at page 27 (http://ec.europa.eu/enterprise/reach/docs/reach/eia-sec-2003_1171.pdf). While the data gaps make it difficult to estimate precisely what proportion of chemicals on the market are likely to present a threat to human health and the environment, it is also difficult to dispute the European Commission's conclusion that under the EU's regulatory system that preceded REACH (and closely resembled the U.S. TSCA), a "significant proportion of all chemicals will enter the environment and reach sufficiently high concentrations to induce adverse effects." Id. In the United States and in California, we face this very same issue. What can account for such slow innovation of safer alternatives despite the technological promise of green chemistry? One reason is that our regulatory system is ineffective at removing hazardous chemicals from the market or restricting their use. As the UC Report describes in detail, the Data, Safety and Technology Gaps undermine the effectiveness of both federal and California environmental statutes. The weakness of the regulatory system permits chemicals manufacturers and industrial users of chemicals to externalize the damage associated with their products, rather than incorporate the cost of that damage into the price of their products. Because society therefore bears these externalized costs, manufacturers have little incentive to develop safer alternatives. Although not directly addressed by the UC Report, the Data Gap also compromises the efficacy of the tort liability system. Plaintiffs injured by toxic

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	chemicals must prove that they were exposed to particular chemicals and that those exposures caused their injuries. This burden is impossible to carry when people are exposed to chemicals that no one knows are toxic. Even the product liability laws, purportedly grounded in strict liability, require proof that the product caused the damage, proof that cannot be provided when such information does not exist. Under both our tort and regulatory systems, then, damage simply lies where it falls when it is caused by hazards that are unrecognized because of the Data Gap. But there is another reason, and that is the major focus of these comments. The Data Gap directly undermines the operation of the chemicals market and prevents it from operating as a properly functioning free market ought to act. While this issue is discussed in the UC Report (see UC Report at pp. 23, 37-55), it is worthy of a somewhat more detailed explanation. The thrust of these comments is also described in Guth, J., Denison, R. and Sass, J., “Require Comprehensive Safety Data For All Chemicals,” Background Paper for Reform No. 5 of the Louisville Charter for Safer Chemicals (2005) (www.louisvillecharter.org) (to be published in 2007 in New Solutions Journal). Over the last several decades, the field of information economics has demonstrated the crucial role of information in the proper operation of a market economy, and the serious economic consequences of “imperfect information” and “information asymmetries.” For an overview of information economics, see Stiglitz, J. E., "Information and the Change in the Paradigm in Economics, Part 1,” 47 The American Economist 6-26 (Fall 2003); Stiglitz, J. E., "Information and the Change in the Paradigm in Economics, Part 2,” 48 The American Economist 17-49 (Spring 2004) (available at http://www2.gsb.columbia.edu/faculty/jstiglitz/papers.cfm). See also Stiglitz, J.E., Globalization and Its Discontents, pp. 73-74, 261n.2, W.W. Norton & Company, Inc. (2003). In the language of economists, an ideally functioning free market is one in which consumers are free to buy the goods and services they desire, which are then produced by the market according to the laws of supply and demand. But for demand to reflect what consumers truly value, consumers must have access to all information that would affect their choices. Without this information, the prices people pay for goods and services will not reflect their true preferences, and people will inadvertently buy goods and services they would not buy if they had more information. When this happens, the market is said to be “inefficient” because it is not producing goods and services according to the true desires of consumers. Lack of information causes a “market failure” by preventing the laws of supply and demand from driving the market to produce what people really want. Information economists have focused on the damaging economic effects of what they call “imperfect information,” including both nonexistent information and information that is available to some, but not all market actors. They have shown that imperfect information and the resulting market failures and economic inefficiencies are pervasive in all economies, including the U.S. economy. They have shown that the market itself often does not provide incentives for creation and disclosure of information and, to the contrary, often provides incentives for market actors to conceal information in order to gain market power and entrench themselves in the market. They also have shown that the market often simply cannot correct these market failures. Government can take steps to correct this type of market failure in order to make the market more efficient, i.e., responsive to informed consumer demand. Government can require that the needed information be produced and made widely available to the market. Well-known examples of such government action include the securities laws (requiring accurate financial disclosures by public corporations) and the drug laws (requiring pre-market proof that drugs are safe and effective). These laws were adopted after serious threats to the proper operation of the financial and drug industries arose, threats that the market alone was unable to redress. Though these laws impose some burden on the affected industries and are by no means perfect, they have plainly strengthened those industries by making them more efficient in the economist’s sense of being more responsive to the desires of investors and consumers, thus enabling the economy to produce financially stronger companies and better drugs. Turning to the chemicals market, many market actors are capable of using chemical safety information when they buy products, including information about the hazardous properties of chemicals as well as how they are used and disposed of. Industrial users of chemicals in particular are often technically sophisticated enough to choose the safest chemical that will suit their purposes, if they can get the information they need. Similarly situated are many other market actors, including:

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	• public health professionals trying to evaluate and prioritize risks to the public; • purchasing organizations including those created by hospital groups; • state and local governments and others attempting to purchase safer products; • green building and other green standard setting bodies; • consumer organizations, and indeed many consumers, attempting to identify safer consumer products; • health-affected groups, citizens and community groups attempting to use information provided by the right-to-know laws to reduce pollution in their communities; • workers attempting to ensure safe workplaces; and • environmental and public health activists trying to motivate corporations to green their activities through market-based environmental and health protection campaigns. However, the Data Gap -- the pervasive lack of safety information in a publicly-available, credible and reliable form for the majority of chemicals in commerce -- is impeding their efforts. While market actors can sometimes avoid products they know are hazardous, the data gaps render them unable to choose products that they know are safer. They are at constant risk of failing to choose what is in fact the safest alternative and of unwittingly choosing a product that turns out later to be equally or perhaps even more hazardous than the chemical they avoided. Because they cannot accurately select and buy safer alternatives, the demand by these market actors for safer products is not being adequately expressed or realized in the market. One often hears that some of these market actors, especially consumers, are incapable of understanding and actually using chemical safety data, so that making such data available to them would not drive the market toward safer chemicals. This argument ignores the fact that professional analysts often analyze complex information on behalf of market actors, who can then act on those analyses without necessarily understanding the information themselves. For example, most investors do not read the financial information made available to the market by individual companies – they rely on brokers, analysts and mutual fund managers to do so. In as similar recent example in the chemicals market, the Environmental Working Group has studied the ingredients of sunscreens and rated them for relative safety based on the information available about those ingredients (see http://www.ewg.org/node/21774). Clearly, readily available chemical hazard information would drive the large and growing demand for greener and safer products and would ensure that more chemical safety information would indeed be used by the market. The Data Gap also prevents chemical manufacturers from innovating and marketing safer chemicals even when they want to. Innovation cannot occur unless a firm has the willingness, opportunity and capacity to change its technology, and information about technological alternatives is fundamental to these preconditions for innovation. See Ashford, N.A, “An Innovation Based Strategy for a Sustainable Environment,” in Hemmelskamp et al. (eds.), Innovation-oriented Environmental Regulation: Theoretical Approaches and Empirical Analysis, pp. 67-107 (2000). Broad information about which chemicals are safe and which are toxic is the fundamental technological knowledge that would-be green chemists must have in order to design safer chemicals – without a full understanding of which chemicals are safe and why, green chemists cannot succeed. Moreover, when manufacturers are unable to fully understand and openly discuss the comparative safety of chemicals in the market, they cannot promote their own products as safer alternatives. Thus, even those who do sell safer chemicals cannot fully claim an advantage in the marketplace, and indeed may not even know they have such an advantage. By preventing manufacturers from gaining any reward in the marketplace for safer chemicals, the data gaps reduce the commercial incentive to develop safer products and reduce industry investment in green chemistry. There is also an asymmetry between pre-1979 and new chemicals (i.e., all chemicals introduced after 1979) that would seem to be causing even further distortion of the market. Though imperfect, TSCA does enable some opportunity for government scrutiny of newly introduced chemicals that does not apply to all older chemicals. This unequal playing field constitutes an additional regulatory preference for older chemicals. One of the explicit objectives of the EU’s new REACH chemicals regulation is to level the playing field for all chemicals and eliminate the preference for older chemicals.

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	Some industry groups argue that the chemical industry possesses substantial chemical safety information that is not publicly available. But even if this is true, the mere existence of such information does the broader market no good. Information that is known by some market actors but not others is a type of imperfect information that causes market failures just as certainly as does nonexistent information. Information used by inside traders is an example. Industry groups also often argue that the HPV Challenge Program is filling the Data Gap. (For a recent critique of the completeness and quality of the data being produced by this voluntary program, see Denison, R. "High Hopes, Low Marks," Environmental Defense (2007) (http://www.edf.org/pressrelease.cfm?contentID=6658)). However, this program at best will provide the OECD SIDS (Screening Information Data Set) data. The SIDS dataset is a far smaller data set than REACH will require for high tonnage chemicals. It is only a set of screening level data that, while perhaps useful as a long-overdue starting point for evaluating these chemicals, is not likely to be sufficient to allow regulation under current law. Nor does this screening level data permit a reasonable evaluation of the safety of the HPV chemicals for human health and the environment, which is what the market needs in order for demand to drive innovation of safer chemicals. (For a comparison of the SIDS data set and the REACH high tonnage data set, see Appendix to Guth, J., Denison, R. and Sass, J., "Require Comprehensive Safety Data For All Chemicals," Background Paper for Reform No. 5 of the Louisville Charter for Safer Chemicals (2005) (www.louisvillecharter.org) (to be published in 2007 in New Solutions Journal)). In sum, the lack of credible and reliable publicly-available chemical safety information is dampening the influence on the market of the many social forces attempting to drive the innovation of the safer chemicals, and it is undermining the ability of industry itself to innovate those products. Why should the chemicals industry strive as it does to maintain such a flawed market? Unfortunately, it is an all too common story. The chemicals market is a classic example of a market dominated by mature firms that seek to block changes that would encourage innovation and entry into the market of new competitors that will gain market share. See Ashford (2000), cited above. Also, fear of liability and regulation that could result from proof their products are unsafe causes firms to perpetuate the information gaps and use them to protect their products and entrench themselves in the market. Thus, acting rationally in their self-interest, they resist actively studying the environmental health effects of their products, produce studies that all too often are designed to exonerate their products, resist independent study by others of their products and oppose measures that would encourage more information disclosure and foster innovation of safer substitutes by competitors. As a result, threats to human health and the environment can only be discovered too late, once chemicals become widespread throughout industry and the environment, and after the impacts have grown large, obvious, distinct and undeniable. If we seem condemned to struggle to protect the environment and human health by belatedly confronting substantial threats caused by entrenched and powerful industries, it is because our current chemicals market ensures that we are locked into this position. One advantage of a government strategy of remedying a market failure by closing data gaps is that its relative cost can be low. In the case of the chemicals market, the cost of closing the Data Gap would constitute a minimal percentage of product prices. After all, information about a particular chemical only has to be produced once. The great bulk of existing untested chemicals must be dealt with only one time; thereafter the information requirements for new chemicals on an ongoing basis would become a much-reduced and manageable task. One estimate of the direct and indirect costs of compliance with the EU's October 2003 REACH proposal (and not just the data requirements) was less than 10 billion euros over an 11 year period, less than 0.15% of the chemical industry's sales revenue over that period. Ackerman, F. and Massey, R., The True Costs of REACH, Global Development and Environment Institute, Tufts University (2004). The cost of REACH as actually passed is estimated by the EC to be much lower (see http://ec.europa.eu/enterprise/reach/faq_en.htm#cost). See also a 2004 overview of 36 studies on the expected impact of REACH on business and European society (http://www.eu2004-reach.nl/downloads/Comprehensive_Overview-v2.pdf). Moreover, each dangerous chemical that is replaced or prevented from ever reaching the market would not damage human health or the environment or need to be cleaned up. The European Commission determined that the costs of its chemical information and other requirements for 30,000 chemicals under the 2003 REACH proposal were far outweighed by the benefits expected from reducing human disease. European Commission, Extended Impact Assessment, COM(2003)644 final, SEC (2003) 1171/3 (October 29, 2003) ("EC Extended Impact Assessment"), pp. 24-29 (http://ec.europa.eu/enterprise/reach/docs/reach/eia-sec-2003_1171.pdf). Most

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	importantly, however, a chemical information requirement would underpin a marketplace that rewards innovation of safer chemicals and encourage creation of a sustainable, safer chemical industry. This industry of the future is what the EU is setting out to create by implementation of their REACH regulation. As the UC Report makes abundantly clear, without taking similar steps, California and the U.S. risk being left behind. To remedy the market failures being caused by the Data Gap, California should require the chemicals industry to provide to the public and government a basic level of health and safety information about its products as a condition of entering and remaining in the public marketplace. The information must be reliable and it must be comprehensive, that is, sufficient to permit the reasonable evaluation of the safety of chemicals for human health and the environment. It must be a firm, mandatory requirement that applies to existing as well as new chemicals. There must be an established deadline for provision of the required information for chemicals already on the market. The intellectual property value of the discovery of safer chemicals should be recognized while also providing for the public's need to know. Some government oversight of data quality may be required, but excessive intrusion into the industry development process should be avoided. These and other elements of a data requirement are discussed in more detail in Guth, J., Denison R. and Sass, J., "Require Comprehensive Safety Data For All Chemicals," Background Paper for Reform No. 5 of the Louisville Charter for Safer Chemicals (2005) (www.louisvillecharter.org), to be published in 2007 in New Solutions Journal. While a federal program to close the Data Gap may have advantages, it is in California's interest and well within its capability to take meaningful, targeted steps toward closing the Data Gap that would significantly improve the operation of the chemicals market in California. There are many ways the State could target its efforts. • California could focus on closing the Data Gap for chemicals sold at high volume within the State. The targeted chemicals could be further limited by targeting chemicals that also have a high volume within the United States to ensure chemicals bearing the burden of the information requirement have a national economic base. • California could tier the required data sets according to volume in commerce, as in REACH. • The required data sets could be structured as stepwise requirements wherein further data would only be required if warranted by reliable screening level data. • The required data could be harmonized with other data requirements, such as those of REACH. For example, California could require that manufacturers of California high volume chemicals provide the REACH high volume data set to the state and the public. • California may be able to devise more efficient and more useful tests than those employed by REACH. State entities such as California's Office of Environmental Health Hazard Assessment (OEHHA) have considerable expertise that the state could draw on to consider this possibility. Conclusion Green chemistry has enormous technological potential. But this potential will not be fully realized across the breadth of our economy unless the market motivates industry to invest in green chemistry at a scale that is commensurate with both the industry's resources and with what is at stake for our society. This requires the market to provide commercial rewards to those who develop safer alternatives. The market cannot provide these rewards unless all those who demand safer chemicals are able to evaluate the safety of the chemicals in the market. Established chemical companies will resist this analysis. Nevertheless, the Green Chemistry Initiative should envision and seek to foster a chemicals market that is capable of steadily innovating incrementally safer chemicals in response to market demand. It should seek to foster a market that looks like many other competitive markets in California, such as the electronics and biotechnology industries. In those evolving and competitive industries, the industrial sector itself remains strong even though individual companies regularly relinquish their market leadership and decline because they fail to remain on the cutting edge. The Green Chemistry Initiative should focus on the strength of the chemicals industry and on the needs of society as a whole, not the continued strength of existing dominant companies and their existing products.

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	The full success of green chemistry requires the Data Gap to be closed. California should take steps to close it. Joseph H. Guth, Ph.D., J.D. Legal Director Science & Environmental Health Network (510) 559-3496 www.sehn.org joe@sehn.org
F-GC-83	the shift in the tide will occur when this happens..... go back in time prior to the petro/benzine/chemical revolution... dow/basf/union carbide/rpm/betco/cheveron etc. were not in business... once in business they all made tons of money hocking their wares once the money was made by convincing you of "better living through chemistry"...there was to be no turning back....until now..or recently.... the awareness of chemicals actually not being good for you or the environment seemingly a slow process of understanding by the general public....of course because those that profit from the creation of said chemicals have no reason to shoot themselves in the foot...and the general public is overall of a low i.q, watches to much t.v and would expect the government to inform them of such risk, if it existed...but of course it does....its just not presented as such based on our lobby driven style of politics... so where does this leave us.... with a bunch of 100+ year old companies making billions of dollars a year with absolutely no incentive to stop profiting on their products...they only "poke" at green chemistry in the guise of seeming like they are generally concerned and doing something about it....they are not...the stewardship programs are smoke and mirrors intended to give the impression that their "on it"...they only change when its mandated by the feds... the only way it will change is by people slowly becoming aware that these things are destroying the earth slowly...this will create fear....fear will create change....as seen with the fear of global warming. and.... when the counter insurgency happens... what is that you ask... its when pioneers such as myself create a substantial amount of clout by creating "anti chemical chemical companies" that are profitable...only once money powerful green companies exist will they be able to stand up against "them" and create change...not with the green chemistry...but with the money lets just take the residential building industry and all the chemicals used in the building of residential homes... are they needed?....were not homes built prior to the chemical petro revolution "sound"....of course they were, not only that they last and have lasted much longer than modern homes built using chemicals...well gee i thought all these chemicals were supposed to make the homes last longer and be better....or is it just that those that produce these products have quashed old technology that worked just fine, because of course they could not make money from it....in with our new chemicals out with the old things that worked just fine....why, because we can make a buck on it....and soon enough those that remember the way it used to be done die,and the new chemical way takes over... the police can not police the police... i suggest incentive programs for NEW inventors and companies outside of the "chemical kings" court...

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	"they" have too much lobby money to have any heavy mandates placed on them... to think outside of the box...your going to have to create a new one.... start at the uc's and private sector people are slow to change when their drunk on ethonol spiked with m.e.k and methonol, saturated with pfa's and drinking water laced with mtbe.....
F-GC-84	Risk-Based Evaluation – the One Approach that Makes Sense Chemistry has enabled the development of countless products that consumers use each and every day, and consumers want to understand what impact these products may have on the environment and on their health. Industry shares this desire, and continues to strive to develop, produce and market products that are both beneficial and safe for people and the environment. Given the complex and multifaceted technical, societal and policy elements that are inherent in the design, manufacture, use and disposal of these products, one must consider a number of factors to effectively assure their safety. Approaches to safety that are performance based and flexible will provide the greatest benefits and allow the development of innovative approaches within the context of California's Green Chemistry Initiative. Industry works to minimize exposure of workers and the public to all chemicals that could be considered hazardous as used, and we pay particular attention to chemicals considered to be hazardous to humans or the environment. At the same time, industry uses chemicals that are least hazardous, and thus require the least expense in worker and public safeguards, consistent with the production of effective and economically accessible products. The two halves of risk--hazard and exposure--are always part of our planning and never far from our minds. Approaches that utilize risk-based evaluations of chemicals to determine efficacy and safety should serve as the foundation for decision making within programs that flow from the California Green Chemistry Initiative. While the toxicity of a substance is an important consideration in a risk based evaluation, the potential for toxicity must be considered in the context of exposure--including exposure level, route, duration and timing. Every substance can produce toxicity under certain exposure conditions. Even common-place substances usually thought of as benign, such as water and table salt, can cause death when ingested at too high a dose over short periods of time. Conversely, even the most toxic substances pose virtually no risk when releases are controlled and exposures are minimized to levels below which, given an adequate margin of safety afforded by risk assessment techniques, the doses will not elicit adverse effects. For example, arsine gas is used to make microcontroller and microprocessor chips, and although arsine gas is highly toxic when inhaled, its "presence" in semiconductor chips in products used in every day life--computers, calculators, appliance microprocessors--poses no health hazards or risks from in-home normal and customary uses. So the question is not just, "How do we control toxic substances?", but also how do we successfully manage both toxicity and exposure--risk--while providing the solutions society needs? The answers to these questions are best provided through: 1) Risk assessment methods that integrate knowledge regarding potential hazards of chemicals with an understanding of their uses and exposures; 2) Product stewardship and risk management programs that establish mechanisms to assure exposures remain in the safe region for typical uses and foreseeable misuses; and 3) Laws and regulations that: • are science-based, • balance potential risks with benefits, • factor in existing scientific knowledge as well as reasonable uncertainties, and • consider the degree of risk to people and the environment.

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F-GC-85	Green Clean Renewable Energy Generated On-Site A breakthrough technology providing a green renewable hydrogen fuel requiring no carbon based fossil fuel nor utility electricity for its generation yielding neither C02 nor any other polluting and greenhouse emissions. For more information: http://www.dtsc.ca.gov/PollutionPrevention/GreenChemistryInitiative/Archive.cfm Posted by Green Chemistry team on behalf of Thomas W. Oakes
F-GC-86	Risk Assessment Methodologies (RAM) Technical Committee The overall mission of the RAM committee is to augment current exposure and risk assessment methods and model development efforts through projects, workshops, and scientific symposia aimed at addressing critical issues such as data needs, data characterization, and model evaluation. For more information: http://dtsc-cm/PollutionPrevention/GreenChemistryInitiative/Archive.cfm Posted by Green Chemistry team on Behalf of the Risk Assessment Methodologies (RAM) Technical Committee
F-GC-87	Quantitative Assessments of “Green” Munitions and Chemicals of Concern For many years, the Department of Defense (DOD has made a concerted effort to reduce the potential impact of munition constituent and other chemicals on human health and the environment. In 2000, the U.S. Army Defense Ammunition Center (DAC) began working with Chemical Compliance Systems, Inc. (CCS) to use CSS’s extensive centralized Relational Chemical and Product Databases as the basis for a series of integrated, web-based modules within what has become the Munitions Analytical Compliance Suite (MACS). (CCS’s centralized databases included over 650 regulatory lists.) MACS includes eight modules. In a few months, the 9th and 10th automated modules the Emissions Risk Assessment and Human Health Risk Assessment–will be added. The most comprehensive of the MACS modules is the “Green” Munitions Analytical Compliance System (G-MACS). CCS developed G-MACS for DAC and PEO Ammunition Office in 2003. DAC and CCS co-own G-MACS, which has been available to 13 military munitions demilitarization facilities and two munitions management offices from coast to coast since its development. Military munitions design engineers can use the G-MACS’s 43 quantitative ecological, health and safety criteria (Endpoint Criteria) to eliminate or reduce the use of hazardous munitions constituents to create a theoretical munition composition that substitutes alternative components, parts or chemicals, and calculates the “green” grade for the total, component, or part composition in 5 to 20 seconds. G-MACS can also quickly identify which munition constituents have an impact on any of 112 state, federal or international regulations. This electronic design capability greatly reduces the labor and time required to design a “greener” munition. G-MACS also has application to other munitions activities (e.g., acquisition handling, demilitarization). Using a munition’s National Stock Number (NSN), G-MACS can calculate a munition’s overall “green” grade, its ecological, health and safety scores, and the 43 Endpoint Criteria scores within five to 10 seconds. Because all scores are normalized on a scale from 0 (worst) to 100 (best), comparisons of the “greenness” of two (or more) munitions is easy and quantitative. The evaluator can view individual scores, from worst to best, as a means to determine those constituents that need to be replaced to improve the “green” grade. When G-MACS is combined with CCS’s proprietary “Green” Process Analytical Compliance System (G-PACS) the four stages of a product life cycle (i.e., design; manufacture; stockpile management [e.g., handling, transportation, storage]; and disposal) can be evaluated. G-PACS uses the same 43 Endpoint Criteria as G-MACS, but analyzes the chemicals used in each step of the manufacturing process, or wastestream, rather than the constituents used in a munition. The MACS Chemicals of Concern (MACS-COC) module combines the objective and quantitative 43 Endpoint Criteria with quantitative Regulatory Impact and Inventory On-Hand Criteria to calculate a ranked Level of Concern listing for any facility’s inventory. This prioritized list can be beneficial in decision making, particularly in regard to inventory management, pollution prevention, and cleanup.

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	I strongly recommend California evaluate CCS's capabilities for application as part of California's Green Chemistry Initiative. I believe California's efforts will benefit from use of CCS's capabilities. CCS's web-based capabilities, their innovative approach, and their willingness to develop new or modified, integrated capabilities has proven beneficial to the Army's efforts to both be good stewards of the environment and to implement its sustainability program. Although I have not used them, I am aware of CCS's non-munitions capabilities, and believe that they would prove to provide tools of value to the civilian community and decision makers.
F-GC-88	Consider Eco endpoints in green chemistry initiative At the suggested of Bill, I would like to offer the following comments. When the impacts of harmful chemicals are evaluated, ecological effects as well as human health effects of toxic materials should be considered. It might be helpful to develop a simple searchable spreadsheet for your audience containing info on the current chemical, why it is harmful to human and ecological health, and what alternatives are available. Even starting with 25 chemicals would be a place to begin; more chemicals could be added on a quarterly/yearly basis. It might also useful to develop factsheets for your audience describing each of the chemicals of concern, theri effects, and possible solutions/alternatives. Hope some of these ideas might be helpful. Barbara OEHHA
F-GC-89	not good enough for me... the problem is the word "chemistry".... what this implies if a VERY SOPHISTICATED LEVEL OF KNOWLEDGE... a level that the average consumer or person does not have...this then allows "bamboozelry" to occur.... for example go to TOXINET.COM type in any nasty chemical, lets say poly functional azridine or stoddard solvent...here we have a cumulative assessment of these compounds with thier respective potential health and environmental "issues"...i guarantee you any of these potential concerns are not that your hair will grow thicker and you'll have slimmer hips and thighs....no its more like, well were pretty sure this stuff is a sensitizer and that it probably causes cancer....but because were just a bunch of independent phd's presenting facts gathered from patients and environmental studies we have no cohesive voice....so , well we'll just post our findings here and let people who are concerned stumble on the info.... how bout, who let them start circulating these chemicals anyway?....funny how "things" not governed by the fda {stuff that goes directly into your body} don't really have that many hurdles to jump over before they can hit the market in any variety of forms.... AND MANY OF THEM NOT NEEDED.... the household cleaning racket as well as the building materials/coatings racket are perfect examples of chemicals being invented before there was a use for them, then creating a use for them, that use being of course a dramatic improvement over whatever was being done before...ya right then theres the fact that the sway tips towards the guys saying" ya this stuff we invented...its great...it will make this better...so were gonna put it in this and sell it"....vrs. the phd who says i dunno this stuff might cause cancer....lets not even get into food additives so the information is all there if you want to find it... the question is WHY were any of these chemicals allowed to be marketed in the first place?....chemicals invented, then coming up with a need for that chemical is purely about money...

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	your not being "scared" or allowed to be scared is lobby money keeping the kibosh on public education about "potential" problem chemicals, "they" side with the manufacturer, not the guy who says its killing you.... only when "fear" enters the picture do people respond..."fear of lead, fear of plastic leeching chemicals, etc. if in some hypothetical netherworld we could create a talking label{many people are too lazy to read good books let alone product labels} talking labels that started listing off all the potential health and environmental effects...i have a feeling many of those products would not sell...
F-GC-90	Environmental Impact Database for Point-of-Purchase Access While many consumers have the desire to engage in sustainable purchasing, they do not have access to a central source of reliable information at the point of purchase — the moment when they actually buy a product. This information could be made available over existing infrastructures, such as that used by web-enabled cell phones. The GreenScanner Project - http://www.GreenScanner.net - is one such attempt. GreenScanner is a public database of information and opinions about the environmental friendliness of various products. Users are able to contribute any information they have, and to evaluate the information contributed by others. This database is then available to consumers with web-enabled phones - a potential purchaser could use his or her phone or PDA to scan the barcode of a particular product, and then view a unified rating of how environmentally friendly that product is. Thus GreenScanner can be used to promote sustainable purchasing at the time of purchase itself. GreenScanner's grassroots-based collection of information could be greatly supplemented by environmental information formally provided by the companies that produce the products. A central website containing links to company-supplied information would be an excellent source of information for GreenScanner, and Californian consumers as a whole. Companies who wish to do business in California could be required to provide this website with links to information about the chemical composition, production methods, and overall (projected) environmental impact of products they make. Having a common format for this information (similar to the Nutrition Facts on the back of foods) would allow for viable comparisons across products. GreenScanner would then be able to crawl this website, collecting the information and making it easily available to consumers at the point of purchase by delivering the information on demand to their web-enabled mobile device.
F-GC-91	How is this different from Design for the Environment? How is this different from the EPA Initiative in the early 1990's called "Design for the Environment" (DfE)? Are there lessons to be learned from that program? Has that been considered? Since this is not really a new idea, the real question is how can it be MORE successful than past attempts to reach the same goal? Historical research may be helpful. Linda Gianelli Pratt
F-GC-92	My thoughts are along the same line. Waste minimization became pollution prevention which begat green chemistry. Is this an evolution or renaming of a concept?

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F-GC-93	Program Manager Today's Washington Post had an article about the spread of green chemistry programs at universities (http://www.washingtonpost.com/wp-dyn/content/article/2007/10/09/AR2007100900247.html) Though the number is still very small (about a dozen programs), it's a start. No Calif. college or university was mentioned. I agree with those who have mentioned creating univ. programs to develop green chemistry expertise and professionals in the state as a way to drive this issue. The article even mentions a university program that is teaching high school teachers green chemistry principles for them to bring back to their students at an earlier age. I have not been aware of any participation at the GCI workshops of university administrative leaders or chemistry dept. It would seem appropriate that DTSC specifically reach out to our key universities, both public and private, and invite them to participate. I also would suggest a specific meeting to discuss with such leaders how to create green chem. programs or integrate its principles into the current curriculum. Please include other stakeholders in that conversation, so that these academics get a well rounded picture of what is needed.
F-GC-94	Green Chemistry & Product Stewardship The California Green Chemistry Initiative is defined by DTSC as an effort to stimulate a “transformation in the design of products and processes.” Interestingly, DTSC’s leading recommendation for bloggers (“…Consider public health and the environmental effects of chemicals during the process of designing products and industrial processes…”) could have been lifted directly from the American Chemistry Council’s Responsible Care® product stewardship program – a program which has been in place since 1991, more than 15 years before California’s initiative. All members of the American Chemistry Council, which represents the leading companies engaged in the business of chemistry, participate in Responsible Care® as a requirement of membership in ACC. “Green chemistry” is product stewardship done right. It is the practice of making health, safety and environmental protection an integral part of the full life cycle of chemical products, including design and manufacture. Under Responsible Care®, this includes evaluations of chemical products and their uses to help assure that those products deliver their intended benefits to society while protecting public health and the environment. Responsible Care® requires our members to employ rigorous management systems that are certified by third-party auditors. In addition to numerous other elements, those auditors certify that our companies have systems to manage risk associated with chemical products and that those systems include management of product development, transport, use and disposal in a safe and secure manner. Companies are also audited on their programs to protect the environment and conserve programs, as well as processes to dialogue with stakeholders about the organization’s impact on human health and the environment. Companies’ performance under Responsible Care® is publicly shared with the public through a first-of-its-kind website: americanchemistry/responsiblecare.com. Reducing hazardous materials in products and processes is also simply good business sense. Hazardous materials cost companies money in additional storage, transportation and disposal fees, as well as additional cost for protecting their work force through engineering controls and personal protective equipment. DTSC and the public can obtain more information on what the chemical industry has been doing in the Responsible Care® program from http://www.responsiblecaretoolkit.com. It’s critical that DTSC’s recommendations to CalEPA in the Green Chemistry Initiative recognize the value and role of industry stewardship programs, and create incentives for others to take similar steps. This is particularly true through the entire value chain, up to and including end users of chemicals and the products made from chemistry.

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F-GC-95	Biomonitoring should be a part of the green chemistry policy Biomonitoring should be a part of the green chemistry policy as a feedback and as part of a Plan-Do-Check-Act management system. EPA Research Grants News Release (HQ): Protecting Americans through Better Chemical Exposure Monitoring Protecting Americans through Better Chemical Exposure Monitoring Contact Information: Suzanne Ackerman, (202) 564-4355 / ackerman.suzanne@epa.gov EPA announced $4 million in grants to five institutions that will work on improving biomonitoring at the Public Health Applications of Human Biomonitoring Meeting. The meeting of experts was sponsored by EPA and the International Council of Chemical Associations (ICCA) Monday and Tuesday at EPA's Research Triangle Park campus. "Protecting public health is an important part of this research and EPA's mission," said George Gray, assistant administrator for EPA's Office of Research and Development. "Biomarkers can help us understand the connections between human exposure, dose, and health effects, and the work EPA is funding will help improve our understanding of how the Agency can use biomarkers to protect human health and the environment." Biomonitoring is the measurement of toxins in people by testing specimens such as blood and urine. Such measuring is critical to tracking public health and establishing public health and environmental policies. Biomarkers are the types of measurements done that show the presence of a chemical. For example, cotinine is a biomarker of exposure to cigarette smoke. Much more work remains to be done to develop other reliable biomarkers, and these grants will further this important endeavor. Biomonitoring also helps federal agencies determine where the U.S. is making progress in reducing exposure to harmful chemicals and where more work needs to be done. CDC's annual biomonitoring report, "National Report on Human Exposure to Environmental Chemicals" (NHANES), showed that people's exposure to secondhand smoke has been greatly reduced, and blood lead levels in children are way down. The five EPA Science to Achieve Results (STAR) research grants will be used to develop computer models that can match biomarkers with exposure and/or dose for many chemicals including chlorpyrifos, diazinon, parathion, carbaryl, perfluorooctanoate (PFOA) and perfluorooctanesulfonate (PFOS). The research results will allow scientists and risk assessors to understand more about the meaning of biomarkers resulting from exposure to these insecticides and fire retardants. EPA's STAR program funds research grants and graduate fellowships in many environmental science and engineering disciplines through a competitive solicitation process and independent peer review. The program engages the nation's best scientists and engineers in targeted research that complements EPA's own research programs and those of our partners in other federal agencies. <http://www.epa.gov/ncer/07biomarkers> More information about the grants: epa.gov/ncer/07biomarkers <http://www.epa.gov/ncer> More information about the STAR grants program: epa.gov/ncer <http://epa.gov/hhrp/> More information about EPA's human health research program: <http://www.epa.gov/ord/npd/hhrp/___> epa.gov/hhrp/ The grants funded by EPA were awarded to: * The Hamner Institutes, Research Triangle Park, N.C., $750,000 - Develop a new model to interpret biomarkers of exposure for carbaryl, a carbamate insecticide used on many crops. * Clark University, Worcester, Mass., $677,499 - Use models to derive a developmental reference dose and/or acceptable daily intake for the organophosphate pesticide chlorpyrifos. * Colorado State University, Fort Collins, Colo., $748,582 - Develop a new model to interpret biomarkers of exposure for chlorpyrifos and diazinon, two organophosphate (OP) insecticides. * The LifeLine Group, Inc., Annandale, Va., $749,991 - Link exposure and models as a method to characterize the relationships between exposures and biomarker levels of two perfluorinated compounds, perfluorooctanoate (PFOA) and perfluorooctanesulfonate (PFOS).

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	* University at Buffalo, Buffalo, N.Y., $749,612 - Improve existing models to better estimate exposures, target tissue dose and resulting effects in human populations, using biomarker data for the organophosphate pesticides chlorpyrifos, parathion, methyl parathion, and diazinon. Note: If a link above doesn't work, please copy and paste the URL into a browser.
F-GC-96	Quantitative Web-based "Green" Munitions Analyses The United States Army Defense Ammunition Center (DAC) has partnered with Chemical Compliance Systems, Inc. (CCS) to develop munition analytical compliance capabilities for the past eight years. Along with other DOD organizations, in 2003, DAC contracted CCS to develop a tool that would assist the Army in efforts to assess munitions from a “green” perspective. What came out of this was a Web-based tool known as the “Green” Munitions Analytical Compliance System, or G-MACS. Since no green criteria had previously been established for munitions, or any other product, the development of G-MACS by CCS with 43 ecological health and safety “green” criteria made a giant step forward in helping our design and manufacturing installations with an automated capability to assess the “greenness” of munition constituents early in the life cycle. The “green” scoring criteria in G-MACS was programmed to be flexible and dynamic enough to be modified as needed to support any environmental factors and/or guidelines on “greenness” that might be developed. G-MACS is unique in that it can, in combination with the CCS “Green” Process Analytical Compliance System (G-PACS), be used to “score” a munition for “greenness” throughout the life cycle (cradle to cradle). G-MACS, along with other CCS systems such as their "Green" Product Compliance Analytical System (GP-CAS), and "Green" Process Analytical Compliance System (G-PACS), could be utilized to provide a complete life cycle “green” product measuring tool that not only covers munition constituents but also, paints, pharmaceuticals, cleaning products, pure chemicals, etc. After a number of years of working with CCS and knowing the tools that they developed such as MACS and G-MACS, DAC is confident that the State of California could benefit by utilizing CCS and their GP-CAS, G-PACS and G-MACS Web-based tools.
F-GC-97	ACC's Perspectives on California's Green Chemistry Initiative The business of American chemistry is built on fundamental science. As a result, the members of the American Chemistry Council (ACC) support science and risk based chemical management policies that simultaneously protect health and the environment, assure product safety and promote innovation in the marketplace. Our industry has always relied upon innovation in its development of products and processes to meet customer needs and expectations, address new regulatory requirements, and to fulfill voluntary commitments to programs that go beyond the law. It’s important to note that “Green Chemistry” is a way of doing business was never intended to be applied as a government mandate through regulation or legislation. Indeed, the American Chemical Society’s Green Chemistry Institute states: "Green Chemistry differs from previous approaches to many environmental issues. Rather than using regulatory restrictions, it unleashes the creativity and innovation of our scientists and engineers in designing and discovering the next generation of chemicals and materials so that they provide increased performance and increased value while meeting all goals to protect and enhance human health and the environment." So how should California approach green chemistry? We think there are a number of threshold issues DTSC must be prepared to address in making recommendations on the basis of this initiative:

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	1. Make a baseline assessment of chemical information that is already available to the State. In ACC's view, there is a lot of information already publicly available on chemicals in commerce, and a lot more coming on line, from other States, the federal government, foreign governments, intergovernmental organizations, and even non-governmental organizations (including industry). DTSC should be studying the availability of data now, particularly the availability of both hazard and exposure data, so that risk determinations can drive decision making. It simply makes sense for California to coordinate on information needs with other governments and other sources of information – why reinvent the wheel? More importantly, DTSC doesn't have to wait until the end of its Green Chemistry Initiative to get the ball rolling on this important element. 2. Reiterate the commitment that the Green Chemistry Initiative will be governed by science. Many entries in the "Conversation with California" appear to be based on an underlying assumption that the current design of products and manufacturing processes is not adequately protective of health and the environment, and recommend that DTSC suggest hazard-based approaches to decision making. That's not good policy. As DTSC acknowledged in the launch of the Initiative, science should govern the process. Americans (and Californians) are living longer, healthier, and safer lives than ever before, and significant improvements have been made in public health and the environment. An extensive legal and regulatory framework, coupled with myriad voluntary programs, initiatives and innovations, has led to those advances in health and the environment. We hope that the Green Chemistry Initiative will examine the basis for the assumptions about the adequacy of current protective measures as policy options are identified. 3. Commit to understand both the burdens and benefits of new regulatory proposals. One University of California report on chemical regulation in California noted that businesses in California labor under a "labyrinth" of rules enforced by a number of agencies. Interestingly, many of the entries in the "Conversation with California" argue that even more regulation is necessary! Some have referred to Europe's new REACH regulation as the solution – taking the interesting position that a regulatory program that is not yet even operating is now a benchmark for chemical regulation. 4. Acknowledge that engineering is a part of "green chemistry." ACC member companies are leaders in green chemistry and green engineering in their operations and have been honored for their efforts. Modifications in process technology have significant potential to minimize possible adverse health or environmental effects of chemical substances. Many of the entries in the "Conversation with California" appear to focus largely on promoting product substitution – the simplistic substitution of one hazardous chemical for a less hazardous alternative – without regard to the consequences of such an approach, and without recognizing the important role that process improvements can have. It's time DTSC made clear in this dialogue that engineering is every bit as important as product improvements. ACC and its member companies believe that the Conversation with California should address a number of the complex, specific issues that are implicated by the Initiative. In the weeks ahead, we intend to address issues like the role of product stewardship, the role of regulation in promoting innovation, how California might stimulate "green chemistry" and "green engineering", and the four broad categories on which DTSC has invited specific comment. Mike Walls Managing Director, Regulatory and Technical Affairs American Chemistry Council

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F-GC-98	Quantitative Green Ranking for All Chemicals A database has been created with over 220,000 chemicals (all listed to date) and all cross reference names with filters for all state and federal regulatory lists. Each chemical has assigned the 33 federal EPA Environmentally Preferred Characteristics (EPP) and additional credible Characteristics given by regulatory agences CAL EPA, other key USA states and key countries totaling 41 key environmental performance characteristics (e.g. LD 50, excess lifetime cancer risk, flammability, health hazardard indicies etc). These characteristics may be organized into three categories Ecology, Human Health and Safety. This database, updated annually, contains over 75,000,000 elements to rank products as a function of the chemicals and chemical percentages. For each environmental characteristic, the chemical that is least compatable with living systems is given a score zero and the most compatable the score one hundred. The scores in between are normalized so that each chemical (all 220,000) has a quantitative normalized score. The navy tested eight adhesives meeting MIL-SPEC by providing the chemicals that make up the products. The chemicals were tranmitted via the on-station web site database of products Hazardous Material Management System (HMMS) to Chemical Compliance System's (CCS; www.chemply.com) web site. A report of all 41 Environmental Characteristics was automatically generated, and with equal weights as the default mode, a normalized score for Ecology, Human Health and Safety and an overall Environmental Score (Green Rank Score to make the best decision for the environment). This tool may be used for face cream, road paint, military aircraft munitions or paint, any product with a list of chemicals and percentage created a true quantitative score. This tool may be utilized by acedemia, government, industry, householders, military etc to formulate-design and or determine the best products compatable with the ecology, human health and safety. The vision is that the state of California purchases the tool for the USA to be utilized for no cost by all so that the environmental may improve rapidly. This would become the biggest pollution prevention project ever and the most cost effective to reduce pollution through source reduction. The federal EPA may also participate. With this tool in place via a web site sponsered by CAL EPA and or FED EPA, the products most compatible with the ecology, human health and safety may be chosen by the consumer. Also, formulations by acedemia, the govenment, industry etc may be optimized for environmental compatability. The user simply imputs the chemical makeup of a product and the web site generates a complete report of the EPA EPP chacteristics (and others from the key state and countries if desired) and a normalized score for the ecology, human health and safety and a total environmental score (green rank). This would be easy to put the information into a green label. Dr. George Thompson, PHD in Chemical Engineering developed this tool taking over 25 years for the DOD through a company www.chemply.com. The rest of the nation should benefit from this significant work.
F-GC-99	Green Chemistry Initiative should not be used to oppose efforts to reduce exposures to toxic chemicals One of the guiding principles of any green chemistry policy will be to protect public health. This will inevitably lead to prevention of exposures to certain chemicals and classes of chemicals that, e.g., cause cancer or affect reproduction or the endocrine system. While one would hope that the Green Chemistry Initiative (GCI) will be operational as soon as possible, realistically it will be years before there is any legislative authorization for the development of appropriate regulations or guidelines. Therefore, in the interim, it is inimical to public health and to the interests of the people of California for DTSC or other departments to oppose legislative or other efforts to restrict exposures to toxic chemicals on the basis that the Green Chemistry Initiative will be in place one day.
F-GC-100	amen...from one who is polyfuntional azridine'ized

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F-GC-101	Lord Professor of Chemistry Again, protect the contents of the cradle. • invest in green chemistry R&D to develop leading university centers • invest in EDC research so that the knowledge obtained can be used to underpin the development of green chemistry • encourage collaborative work between green chemists and EDC researchers to foster strategies for avoiding EDCs in new products • promote public education into the dangers of EDCs and the need for green chemical approaches to designing alternative products
F-GC-102	Summary of the Green Chemistry panel at the Society of Environmental Journalists National Conference The Society of Environmental Journalists sponsored a Green Chemistry panel on Sept. 8 as part of its National Conference at Stanford. The session, well attended by journalists from across the country, included panelists Mike Wilson of U.C. Berkeley; John McIsaac of Columbia Forest Products; Jennifer Harris from XenoPort and the Silicon Valley Leadership Group; and Mark Schapiro of the Center for Investigative Reporting. Marla Cone of the Los Angeles Times was moderator of the panel. Here are some of the key issues and emerging options offered by the panelists: - In his new book, “Exposed: The toxic chemistry of everyday products and what’s at stake for American power,” Schapiro warns that U.S. consumers are becoming a “dumping ground” for goods – from cosmetics to plastics to toys to electronics – that a growing number of nations deem too toxic for their citizens. New regulations adopted in the European Union, the world’s largest economic trading bloc, are increasingly being adopted in other nations, including China and Mexico, as global environmental protection and leadership shifts from Washington to Brussels. He said that, absent complete information, consumers are unable to make informed choices, an example of market failure. - Wilson said changes in industrial chemistry will require a massive shift in the industrial-chemical sector as industry enters an “unchartered wilderness.” He said China, Japan, South Korea and Europe are moving rapidly to adopt Green Chemistry practices. He called for reforms to state and U.S. laws to fix: the data gap, so companies disclose toxic substances to workers and consumers; the safety gap, so government can use the toxic substance information to identify and prioritize chemical risks; the technology gap, so business, government and academia can innovate green chemistry technologies. He described the establishment of a Consortium on Green Chemistry at UC Berkeley, possibly headed by a Dow Chemical executive. He said the California Dept. of Toxic Substances Control Division will need to expand its staff to launch a Green Chemistry program. - Harris praised the California Dept. of Toxic Substances Control Division Green Chemistry initiative, but questioned whether it will be an ongoing dialogue or a series of regulations. She also questioned how to integrate Green Chemistry into curriculum, research and development, finance and engineering. She asked whether small businesses should be included in a Green Chemistry program. She urged more education for business groups and involvement of UC Extension. - McIsaac recounted the intense opposition his company faced from its trade organization and the chemical industry when it replaced formaldehyde in plywood with a soy-based adhesive. He said continued industry resistance to new, anti-formaldehyde regulations adopted by the California Air Resources Board slows introduction of clean, new products that he says perform just as well as the more toxic products that were replaced. Meanwhile, he described how Chinese companies continue to ship large amounts of formaldehyde-soaked plywood to the United States, though the product is banned for use in the EU and China.
F-GC-103	How to Stimulate Green Chemistry: Regulatory/Statutory Requirements Regulatory/Statutory Requirements: Should there be requirements placed on labeling ‘green’ products, similar how the term ‘organic’ is allowed to be used in foods? Are there better models?

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F-GC-104	I think a criteria similar to that used for Green Buildings/LEED Certification would work for certifying green products. With the LEED Green Building certification there is a rating system to define and measure green buildings based on their meeting requirements in certain green areas. Each green area (sustainable site, water efficiency, energy and atmosphere, materials and resources, indoor environmental quality, and innovation and design) has a certain number of possible points. There are different options for earning points within each area and you have to earn a set number of points to qualify for the LEED Green building certification. I believe that there are different levels of green that you can achieve for the LEED certification. Green product certification/ labelling requirements could be based on a similar system. For this system the green areas may include use of green energy during manufacturing, waste generation, use of recyclable materials, use of non-toxic ingredients, etc.
F-GC-105	Legislative Changes I have conducted research on safer alternatives for the last 30 years. Over the last 17 years, my organization, the Institute for Research and Technical Assistance (IRTA), has identified, tested, developed and demonstrated safer alternatives in a range of different applications and industries. Over that period, IRTA has assisted hundreds of facilities in California in adopting alternatives. IRTA has worked on alternatives in dry cleaning, repair and maintenance cleaning, handwipe cleaning, batch loaded cold cleaning, electronics cleaning, vapor degreasing, printing cleanup, paint stripping, coatings and adhesives. In some cases, whole industries have adopted alternatives developed and tested by IRTA. Over the course of this work, I have learned much about how the system works and have become aware that, in order to ensure that safer alternatives are used, legislative changes are required. First, California needs a California Toxic Substances Control Act (CAL TSCA). CAL TSCA would require all new chemicals sold into California to be tested for toxicity before they are marketed. A set of toxicity tests that would be required would be developed by a consensus group of toxicologists with input from DTSC and the public. The manufacturers or distributors would have to conduct these toxicity tests at their own expense. CAL TSCA would also establish a set of toxicity tests that would be required for existing chemicals, chemicals that are already being used and marketed in California. In a few cases, the toxicity test information would already be available; in other cases, the tests would have to be performed. When the toxicity test data were provided by the manufacturers or suppliers, DTSC, with the help of the Office of Environmental Health Hazard Assessment (OEHHA), would evaluate the results and decide whether the chemical could be marketed (new chemicals) or whether the chemical would have to be removed from the market (existing chemicals). The criteria for deciding on this up or down vote would be predetermined by the group of toxicologists who designed the tests and DTSC with public input. Many chemicals that have toxicity problems have come on the market in the last 10 years. These chemicals are used extensively and exposure of workers and community members is high. An example is n-propyl bromide (NPB). NPB is a reproductive toxin in animals and has also caused nerve damage. It is currently undergoing testing for carcinogenicity. When the chemical was first marketed, EPA did not require toxicity testing for the substance under Federal TSCA. The chemical has been listed on California's Proposition 65 but is not on the state toxics list. Cal/OSHA and Federal OSHA have not established worker exposure levels for the chemical. NPB is used in vapor degreasing. The dry cleaning industry is considering using it as a dry cleaning solvent and there is nothing that would prevent this. Once chemicals like NPB are on the market, there is no mechanism for preventing their use in dispersive applications. Adopting a CAL TSCA would allow the state to deal with chemicals like NPB. Second, OEHHA has the responsibility of determining whether chemicals pose an unacceptable risk and that agency has few resources. OEHHA's budget should be expanded substantially. Dry cleaners in the state have been using a dry cleaning solvent called D5 for several years and D5 has caused cancer in laboratory animals. OEHHA has been evaluating toxicity test results to determine whether D5 is a threat but has not completed their analysis. In the meantime, no regulatory agency can regulate D5 and the dry cleaning industry is using it extensively. Giving OEHHA more resources could speed the evaluation process and give high priority to the new work the agency would be called upon to do under CAL TSCA. Third, the California Air Resources Board (CARB) is limited in their regulatory authority and their authority should be expanded. CARB regulates consumer products but is forbidden from regulating away a whole product type. In other words, if a low-VOC or low toxicity nonaerosol product is available and could

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	substitute for a higher VOC more toxic aerosol product, CARB cannot regulate the VOC content or toxicity of the aerosol product on that basis. CARB can set a lower VOC limit or ban certain toxics in the aerosol product if there are other aerosol products with lower VOC content or no toxics. Aerosol products are inherently not green. They lead to a very large waste stream and they rely on propellants that are often VOCs or greenhouse gases. As an example, consider antiperspirants and deoderants. Roll on products have very low or no VOC content. In contrast, aerosol products have a higher VOC content and contain propellants that may be greenhouse gases or VOCs. Expanding CARB's authority would permit the agency to establish VOC and toxics limits based on the nonaerosol products. This would allow the state to forbid the use of aerosol products in cases where there are greener products. It would also allow CARB to forbid the use of certain toxics as determined under CAL TSCA as a threat. The three legislative suggestions described here would make it far easier to restrict the use of certain materials that cause problems for health and the environment. The strategy would provide an incentive for manufacturers and suppliers to find and market greener products. This would result in better protection of the health of consumers and workers and of the environment in California.
F-GC-106	How to Stimulate Green Chemistry: Technical Assistance/Information Dissemination Technical Assistance/Information Dissemination Are there priority industry sectors or product categories where the State should focus first in forming partnerships, developing guidance, etc.? What are the best models for businesses to use in doing 'safer chemical substitution' analyses?
F-GC-107	How to Stimulate Green Chemistry: Awards/Recognition Awards/Recognition: How can recognition or awards be used to encourage green chemistry? What types of recognition by government will be most effective?
F-GC-108	I believe that recognition of environental achievements is a strong motivator for businesses, especially since environmental protection is such a concern to the general public. Just look at the number of buildings trying for the LEED Green Building certification. There is often a significant cost associated with achieving LEED certification, but many businesses are choosing to do so. Recognition of green products and receipt of "awards" would be an even stronger motivator because of the liklihood that having the award would lead to greater sales and preferential purchase by environmentally conscious consumers. I think that recognition accompanied by the right to display a logo that consumers could easily identify would be the most effective method, because it would more likely result in the preferential selection of the products by consumers. - See earlier blog on the German Blue Angel award and logo (www.Blauer-Engel.de)
F-GC-109	How to Stimulate Green Chemistry: Green Chemistry Education Green Chemistry Education: One suggestion has been that the university system should develop programs in green chemistry and engineering. Do you think this should be done? Any specific ideas? Could endowments or scholarships for the study of green chemistry play an important role? How about K-12 education? Should green chemistry concepts be taught in the classroom?

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F-GC-110	How to Stimulate Green Chemistry: Consumer Choice/Market Forces Consumer Choices/Market Forces: The concept of government “leading by example” is sometimes cited as a positive factor to influence the wider application of new and more environmentally friendly activities. Do you believe these environmentally preferable purchasing programs by government and the use of green products and technologies can be a useful tool to stimulate green chemistry in California? What can be done to encourage consumers to purchase and/or demand safer products? Public service announcements such as anti-litter campaigns, fire prevention, and others have been used to encourage people to take or avoid certain actions. Should the government market ‘Green Buying’ to educate and encourage people to buy and use safer product or adopt safer practices? What kind of market research should be done – directed at consumers? Retailers? Wholesalers? Importers? Manufacturers? Some have suggested we are entering a phase of marketing where products and services may be promoted as ‘green’ to attract customers increasingly interested in product safety and the environment. If this is the case, what can be done to guard against this kind of “greenwashing” of products? What mechanisms should be put in place to ensure the validity of green product claims?
F-GC-111	While government Green Purchasing is a potentially powerful market driver, like any power tool it should be wielded with care. One area of concern that permeates issues of "green standards" and "green labeling" in general is the potential to unintentionally limit green innovation by our current definitions. That is to say, for the sake of regulations and purchasing criteria we might define "green" as being today's best practices. There are examples of companies who have invented something radically "greener" than anything previously known who could not be sourced under government green purchasing regs because the regulations defined green specifically in the older, ironically less green, mold. Thus the truly innovative, next generation green companies can end up being out-competed by their slower less green competitors. Thus how "green" is defined is very important - and very hard to do, since we can't use current best practices as the standard. Green Chemistry, moreover, is not a checklist for product attributes. It is a set of principles for creating next generation molecules and chemicals. It is inherently dynamic and assumes constant improvement and innovation. This is not to say there is no role for purchasing standards, but to be clear about where in the process different tools and regimes come in: while Green Chemistry frames innovation, purchasing standards at their most effective encourage constant improvement.
F-GC-112	I wonder if there is any research on the effect of Walmart's commercials regarding compact flourescent lights on the increase in sales of those light bulbs. I see that commercial at least once a week. If there has been a significant increase in the purchase of those bulbs since Walmart started airing the ads then that would support the theory that consumers will choose environmentally friendly products if they are educated regarding the benefits of the products. With regard to a labelling system for green products, a system like the LEED Green Building Certification may allow for more flexibility in accomodating new technologies. With the LEED certification, buildings earn points within several different categories and a building needs to earn a minimum number of points to achieve the certification. Within each category there is a laundry list of different ways to earn points and the builders can choose which options are most practical and feasible for their building and budget. There are also different levels of certification based on the total number of points earned. Government agencies could establish procedures that require purchasing of green products that achieve a minimum number of points on the "green product rating system". As new technologies are developed, additional options for earning points could very easily be added to the laundry list of potential point options. Truly innovative methods could have a higher possible point value, thus making it easier to achieve certification or higher levels of certification.

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F-GC-113	We believe government increasing the "lead by example" effort to be the best option for generating immediate results in the use of EPP products, across all markets. Our Emerging Tech Group is responsible for outreach and demand mangement associated with a recycled cotton insulation product - an alternative to traditional materials that have dominated the building insulation market for decades. Use of the recycled denim product creates conformance with the provisions of a cradle-to-cradle framework. Positives are also realized in raw material resource & energy conservation, air quality, public/occupational health, pesticide use, and overall release of toxics. The downside is the base cost, however minute the variation. If incorporating life-cycle, environmental impact, and risk management analysis - a "no-brainer" prevails. We find growth most in the consumer markets. They are driven by the value-added aspects and common sense comparisons, that coincidentally cross-over with the regulatory responsibilities of a majority of CALEPA's BDOs. The established private sector infrastructure hamstrings efforts to get the product mainstream in new residential development, commercial, and government building markets. Without the generation of a series of mandated standards that support the regulatory community, and the public sector in it's efforts as a whole - other green technology innovations will find similar circumstances and an unchecked resistance on the part of grandfathered interests.
F-GC-114	How to Stimulate Green Chemistry: Economic Incentives Economic Incentives: What taxes or other incentives / disincentives should be considered to steer behavior towards green chemistry / green engineering? If you know of examples that have been effective elsewhere, please describe these. For example, would a program offering grants or low interest loans to retrofit equipment to accommodate ‘greener’ alternatives be effective? If so, what should be the priorities for targeting such grants?
F-GC-115	How to Stimulate Green Chemistry: Research Research: Are there specific areas of research that should be pursued by the State? What do you see as the highest priority information needs or data gaps that present obstacles to producing greener products and utilizing greener processes? Please provide ideas on the role that State can play in engaging in or promoting research to fill these gaps. Life Cycle Assessment (LCA) has been mentioned as an important tool for business (or government) to use in decision making, not only to help guide better environmental decisions, but also for the potential long-term economic advantages it may offer companies. How can more businesses be encouraged to conduct LCAs to guide key product design and production decisions?
F-GC-116	"Are there specific areas of research that should be pursued by the State?" first, start up our nuke program....stop burning coal and releasing thorium and uranium into the atmosphere as well as all the greenhouse gas....study the french and their program....and educate yourselves on the FACTS ABOUT IT.....one small accident {that no one died in} and the following movie silkwood seemed to destroy the program...based on hysteria and lack of FACTS...rethink and promote nuke... "How can more businesses be encouraged to conduct LCAs to guide key product design and production decisions?" make it possible for company's that don't have 8 figure established sales figures to be able to actually get some useful help...
F-GC-117	How to Stimulate Green Chemistry: Existing Models Existing Models: What specific provisions or elements of other programs – in other states, USEPA, internationally – should California consider adopting in order to stimulate green chemistry? Please cite references where possible.

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F-GC-118	Green logo on product packaging to identify green products I think that more and more people are becoming environmentally "aware" and concerned about the environment. If consumers were to be more informed about 1) the dangers of some chemicals used in industry and the environmental impact of some products like plastics and 2) knew how to find environmentally friendly alternatives and products - they would then gear their purchases towards those "green" products and manufacturers. The problem is that the general population has not had a lot of exposure to issues related to hazardous chemicals in products. Most environmental advertising is related to reducing air emissions and halting global warming. There has been very little public education on land and water pollution. I think that DTSC should develop a grading/ award system for products that meet certain green criteria. This could be a joint effort with other Cal EPA agencies that could include the use of green energy as well as green chemistry technologies. Products could be evaluated on the environmental impacts during manufacturing as well as impacts from the use of the product by the consumer. Those that meet certain green standards would earn the right to put a standard and easily recognizable "green" logo (which DTSC would create) on the product packaging that consumers could look for at the store. Maybe the award system would include different levels such as bronze, silver, gold and platinum based on how green they are. With advertising, the consumers could then know what to look for when trying to purchase environmentally friendly products. I believe given a simple system for identifying green products, consumers would choose those products at the store over those without the green logo. This would be similar to what the food manufacturers are trying to do as far as using using simple symbols to illustrate the health benefits of certain foods. With enough consumers choosing products with the green logo, the manufacturers would then be motivated to invest more research and energy into the development of green products. Otherwise they may lose customers. I also think that DTSC should have more information on the public website geared towards the general public, particularly related to the purchase and use of certain products. There could be a page with lists of manufacturers and products that have received the DTSC "green" awards, which would further motivate manufacturers to use green technologies and submit their information to DTSC for review. The website should also include information about the environmental impacts of plastics, greener alternative to household chemicals, disposal options for universal waste and info on green chemistry. Currently some of this information is on the website in various places, but it is hard to find, especially if the general public isn't aware of issues and doesn't know to look for the information. Most of the DTSC site is geared towards consultants and generators, not the average Californian. There should be one large link on both the DTSC home page and the Cal EPA home page (and each of the other Cal/EPA agency sites) called "What can I do to help the environment?" that leads the average person to a page where they can find concise information regarding environmental issues and what they can do to help. The more that the general public is aware of these issues, the greater pressure they will put on manufacturers and legislatures to make green chemistry and environmental protection a priority. After becoming aware of some of the issues at the Green Chemistry Symposium I immediately emailed all my friends and family information on the subject. Several of us quickly bought several portable and washable water bottles to use instead of bottled water and we also bought dozens of reusable grocery bags. The very graphic images of plastics pollution made a strong impact on us and I believe it would do the same for most of the general public. We just need to get the word out. I have already noticed that some bottled water manufacturers are listening to the buzz about plastic. Some manufacturers are starting to use less plastic in their bottles and are advertising such on the packaging.
F-GC-119	There is an environmental certification in Germany called "The Blue Angel". http://www.blauer-engel.de/englisch/navigation/body_blauer_engel.htm It has been around since 1972 and about 3600 products have received this certification label. "the Blue Angel promotes the concerns of both environmental protection and consumer protection. Therefore it is awarded to products and services which are particularly beneficial for the environment in an all-round consideration and which also fulfil high standards of occupational health and safety and fitness for use. Economical use of raw materials, production, usage, service life and disposal – all these factors are assigned a high importance. Products which are awarded the label bear the logo of the Blue Angel directly on the product whereby service companies use it on materials used to offer their

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	services."

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Number	**Full Comment**
F-TD-1	Cradle to Cradle: Through product design and industrial innovation, produce products that reduce the use of harmful chemicals, thus generating fewer emissions and less waste. How do you think California should move to a Cradle to Cradle framework? California needs to carefully review and identify with stakeholders the current significant barriers that impede investment in, and adoption of, sustainable technologies. Although the long-term economic benefits of sustainable technologies, such as reduced regulatory and waste disposal costs, can be significant, businesses can be placed at a near-term competitive disadvantage because of potentially prohibitive, up-front costs. Regulations need to be revised to allow flexibility for the superior environmental performance obtained when clean technologies are employed. To effectively address this dilemma, ACS believes that governments should provide incentives for the implementation of sustainable technologies, as explained further by our answer to the green chemistry question.
F-TD-2	Industrial cleaning product constituent chemicals have a wide spectrum of potential effects on human health and the environment. Manufacturer employee, product user, and cleaned building resident exposures potentially encompass both acute and chronic health risks. Selected products and processes also manifest safety risks (e.g., fire, explosion, incompatibilities). Constituents may additionally pollute air, water and soil. Everyone gains when historic industrial and household cleaners are cost effectively replaced with “green” products and manufacturing processes that have passed quantitative, objective, and comprehensive assessments. Customization of the Chemical Compliance Systems, Inc. (CCS) “Green” Process Compliance Analytical System (G-PACS) and their “Green” Product Compliance Analytical System (GP-CAS) enables the Chlorine Free Products Association (CFPA) to utilize the “Green” Cleaning Product Process Analytical Compliance System (GCP-PACS) in conjunction with the third party accountability services of our Sustainable Manufacturing Initiative (SMI) on-site audits. Those facilities that complete the SMI with GCP-PACS are then offered access to the on-line, automated “Green” Cleaning Product Compliance Analytical System (GCP-CAS) to provide a complete, comprehensive, cleaning product assessment within 5-10 seconds. Both systems utilize over 40 ecological, health and safety criteria for each chemical constituent. The process, or product, is quantitatively rated on a scale of 0 (worst green) to 100 (best green) for easy manufacturing, or acquisition, assessment against pass/fail criteria, or comparison of competitor products. Compromising product hazards and offending constituents are also quantitatively identified. Both GCP-PACS and GCP-CAS include alternative constitutent databases in their process/product Design modes that greatly streamline selection of less hazardous constituents to replace more harmful ingredients. This latter feature greatly facilitates “green” cleaning product and process research and development by rapidly calculating product, or process, “green” ratings as alternative constituents are theoretically inserted for compromising ingredients. Cleaning product or process constitutent impacts on over 100 state, federal, international and other third party regulations are simultaneously assessed. GCP-CAS and GCP-PACS represent the first standardized, Web-based analytical compliance capabilities for quantitatively certifying the “greenness” of industrial cleaning products and processes by an independent third party. CFPA recommends that California consider these CCS capabilities as options for achieving the objectives of the California Green Chemistry Initiative.

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F-TD-3	Protecting the environment is in the interest of every Californian, and any programs or processes should be open and transparent with an opportunity for public input. We need to get a handle on the toxic chemicals in our environment quickly—that means developing and using cost- and time-efficient high-throughput human cell and tissue methods, computer-based methods such as (Q)SAR, and intelligent, tiered testing schemes. California's implementation of Green Chemistry goals should align with the vision for 21st-Century Toxicity Testing put forth by the National Academy of Science by committing funding and resources to this effort and ensuring any Green Chemistry initiatives related to toxicity testing take this groundbreaking report into account. Animal-based toxicity testing methods are inaccurate and can result in the painful deaths of more than a thousand animals per chemical. California cannot ensure the health and safety of its citizens or wildlife by relying on these methods. Data gathering requirements must take advantage of existing data gathered from other testing programs as well as intelligent testing strategies. Requiring a fixed list of toxicity tests for all chemicals is wasteful and unscientific. Thank you for your attention to these important points.
F-TD-4	In reading the posts on this blog, I am troubled to see so much praise heaped on EPA's HPV program and am disappointed in the limited thinking that suggests that managing risks rather than managing chemicals is the way to a toxic free future. For nearly half a century, we have been managing risk yet somehow, toxic chemicals can be found in our land, in our air, in our water, in our bodies and even in our unborn children. It is time to acknowledge that the current system of managing risks does not protect the environment or public health and it is time to go in a new direction. Many companies want to do the right thing and want to make sure that their products are free from known environmental or biological toxicants but are frustrated because of the lack of data. In my conversations with these forward thinking businesses, the EPA's HPV Challenge program has done little to provide them with the information they are seeking regarding long term health and environmental impacts. HPV does not require any new information to be generated regarding a chemical's ability to cause cancer, reproductive harm, endocrine disruption, long term respiratory harm or neurotoxicity. Until we have a program that requires this information as a condition for being on the market, we will never know if a chemical that is used is truly the safest it can possibly be. In addition, any new chemicals policy needs to evaluate chemicals based on hazard, not based on how well we can manage risk. It is nearly impossible to know the life of a chemical. From its inception as a molecule, to its transport to manufacturing facilities to its use in the creation of a product to our store shelves to our homes or offices and finally to the landfill or ocean, it is a herculean effort to anticipate every scenario in which a toxic chemical may come in contact with our environment or ourselves. Since it is impossible to effectively manage risk at every stage of a chemical's life, it is a much easier and wiser strategy to not allow toxics to be used in the first place. I have been delighted to be a participant in this conversation with California and I sincerely hope that this conversation continues since 6 months is a very short amount of time to create a paradigm-shifting vision of our future together. In the mean time, I sincerely hope that the programs that come of of this initiative will be truly visionary. While information sharing with the EU and Canada is important, we must go beyond it and require information generation based on several different hazard traits, not merely those required under REACH or the Canadian program. This will take an investment and certainly time but we will not be sorry. Furthermore, as it has been said before, we should not be waiting to take action on those chemicals we know are harmful. As biomonitoring data shows us, our current strategy of managing risks has not prevented our being exposed to hundreds, if not thousands of chemicals. As someone who advocates for breast cancer survivors, those currently struggling with breast cancer and those who have lost their lives to this disease I will humbly submit that this is a moral issue. We cannot leave this problem to future generations nor can we assume that the market will take care of the

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	problem. Women are being exposed to breast carcinogens every day. I am encouraged that California has taken a leadership role in solving the chemical crisis and I am hopeful that the solutions this process generates will be thoughtful, bold and effective.
F-TD-5	We must stop adding toxic chemicals in our environment. One thing to do would be todevelope and use cost efficient and time efficient high-throughput human cell and tissue methods, computer-based methods such as (Q)SAR, and intelligent, tiered testing schemes. This would help to eliminate alot of toxic material in the environment.
F-TD-6	To the extent the Viable List of Options includes options for a mechanism to ban or phase out the use of chemicals, please consider the following comments: 1. The process established to consider the banning or phasing out of chemicals should be de-politicized to the maximum extent possible. One way to achieve that goal would be formation of a small panel of experts selected by the University of California president's office to make the determination whether the use of certain chemicals should be restricted. 2. It is important that the panel's work be viewed by all interested parties as impartial and scientifically beyond reproach. To ensure the perceived legitimacy of the panel's work, panel members should have the highest possible accreditation. To that end, panel members should be members of the National Academy of Sciences. Panel members should only be asked to serve short terms (2 to 3 years). 3. Panel members should be working in a relevant discipline (e.g., biochemistry, toxicology, epidemiology). 4. A limited number of substances should be considered each year. It may not be feasible to consider more than three to five substances per year, particularly given the other professional demands placed on highly qualified panel members. An incremental and deliberate process will also serve to minimize economic dislocations. 5. Petitions to phase out or otherwise restrict the use of chemical substances should be submitted to DTSC. Petitions that have been received should be posted on DTSC's web site and provided to the principal manufacturers and users of the chemical in question. Interested parties should have the opportunity to submit information to DTSC. Based on the information it receives, DTSC should select a small number of substances per year for the expert panel to evaluate. 6. The expert panel should be free to request any information it needs from any party and to conduct any investigation it deems appropriate. (No party should be compelled to respond, however). 7. The expert panel should have the authority to recommend the phase-out of a chemical from certain specific uses or to recommend that chemicals be banned from certain specific uses unless specified precautions are taken. There should be a strong presumption against banning a substance completely, as this can lead to the loss of manufacturing infrastructure and attendant economic dislocation. Phase-outs of chemical substances should be limited to those specific uses that have been demonstrated to be problematic. 8. In order to phase out a chemical substance from a specific use, there should be substantial evidence of harm caused by that use.
F-TD-7	The Center for Biological Diversity (“the Center”) appreciates the efforts being made by the state of California to address the issue of toxic chemicals. Toxic chemicals have become a pervasive part of our lives and action is necessary to protect public health and the environment from further degradation. The Center encourages California to lead the way as it has on other important environmental issues such as global warming—waiting for nationwide consensus will only result in further damage to the health of Californians and to California’s environment. The Center for Biological Diversity advocates a precautionary approach to toxic chemicals. This means the burden of proof should be on the chemical producing companies to fully disclose the chemicals in their products and to adequately demonstrate that the chemicals and products are safe. A precautionary approach also means that California should not fail to act in the face of uncertainty—there is no reason for humans and the environment to suffer simply because of the lack of conclusive proof about the effects of various chemicals that have been found to be potentially harmful. In other words, if conclusive proof is required, such a burden should lay with the chemical producers to conclusively demonstrate that their chemicals and

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	products are safe. Chemical companies should also be required to fund independent research of the impacts of their products, not just research conducted by their own scientists. Moreover, the research should address the effects of multiple chemicals—only testing chemicals in isolation will fail to address the real world impacts. Furthermore, “safe” should not focus solely on human health. It is imperative that the precautionary approach be directed at the health of animals and plants as well. For instance, frogs, other amphibians, and fish are highly sensitive to chemicals in their environment. Many scientific studies have shown how chemicals are harming fish and amphibians, especially by disrupting their immune, endocrine, or reproductive systems. See, e.g., Rosen, Michael R. et al., Investigations of the Effects of Synthetic Chemicals on the Endocrine System of Common Carp in Lake Mead, Nevada and Arizona, U.S. Geological Survey, Fact Sheet 2006-3131, Version 1.1, October 2007, Prepared in cooperation with the U.S. Fish and Wildlife Service and National Park Service (found at http://pubs.usgs.gov/fs/2006/3131/); Hayes, Tyrone B., et al, Hermaphroditic, demasculinized frogs after exposure to the herbicide atrazine at low ecologically relevant doses, Proc. Natl. Acad. Sci. April a6, 2002, Vol. 99, Issue 8, 5476-5480 (found at www.pnas.org/cgi/reprint/99/8/5476.pdf); Endocrine Disrupting Chemicals: Summary of Research Activities within BRD (found at http://www.cerc.usgs.gov/Other_Webs/endocrine/summary.htm); Summary of Endocrine Disruption Research in Contaminant Biology Program (found at http://www.ecrc.usgs.gov/endocrine/summary.htm); Poisoning our imperiled wildlife: A Center for Biological Diversity Report, February 2006 (found at http://www.biologicaldiversity.org/swcbd/programs/science/pesticides/BayAreaPesticidesReport.pdf. In fact, heavy metals and PCBs are persistent in high quantities in fish, marine mammals, and seabirds, which can cause genetic damage as well as harm to immune systems. See, e.g., Toxicology of Marine Mammals, Edited by Joseph G. Vos et al.; David R. Thompson1 & Keith C. Hamer; Stress in seabirds: causes, consequences and diagnostic value, Journal of Aquatic Ecosystem Stress and Recovery 7: 91–110, 2000. Again, in order to protect California’s biodiversity, the focus should be on only allowing the use of products that have been demonstrated to be harmless. Where uncertainty exists, caution should be exercised in favor of protecting wildlife and the environment—uncertainty should not be allowed to be used as an excuse for continued use of potentially unsafe chemicals and products. While impacts to all wildlife should be addressed, it makes sense to prioritize by focusing research on the impacts of chemicals to endangered, threatened, or imperiled species. By addressing the most vulnerable, we will likely be protecting many other species as well. It also makes sense to focus the most energy on amphibians and upper trophic level predators. Amphibians, due to their body type, are often the first animals to be impacted by toxics and can therefore likely provide us with early and important information about the harmful impacts of chemicals; upper trophic level predators (like polar bears) bioaccumulate toxins and therefore often exhibit high toxin concentrations in their systems, making them important sentinels of the ecological impacts of toxins. Research efforts should also include the monitoring of various species, especially amphibians and upper trophic level predators, so as to better understand what chemicals are already present in the environment and what their impacts are. In short, there is no sound reason to place the health of humans, or of other species, at grave risk, simply because we failed to adequately and carefully ensure that various chemicals were safe and would not accumulate in the environment. In addition to the adoption of regulations that better prevent harmful chemicals from being used in the first place, the Center advocates for the phasing out and ban of all chemicals found to be harmful to people or wildlife. A good example is the legislation recently passed by the state of California that outlaws the use of lead bullets in California condor habitat. This was necessary because the science showed that condors were being significantly harmed by lead. Similar legislation should be passed when confronted with situations where chemicals are harming people, wildlife, or the environment. Finally, incentives should be instituted that encourage the production and use of products that do not contain toxic chemicals as well as more aggressive education campaigns about the alternatives to harmful chemicals and their products.

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	November 16, 2007 Maureen Gorsen Director Department of Toxics Substances Control PO Box 806 Sacramento CA 95812-0806 Dear Ms. Gorsen- On behalf of my environmental organization Heal the Bay, and the public-private partnership of the Education and the Environment Initiative, I express strong support for the Green Chemistry Initiative. Clearly, the current structure by which we regulate chemicals in California is not sustainable. Given that California has serious pollution, ecosystem degradation, and natural resource scarcity concerns, it is imperative that the state develop a more cradle-to-cradle approach. The Department of Toxics Substances Control's (DTSC's) leadership is essential to create such a new policy and regulatory framework. Green Chemistry will better enable California to protect people, and the environment, as well as economically keep pace with changes worldwide, and here at home. Educate about the environment is fundamentally critical to any such new Green Chemistry policy and attendant programs. Education is necessary in order to scientifically inform such a policy, practically and efficiently implement it, and also to disseminate information about it to future generations. Luckily, California is currently poised to lead the nation in environmental literacy: the Education and the Environment Initiative (EEI) is a landmark environmental education law that requires the development and implementation of multi-disciplinary environmental education curricula in all disciplines (science, history/social science, English/language arts, and mathematics) for all K-12 grade students in state public schools. The EEI was co-authored by environmental organization Heal the Bay and signed into law in 2003 by former California Governor Gray Davis. In 2005, Governor Schwarzenegger allocated state funds over two years for environmental education curricula development under the EEI. A national model, the EEI will ultimately allow six million California school children each year to have the information they need to make informed decisions about protecting their health and our precious natural resources. As currently being developed, the EEI will necessarily include information that touches on green chemistry specifically. For example, EEI statutory mandates specifically call for the EEI curricula to address topic areas such as "toxics and hazardous waste," "public health and the environment," "pollution prevention," and "environmental sustainability." Obviously, there is significant overlap between the educational mandate of the EEI and the subject matter and goals of any state Green Chemistry Policy. We therefore encourage DTSC to make sure there is full integration between the EEI curricula development and its implementation, and the Green Chemistry policy and program development (including, but not, limited to K-12, post-secondary, and vocational educational efforts associated with Green Chemistry.) To date, DTSC has been very supportive of the EEI effort, and we gratefully applaud their leadership in this regard. We hope that as the Green Chemistry policy unfolds, that DTSC will continue to closely coordinate with the EEI and share Green Chemistry educational content, potential outreach opportunities, and other resources. Together, we can help children learn about environmental issues and make informed decisions about their individual impact on the environment. Sincerely, Leslie Tamminen Legislative Director/EEI Director
F-TD-8	Heal the Bay

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F-TD-9	Thank you for soliciting input from California residents concerning the Green Chemistry Initiative. I am currently writing a book-length narrative about environmental illness (including one fictional character based on Dr. John Balmes, who was extremely helpful to me when I first became chemically sensitive), and I would love to contribute my insights to your project. The REACH program currently underway in the E. U. would be a wonderful model for California. In addition to this, however, we need to zero in on those toxins to which the general public is being heavily exposed on a daily basis. At the top of this list is secondhand cigarette smoke. Twenty-one years ago, Surgeon General C. Everett Koop concluded that secondhand smoke causes disease. Twenty years later, Surgeon General Richard Carmona called secondhand smoke an alarming public health threat, "a serious health hazard at any level" One and a half years ago, the State of California's Air Resources Board defined secondhand smoke as "toxic." So what are we waiting for? Who are we afraid of? …more on behalf of Trudy Fisher
F-TD-10	The problems of toxics in products, both by design and by accident, need to be seen not just as a “design” issue – but as a knowledge generation issue. We still don’t know enough about the risks to which we are exposed or why products are designed and produced in the ways they are. We need to invest much more in basic scientific, toxicological, and consumer testing and observations. The US EPA is supposed to be conducting comprehensive testing of chemicals for their endocrine disrupting potentials. After a decade, this program has yielded relatively few results and appears to be progressing slowly, in part because the US government has not set priorities with concomitant resources. A new institutional role for NGOs, communities, and citizens in California may need to be created, in order to make testing within the state, and ultimately nationwide, more publicly accountable and more responsive. This is already occurring for the biomonitoring program. We could change our regulatory science to accommodate a wider range of scientific and societal inputs. Many chemical risks are associated with multiple exposures (through using or being in proximity to multiple products), and with human behavior and buildings affecting actual use (for example, using personal care products in combinations or children ingesting substances while playing). Yet, regulatory science standards and procedures do not allow for these inputs. California could specify that its regulatory science processes for chemicals pay attention to the inputs. Already, the CARB has considered, and introduced standards for, a number of chemical products, including perc in dry cleaning and VOC emissions from paints more generally. We can improve our understanding of why and how industry uses chemicals, along with the uses and locations for these products. This analysis needs to be expanded to consumers and governments. In many cases, regulatory standards or established industry practices actually exacerbate the creation of risks. Flammability standards have encouraged the use of brominated flame retardants; companies often simply use specific chemicals in manufacturing because they are accustomed to doing so and their technologies and ordering systems are built on the chemicals. We need to conduct detailed studies of why specific chemistries are being used in terms of industrial structures and histories. In turn, we can develop a different set of metrics to evaluate the impacts of chemical products in much more easily visualizable ways. Instead of simply evaluating toxicity, we can create “maps” of where, why, how, and by whom chemicals are used in society and throughout cities. GIS data could be integrated with workplace use, health, ecological, and other data to identify patterns that affect chemical impacts. We need to understand, in particular, the distributional effects of chemical exposures. We also need to develop new monitoring systems that can track chemicals and materials as they are introduced into consumer products or industrial systems, and identify far more promptly emerging problems. The Royal Commission on Environmental Pollution in the UK recommended in 2003 that such systems be introduced. These could include developing biomonitoring schemes, consumer and ecological health surveillance, and feedback from workers and downstream users or manufacturers.

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F-TD-11	The California Association of RV Parks and Campgrounds (CalARVC) requests that the Department of Toxic Substance Control prohibit the import, sale, or use of certain RV toilet additives as part of the California Green Chemistry Initiative. Many of these products are detrimental to onsite septic systems and often cause systems to fail and pollute surrounding soil and groundwater. CalARVC, which is comprised mainly of hundreds of small "mom and pop" RV parks and campgrounds from all over the state, has been seeking a solution for this problem to several years. CalARVC believes the best solution is to ban the sale and use of deleterious products that contain formaldehyde or similar biocides. Most of the toilet additive products sold and used in California contain formaldehyde or a derivative of formaldehyde. These products help dissolve toilet paper and bio-solids and are used by RV owners to prevent odors and blockages in their toilet systems. However, the chemicals in these products that help dissolve toilet paper and bio-solids also kill natural biological organisms used in many onsite wastewater systems. Many onsite wastewater treatment systems use natural organism to breakdown bio-solids and toilet paper. Thus, when RV holding tanks containing certain RV toilet additives are dumped into an onsite wastewater system, which is a common everyday occurrence at RV parks, the chemicals designed to eliminate odors and dissolve toilet waste also kill off the natural organisms causing the onsite septic systems to fail....more on behalf of California Association of RV Parks and Campgrounds
F-TD-12	On behalf of Johnson & Johnson and its family of companies, I appreciate the opportunity to provide additional comments on the California Green Chemistry Initiative. Johnson & Johnson has identified a number of key policy points regarding green chemistry that we believe are important guidelines that will lead to the overall success of California's Green Chemistry Initiative. Johnson & Johnson recommends specific policy points should be structured around the following policy goals and objectives: on behalf of Johnson & Johnson
F-TD-13	Green Chemistry in California – Initial Policy Elements Proposed by the Silicon Valley Leadership Group (These comments have been posted to all four discussion forums in the same form, due to overlap in topics.) The Silicon Valley Leadership Group advocates a comprehensive, integrated approach to expanding Green Chemistry in California. By highlighting leaders in the corporate environmental practices and encouraging those who are further behind, we can all move ahead. We envision Green Chemistry as an interactive, evolving partnership with industry, government and consumers working together to protect human health and promote a cleaner, safer environment. Leadership Group members involved in crafting these initial suggestions include those from the electronics, biotechnology, pharmaceutical, chemical manufacturing, and supporting sectors. For more information about the Leadership Group please visit www.svlg.net. The Leadership Group proposes the following policy elements to further Green Chemistry in California: 1. Strengthen the recognition and pursuit of Green Chemistry processes and products by establishing clear criteria and voluntary certification based on comprehensive lifecycle considerations. Equally important, consumers need to be educated about responsible choices and practices. 2. Explore models other than, or building upon, the current Materials Safety Data Sheet (MSDS) system to provide needed chemical hazard data throughout the supply chain. 3. Establish a Green Chemistry Coordination Council to collect and promote the sharing of information, highlight businesses with green practices, provide assistance to businesses lacking resources, and educate consumers. 4. Prioritize chemicals for screening, testing and appropriate restrictions. We suggest building upon the model of Canada's analysis and prioritization as

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	well as the Proposition 65 review process conducted by OEHHA. Chemicals of high concern should be allowed for targeted, low-exposure uses as determined in an open process by DTSC. 5. Greater investment in pollution prevention in the short term as well as extension of the current CA Pollution Prevention model to downstream chemical users as an element of the long term Green Chemistry strategy. 6. Continue the Conversation with California to sustain progress in Green Chemistry. The dialogue between DTSC and stakeholders has been very helpful and will result in more well-developed, effective policy. IN MORE DETAIL: 1) Issue: Our market economy and the innovations that it engenders, environmental and otherwise, are driven by the relationship between industry and consumers. In order for industry to offer products that are environmentally-sound, and for consumers to recognize them, clear and stakeholder-driven criteria are necessary. Proposal: The Leadership Group proposes we strengthen the recognition and pursuit of Green Chemistry processes and products by establishing clear criteria and voluntary certification based on comprehensive lifecycle considerations. Equally important, consumers need to be educated about responsible choices and practices. While the focus of the Initiative has been on chemical safety, green chemistry in the broader sense should incorporate an accounting of embedded energy, C02 impact, water usage, packaging, recyclability and so forth. Industry on the whole is already moving toward a greater consideration of these factors in our practices. The difficulty of quantifying and ascribing relative importance to these factors points to the need for commonly-held practices or industry standards. A voluntary certification program for green chemistry processes and products will clarify goals for industry members while empowering consumers with the information they need to make informed choices. As green chemistry practices evolve, according to the green chemistry principles we are so well aware of, so should the criteria - we should build flexibility into the system. It is important to note that a voluntary system is more pragmatic than standards at this point, given the innovative and often resource intensive approaches that will be required, the longer timeline necessary for industry transformation, and the need for consumers to have choices. As with organic food, not every consumer wants the environmentally-sensitive approach, if it costs more. The International Standards Organization (ISO) 14001 process certification and ACC's Responsible Care Management Practices are good examples to build upon. It is also important to note that potential green chemistry certification should be a recognition of process in addition to the product. As many experts in the DTSC Symposia have remarked, we are not only trying to improve products, but the entire system that goes into making that product. And we should realize that perfection will not be immediate, but evolve over time. In order to motivate voluntary certification some type of incentive, especially market mechanism such as rebate, tax incentive, or fee refund, should be explored. We understand very well that the consumer wants environmental accountability. As consumers gain in accountability, though, so should they gain in responsibility. This is in no way a proposal to allow industry to abdicate its responsibility for the safer use of chemicals, but rather to acknowledge that in a market-based society, corporate and consumer responsibility must closely intertwine to be successful. Beyond making informed purchases, we can best protect the environment when consumers understand Green Chemistry applies to them as well. How they collectively handle chemical products has an enormous effect (for example, nail polish remover can be easily poured down a household sink which would not be allowed in the workplace). The Green Chemistry Coordination Council described in the third point below could assist in consumer education. 2) Issue: The MSDS provides insufficient data on chemical hazards to those downstream in the supply chain. Proposal: The Leadership Group proposes the DTSC explore models other than, or building upon, the current Materials Safety Data Sheet (MSDS) system to provide needed chemical hazard data throughout the supply chain.

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	Our members often find the data included on the Material Safety Data Sheet (MSDS) to be insufficient for determining chemical hazards. Many times important information is addressed in a superficial, boiler-plate fashion or missing altogether. The same raw material from different suppliers may have divergent information. This is in part due to some government regulations requiring that an MSDS be obtained directly from the manufacturer. While we recognize that confidential business information needs to be protected, best possible data on hazard and ecological effects should be made readily available to the supply chain and other stakeholders. In order to meet customer information requirements on chemicals in products, some electronics manufacturers currently must request additional information from upstream suppliers. Instead of doing this on a case by case basis, and in some cases taking the costly approach of reverse-engineering products to determine content, it would be more cost-effective to make raw materials hazard information available further upstream. One approach that could facilitate the sharing of information could be to use the existing MSDS system as a vehicle. More uniform information availability, through approaches such as the ANSI standard for a 16-section MSDS or the IPC 1752 could be an improvement. However, since the MSDS was originally intended to provide more immediate emergency response and use information, it might be best to explore other options such as an MSDS addendum, focused on hazard data. As both REACH and industry efforts such as the Global Product Stewardship initiative make available this data over a 4-10 year timeframe, it is important to recognize that generating this hazard data will take time. A voluntary certification process, with recognition for particularly thorough MSDS's, could also improve the quality of information while allowing chemicals manufacturers to differentiate their products. The Global Harmonization System for the Classification and Labeling of Chemicals (GHS) should be considered, as well. Any model chosen should include the appropriate ecological as well as toxicological information. We also recommend that early stage R&D chemicals be exempted due to their limited use and limited exposures. Worker exposure issues involving recognized hazards (mostly in small/medium enterprises) during the Conversation with California suggests that incorporating MSDS information into real-life practices may be an issue, aside from content. Technical Assistance for those less familiar with critical MSDS information is included as part of the Green Chemistry Coordination Council described below. 3) Issue: Some companies and industries have already made much progress in achieving the aims of Green Chemistry while others lag behind. Green Chemistry involves myriad innovations and the collection and processing of much information. We do not have an adequate way of sharing Green Chemistry practices nor have we made the investment to encourage and reward green efforts. Proposal: The Leadership Group proposes the establishment of a Green Chemistry Coordination Council to collect and promote the sharing of information, highlight businesses with green practices, provide assistance to businesses lacking resources, and educate consumers. The information presented by the speakers, panelists, and stakeholders during the past year of effort on this Initiative has been incredibly thorough, enlightening, and inspiring for all stakeholders. We suggest the DTSC catalog and make easily available information regarding best practice screening processes, green chemical design, collaborative efforts such as the ACS Green Chemistry Institute, and international efforts such as the Global Harmonization System. All stakeholders still have a lot to learn in this dynamic area, and everyone stands to gain from continued information sharing. DTSC's leadership in this area should be continued by establishing it as a central clearinghouse of information for the state and beyond. Many medium and small companies are lacking in appropriate knowledge and resources, and will need assistance in taking advantage of Green Chemistry practices. Providing incentives for the sharing of data and best practices will help all companies. We further suggest building upon and making readily available the information provided by existing efforts: ACS Green Chemistry Institute, Cleangredients, U.S. EPA's Design for Environment Program, Performance Track, the chemical industry's HPV testing program, eChemPortal, EPEAT, and DTSC Technical Resource Center. 4) Issue: California has limited resources to evaluate chemicals for restriction. Chemical safety is a measure of exposure as well as toxicity. While we need to carefully assess and restrict the use of chemicals of concern, complete bans fail to allow for appropriate and beneficial uses.

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	Proposal: The Leadership Group proposes the DTSC prioritize chemicals for screening, testing and appropriate restrictions. We suggest building upon the model of Canada's analysis and prioritization as well as the Proposition 65 review process conducted by OEHHA. Chemicals of high concern should be allowed for targeted, low-exposure uses as determined in an open process by DTSC. The DTSC, together with other relevant State agencies, needs to establish clear and consistent science-based protocols for screening and testing. These should include determination of endpoints of concern and modes of action, where scientific and methodological questions are sufficiently advanced to enable consistently sound science-based judgments of potential risk. The use of a transparent and rigorous process to evaluate risk factors as indicated by toxicological, epidemiological, and exposure data will allow us to compare the relative importance and safety of chemicals as well as determine whether any restrictions or substitutions are appropriate. A scientific panel of experts with a range of theoretical and applied chemicals experience can best establish and oversee a process acceptable to all stakeholders. The Proposition 65 review process may offer a starting point for development of a thorough, scientific process to meet these broader needs. Government entities around the world have been or are in the process of revamping their chemicals use policies. Although the DTSC will need to analyze the individual needs of our state through such means as chemical mapping, we should coordinate with the chemicals policies of other countries to minimize confusion, cost and competitive impacts. Starting with the thorough screening done by Canada's Environmental Policy Act (CEPA) would allow us to build upon their scientific knowledge base and mitigate the burden of data gathering. Any proposed restrictions or mandates should be targeted and include careful evaluation of alternatives. This targeted approach will allow us to concentrate our resources where most needed. Furthermore, any mandates should be harmonized with systems in other countries as much as possible. While we wish it were not necessary to use chemicals determined by such scientific protocols to be of high concern, many times they are needed to promote human health or advance ground-breaking research. This is the uncomfortable irony with which we will have to live until we find better alternatives. In the meantime, targeted use of these chemicals under highly controlled and low-exposure scenarios should be allowed by DTSC, after an open, scientifically based stakeholder process. In the absence of safer alternatives, which should be technically feasible, improve health/safety/environmental profile, be of comparable or superior performance, cost-effective, and be capable of persistence, banning should be avoided. In that case, resources should be devoted to R&D or incentives should be provided to develop cost-effective alternatives. Our goal should be a marketplace where informed decision making at both the manufacturing and consumer levels is consistently delivering changes/substitutions that advance our collective interests along the dimensions outlined above. We recommend that novel R&D chemicals, used in relatively tiny amounts in highly controlled settings, be excluded from any consideration of a restriction or mandate. There are rarely, if ever, exposures outside of the laboratory. Government oversight of these chemicals would not be cost-effective and would be counterproductive to the aims of Green Chemistry. Flexibility in this type of research chemical use promotes the innovation of safer chemicals and processes. Both CEPA and REACH exempt these chemical uses. Exemptions should also be allowed for select pilot demonstrations and testing. 5) Issue: It will take a significant amount of time for industry and consumers to move to Greener Chemistry and we need to address pollution concerns in the meantime. Existing efforts at pollution prevention in the state utilize a collaborative model that has proven effective, but has been limited by its modest resource commitment and its narrow manufacturing focus. Proposal: The Leadership Group proposes greater investment in pollution prevention in the short term as well as extension of the current CA Pollution Prevention model to downstream chemical users as an element of the long term Green Chemistry strategy. Pollution prevention programs and policies such as SB 14 have been promoted for quite some time, yet they never receive anywhere near adequate funding and attention. We need to increase our investment in pollution prevention assistance, especially for medium and small businesses that either lack the resources or motivation to tackle the problem on their own. Since pollution prevention has led to demonstrated improvements and optimization of

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	chemical processes, it is a critical, complementary approach to Green Chemistry's goals of better chemical design. The model of collaboration between companies, the DTSC and third party experts (in the case of the SB 14 program, from the University of California), may also offer a model applicable to a broader Green Chemistry strategy. The impressive accomplishments of the Institute for Research and Technical Assistance in enabling development of substitutes for problem solvents in various applications suggest that such targeted 3rd party collaboration may pay dividends in products/product use as well as in manufacturing. This suggests the possibility of 1) taking chemicals of top priority concern, 2) identifying the specific applications or industry uses posing the greatest risk from those chemicals, and 3) applying a collaborative process of agency, industry and third-party experts to identify or develop viable alternatives that can maintain efficacy, but reduce risk in those targeted applications. 6) Issue: The stakeholder process for developing Green Chemistry has provided much more comprehensive progress than could have been achieved otherwise. Proposal: The Leadership Group proposes we continue the Conversation with California to sustain Green Chemistry progress. The dialogue between DTSC and stakeholders has been very helpful and will result in more well-developed, effective policy. We commend the DTSC for encouraging creativity in finding safer alternatives and providing opportunities for open-ended discussion. There remains, though, a very real need for extensive further discussion by the stakeholders in this Green Chemistry Initiative. We hope that the inclusive nature of this process is not at an end. There are so many pieces to Green Chemistry and as the focus narrows to various subtopics, meaningful stakeholder participation will be essential. We have all built personal relationships and broadened our understanding of the various points of view. It would be a shame to toss this hard-won experience aside. Submitted: November 16, 2007
F-TD-14	The Western States Petroleum Association (WSPA) is pleased to offer the following comments on policy options being considered in the context of Cal-EPA's Green Chemistry Initiative. Many of the comments submitted to DTSC to date and debated in public forums refer to the need for California to supplement the requirements of the Federal Toxic Substances Control Act (TSCA). Prior to immediately moving in this direction, WSPA believes that DTSC must evaluate what regulations and information are currently available and whether these tools are being appropriately implemented and applied prior to developing new programs. Indeed, we expect this analysis is already underway, pursuant to the mandate to conduct a "baseline assessment" of existing programs and information described in the April 20 memorandum from Cal-EPA Secretary Linda Adams announcing the Green Chemistry Initiative. We further expect that this analysis will be presented to Initiative stakeholders for review and comment along with the policy options that flow from it, to ensure that all relevant information has been considered, including information obtained from national and international programs. We are optimistic that this approach will lead to meaningful improvements in existing state programs. on behalf of Western States Petroleum Association
F-TD-15	I am a resident of OJai, California, and am concerned about the safety of many of the products we use from toxic chemicals in them - mostly food, but also pharmaceuticals, cleaners, etc. I have learned about the Green Chemistry Initiative which provides an opportunity to protect California by acting to restrict or eliminate especially dangerous substances and by mandating safer alternatives. This is a wonderful idea and I heartily endorse it. However, I really encourage you to ensure that in addition to incentive programs, the Initiative implements protective regulations, including restrictions and bans of chemicals for which the weight of evidence demonstrates a severe hazard to human health and/or the environment. Many thanks for considering this suggestion.

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	on behalf of Walter M. McClelland
F-TD-16	I am in support of the Green Chemistry Initiative to restrict or eliminate dangerous substances in California. We are being exposed to far too many chemicals in our daily environment and many of us are getting sick. It is especially necessary to get them out of commercial cleaning products that are used everywhere, from stores to doctor's offices and even hospitals! We need some strict regulation on use of harmful chemicals that in many cases can simply be replaced by less or non toxic ones. This is a critical situation which requires regulations to test chemicals and ban those shown to be a hazard to our health and well being. Please reply too: Diane Brodd on behalf of Diane Brodd
F-TD-17	I would like to add my support of the Green Chemistry Initiative to restrict or eliminate dangerous substances in California I would like to see this initiative include the problem of chemicals being used in our daily lives that have not been tested for neurotoxicity in children. I urge you to include restrictions and bans on chemicals that demonstrate a hazard to our health and/or environment. This is a critical situation that requires immediate attention by not only providing incentive programs but requiring restrictions and bans on those chemicals that are potentially dangerous. Please reply too: Linda Blackwell on behalf of Linda Blackwell
F-TD-18	Dear Director Gorsen: The Consumer Specialty Products Association (CSPA) has appreciated your continual efforts to include us in the discussions and stakeholder input on the Department of Toxic Substances Control (DTSC) California Green Chemistry Initiative. We also appreciate this opportunity to provide supplemental comments in addition to the information that we have provided on the “Conversation with California” website. CSPA is a national nonprofit trade association that represents more than 260 companies engaged in the formulation, manufacture, distribution and sale of consumer, institutional and commercial products. CSPA member companies manufacture and market a wide range of products, including: cleaning products, disinfectants and sanitizers, candles and air care products, household pesticide products, automotive products used to clean and maintain vehicles, and polishes and floor maintenance products. CSPA members are committed to manufacturing and marketing safe products which are protective of human health and the environment while providing essential benefits to consumers. CSPA and our members support the broad goals of the Green Chemistry Initiative and look forward to working with DTSC and other stakeholders in the state to help spur green chemical innovation and ensure that products are safe. I. Background CSPA member products improve the quality of human life and are necessary to protect the public health against dangerous diseases, infestation, and unsanitary conditions. CSPA members are committed to providing products that are thoroughly evaluated for human and environmental safety and go through rigorous safety-based assessments before they are brought to market. CSPA members are also committed to clear and meaningful labeling on consumer products, i.e., label instructions are written to ensure that consumers use products in accordance with label instructions. Finally, CSPA

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	members are committed to the development of green products that are safe for human health and the environment. In addition, CSPA members routinely apply green chemistry and green engineering principles in their operations and have been honored with awards for their efforts. The consumer products industry develops products that meet or exceed safety requirements of all state and federal agencies in the United States and Canada charged with regulating those products, including the California Department of Pesticide Regulation, the California Air resources Board, and other state agencies, U.S. Consumer Product Safety Commission (CPSC), the U.S. Environmental Protection Agency (EPA), the Occupational Safety and Health Administration (OSHA), the U.S. Food and Drug Administration (FDA), Health Canada, and Environment Canada. While we support the California Green Chemistry Initiative and believe there is much that can be done to address and spur the development of green chemical technology, CSPA believes that regulation of our members' products under current federal and state regulatory authorities provides safety and protection to consumers. Below is a short summary of the various regulatory authorities that ensure the safety of consumer products and their ingredients. While it is not an exhaustive list of the regulatory requirements these products undergo, it illustrates the extensive oversight that already surrounds the manufacturing and marketing of consumer specialty products. II. Toxic Substances Control Act (TSCA) The Toxic Substances Control Act (TSCA) gives EPA the authority to regulate chemicals produced or imported into the United States. EPA repeatedly screens these chemicals and can require reporting, testing or a complete ban of those that may pose an environmental or human-health hazard. Any person intending to manufacture or import a chemical substance first must determine whether the substance is listed on the TSCA Inventory. If it is not listed, the prospective manufacturer or importer must satisfy premanufacturing notice (PMN) requirements before commencing production or importation of the substance. In filing a PMN, the manufacturer or importer must give their identity, specific chemical identity, product volume, use, exposures (worker, user and consumer), and environmental fate. Additionally, any test data relating to environmental or health effects of manufacturing, processing, distributing, using, or disposing of the new chemical substance must also be submitted. The PMN must be filed at least 90 days prior to the commencement of commercial production or importation of a new chemical substance. EPA's review of a PMN consists of seven major stages designed to ensure that EPA examines all aspects of a new chemical, including its physical and chemical properties, potential toxicity, exposure of workers, users and consumers, and economic benefits. EPA has the authority to prevent, delay, or limit manufacture after the initial PMN review period ends. EPA can issue an administrative order regulating a new chemical substance if the Agency finds that there is insufficient information to reasonably evaluate the risk and either the chemical may present an unreasonable risk to health or the environment or it will be produced in substantial quantities with the result that either substantial quantities will enter the environment or there will be substantial or significant human exposure to the substance. While EPA does not require a designated set of toxicity testing to be included in the PMN submissions, it has identified several categories of chemicals and the concerns areas where it has required such tests. Under these requirements a company must provide information addressing these risk concerns or face restrictions based on default assumptions. EPA has broad authority to regulate the existing chemicals in commerce as well. If a chemical presents unreasonable risks to health or the environment, EPA must initiate a rule-making to regulate the chemical. As of 2007, EPA has issued over 1300 Significant New Use Rules, which restrict the manufacture, import, or processing of a substance . EPA can prohibit or limit the manufacture, processing, distribution, commercial use or disposal of the chemical; prohibit or limit the use of the chemical in a concentration above a specified level; require adequate warnings and instructions with respect to the chemical's use, distribution in commerce or disposal; require record-keeping; prohibit or regulate disposal of the chemical; and require notification to the purchasers or the general public about the risks involved and to replace or repurchase a chemical substance or mixture if requested. EPA also has the authority under TSCA to require manufacturers of substances to develop safety and environmental data. III. Consumer Product Safety Act (CPSA) The Consumer Product Safety Act (CPSA) provides that when the Consumer Products Safety Commission (CPSC) finds an unreasonable risk of injury

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	associated with a consumer product it can develop a standard to reduce or eliminate the risk. The CPSA also provides the authority to ban a product if there is no feasible standard, and it gives CPSC authority to pursue recalls for products that present a substantial product hazard. The CPSC is authorized to set safety standards as to consumer product performance, composition, contents, design, construction, finish, packaging and labeling. In general, the manufacturer of a consumer product subject to regulation must issue a certificate announcing compliance with the applicable standards, and must label the product with the date and place of manufacture, the identity of the manufacturer, a certification of compliance with any applicable rule, and a brief description of such rule. Manufacturers are required to immediately notify the CPSC if it obtains information which reasonably supports the conclusion that a product: (1) fails to comply with a consumer product safety standard or banning regulation or a voluntary consumer product safety standard upon which the CPSC has relied upon; (2) contains a defect which could create a substantial product hazard described in the CPSA; or (3) creates an unreasonable risk of serious injury or death. In the last ten years, CPSC obtained 472 voluntary recalls involving 110 million product units. During this time, CPSC obtained 1031 corrective actions (including recalls and other actions to keep unsafe products from consumers). IV. Federal Hazardous Substances Act (FHSA) The Federal Hazardous Substances Act (FHSA) requires labeling of hazardous substances sold to households. It prohibits the sale or introduction into interstate commerce any product which does not comply with the regulations. FHSA regulations provide specific guidelines to determine potential risks specific to the entire formulation and package. Product risk assessments are the basis for label decisions and precautionary label text to protect consumers and children. At a minimum, labels must include hazard signal word, affirmative statement of hazards, the name of each component that contributes to the hazard, and precautionary measures to be taken to avoid risk, required or appropriate instruction for first aid treatment, handling instructions, storage instructions, and “Keep out of reach of children.” V. Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) The Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) provides the basis for regulation, sale, distribution and use of pesticides in the U.S. FIFRA authorizes EPA to review and register pesticides for the specified use which a registrant applies for. Before registering a new pesticide or new use for a registered pesticide, EPA must first ensure that the pesticide, when used according to label directions, can be used with a reasonable certainty of no harm to human health and without posing unreasonable risks to the environment. To make such determinations, EPA requires more than 100 different scientific studies and tests for active ingredients. In fact, EPA has banned and severely restricted 64 pesticides in the United States. When EPA registers a pesticide, it approves the product’s label, which includes (among other things) directions for use, hazard warnings, and precautions. It is a violation of FIFRA for any person to use a pesticide in a manner inconsistent with its EPA-approved labeling. EPA also has the authority to suspend or cancel the registration of a pesticide if subsequent information shows that continued use would pose unreasonable risks to health or the environment. EPA may decide to remove a pesticide from the market based on information from a variety of sources: new studies conducted by the registrant, the Government, or a third party; incident information submitted by a registrant; or results of the EPA’s periodic review of pesticides and tolerances. EPA is currently completing a review of those pesticides registered before November 1984 to ensure that they meet current scientific and regulatory standards. This process, called reregistration, considers the human health and ecological effects of pesticides and results in actions to reduce risks that are of concern. Concurrently, EPA has begun a registration review process for those products registered subsequent to 1984 and for those pesticides that were review under the reregistration process previously. These ongoing review processes assure the continual reexamination of the safety and environmental profile of pesticides. EPA and the states enforce FIFRA primarily through stop sale, use, and removal orders, civil penalties, or a combination of the two. Unlawful acts under

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	FIFRA include: selling an unregistered or misbranded pesticide; selling a pesticide whose composition differs from the one described in the pesticide's registration application, violating EPA's labeling requirements, failing to file annual production reports, and violating FIFRA's export requirements. VI. Recommendations for Product Stewardship & Safety-based Assessments As stated in our November 6 "Conversation with California" entry, CSPA supports company performed safety-based assessments of consumer products prior to the marketing of a product, that take into consideration all of the phases of a product's life-cycle. CSPA also supports appropriate use-restrictions for chemical ingredients when scientific safety-based assessments indicate that they cannot be used safely in a consumer product or use application. CSPA and our members believe that every responsible company should be performing these types of safety-based assessments and supports initiatives that recognize companies for these types of procedures. In fact, CSPA has demonstrated our industry's commitment to manufacturing and marketing safe products which are protective of human health and the environment while providing essential benefits to consumers, when we initiated our Product Care program in 2001. CSPA's Product Care program is a stewardship program for the consumer and institutional specialty products industry where participating companies have agreed to go beyond government regulations in emphasizing health, safety and environmental concerns by carefully designing products, purchasing raw material and packaging, operating safe manufacturing facilities, promoting safe storage and distribution, providing useful product information, answering consumers questions and anticipating product disposal needs. CSPA believes that these types of product stewardship programs should be considered as frameworks for programs developed under the Green Chemistry Initiative. Product Care provides a framework for companies to identify and commit to stewardship principles, share ideas and information and benchmark better performance. Participating companies have pledged to develop management principles for each of seven areas in a product's life cycle from development in a research facility through product use and disposal. Through this program Companies Must Commit to Evaluate: 1. Product Design 2. Raw Material, Package and Service Supply 3. Manufacture and Production Site Management 4. Product Storage and Distribution 5. In-market Support, Incident Evaluation and Follow-up 6. Consumer Education and Outreach 7. Product Disposal Stewardship did not begin when CSPA's Product Care program was initiated in 2001. Responsible companies have long followed policies promoting safe products that provide important health benefits while not adversely affecting the environment. CSPA believes it is vital that these types of product stewardship programs and companies that participate in these programs be recognized and fostered through any program developed under the Green Chemistry Initiative. In particular, CSPA believes that DTSC and California can leverage and recognize programs like Product Care as a way of encouraging companies to establish robust procedures to ensure product safety and environmental safety. VII. Recommendations for Chemical Data Development Initiatives Chemical data development efforts should build on existing statutory and regulatory structures, voluntary initiatives, and data development efforts. CSPA does not support California-specific data development requirements and pre-market approval process for chemicals or consumer products. However, CSPA supports collaboration by DTSC and California in ongoing work by other government agencies to assess chemicals and consumer products. Specifically, California and DTSC could leverage efforts by Health and Environment Canada in addressing priority chemicals in the Chemicals Management Plan. DTSC and California could collaborate with these agencies on their high priority list and avoid needless duplication of current data development and prioritization efforts. DTSC and California could also participate in the effort launched in August during the Security and Prosperity Partnership (SPP) with under the Montebello Agreement involving trilateral cooperation among the governments of Canada, the United States and

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	Mexico to share chemical information and safety assessments. In addition if DTSC and California move forward with efforts to establish chemical priorities the process should be collaborative and should include scientific experts in toxicity and exposure, chemical manufacturers, consumer product manufacturers, and nongovernmental organizations. CSPA believes inclusion of manufacturers of the chemicals and consumer products could provide toxicity and exposure/use data to determine whether the uses of “priority chemicals” are safe or should be restricted. As referenced above, CSPA does not support pre-market approval of chemicals or consumer products, because this would be an incredibly burdensome and expensive process for the State of California and would unnecessarily slow down the development of products. For example, the Department of Pesticide Regulation registers approximately 12,000 pesticide products sold in the State and in 2005-06 it cost the agency over $17.5 million to review and approve these products . To require pre-market approval for the hundreds of thousands of chemicals and consumer products in commerce would be cost-prohibitive. VIII. Support for Appropriate Ingredient Disclosure Throughout Green Chemistry discussions and in recent market research consumers and others have expressed a desire to know what ingredients are in the products they use in their everyday life. These consumers are interested in having this knowledge in order to make informed product choices. It may appear that product ingredient information may not be readily available to consumers; however, our members willingly provide information to meet consumer needs. While some organizations have expressed concerns about ingredients in consumer products, much of this information is inaccurate. This is primarily due to the reliance on outdated resources that are dependant on old technologies or on assumptions made by sources that are not well versed in specific product chemistries. CSPA and our members support an appropriate approach to providing accurate information to consumers through ingredient communication. Our industry stands behind the safety of our products and the appropriate use of chemical ingredients in those products. We would like to work with DTSC and the State of California to implement a means of ingredient communication that would provide consumers with the information they can use to make informed decisions regarding the products they use in their homes. IX. Essential Principles for Green Chemistry Initiatives As any Green Chemistry program moves forward, CSPA believes, that in order for the effort to be credible and have a positive impact it must be structured in a way that includes all stakeholders and provides a sound scientific basis for the program. Specifically, Green Chemistry should ensure the safety of chemicals and consumer products through the use of sound science in the decision-making process. Additionally, green chemistry programs should be designed to ensure that products remain technologically and commercially feasible to produce; and that product efficacy, performance, and usability are not compromised or undermined. As such, Green Chemistry must foster innovation and not limit the development of new chemistry technologies. X. Support for Initiatives to Spur Green Innovation Stimulating green chemical innovation has been a core concept of the Green Chemistry Initiative, and discussion of this topic has shown the promise that new technologies have for improving the standard of life in California and reducing environmental impacts. CSPA supports collaborative efforts to encourage public and private partnerships with the goal of developing “greener” products and “environmentally responsible” ingredients rather than mandatory and voluntary state labeling programs that endorse green products or programs that stipulate a single third-party certification of green products. CSPA supports initiatives that provide incentives for companies that innovate and develop technologically and commercially feasible products using green chemistry. CSPA also supports recognition for companies that develop sustainable business operations, processes, and/or products. We also believe there are unique opportunities in California for research that identifies areas for the use of green chemistry in consumer products. Essential elements to ensuring that these technologies become widespread are implementing State policies that are designed to overcome barriers to commercial

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	application of green chemistry research and development efforts. XI. Conclusion Once again, CSPA has appreciated DTSC's efforts to include all stakeholders in the discussions during the California Green Chemistry Initiative. CSPA believes that the Green Chemistry Initiative holds incredible promise for helping spur green innovation in California. We also believe that the Initiative can leverage ongoing chemical data development initiatives in setting chemical priorities. Further, CSPA believes that DTSC should recognize and encourage the current product stewardship procedures and safety-based assessments that companies perform prior to marketing a consumer product. CSPA would also look forward to working with DTSC and the State of California on an appropriate ingredient information system to help inform consumers when making their purchasing decisions. CSPA looks forward to continuing to work with DTSC through the Green Chemistry Initiative, as recommendations are developed, and CSPA hopes that our continued participation in this discussion will provide meaningful help to the endeavor. Please feel free to contact me directly at (202) 833-7328, or CSPA's in-state representation, Laurie Nelson at (916) 446-1111 if you have any questions about these comments. Respectfully Submitted, Andrew R Hackman Manager, State Affairs Programs
F-TD-19	Every Californian should be interested in protecting the environment this should mean that public input should be required for any types of programs or processes. It is imperative we figure out the impact of the toxic chemicals in our environment and to od this developing and using human cell and tissue methods, computer-based methods like (Q)SAR and intelligent, tiered testing schemes. Green Chemistry goals should be implemented in CA and align with the vision for 21st Century Toxicity Testing recommended by the NAS report. Old-fashioned, animal-based toxicity testing methods are inaccurate and can result in the painful deaths of hundreds or sometimes more than a thousand animals per chemical. We cannot ensure the health and safety of CA's citizens or wildlife by relying on these methods.
F-TD-20	In order to design safer, less toxic products, we must have well-trained, knowledgeable scientists and engineers. Today, chemists, chemical engineers and most biologists receive absolutely NO toxicity training during their education. Students are usually familiar with unsafe compounds and how to work with them safely, but there is often little to no thought put into the safety of the end user when designing new products. This has been exacerbated in recent history as more and more companies become increasingly specialized and may have their starting material handled and processed by many other entities during the production process. An example in the news recently is that of phthalates in plastic children's toys. The chemist who designed the softer plastic using these chemicals probably didn't envision the wide array of products that would rapidly permeate our society. The original polymer mixture was then transferred through many levels of industry for processing, molding and final packaging before being brought to market. The engineer who designed the baby toys using these polymer mixtures probably had no idea there were phthalate monomers remaining in the plastic, much less the effects it might have if ingested. Neither of these characters is at direct fault--they are simply fulfilling the economic demand for materials with new properties and inexpensive products. In order to prevent toxic substances from making it into consumer homes, we need to look critically at the system that allows toxic chemicals to be used in consumer goods. This example highlights three issues that work together to cause the situation we have today: lack of testing, communication and reporting of potentially toxic compounds, lack of responsibility on the part of chemical producers and, I think most importantly, a lack of enforcement capabilities within our regulatory system. We rely on risk management policy which might sound like we "manage to avoid risk" but in actuality means we can't stop a chemical

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	from making it to market until people are PROVEN to have been harmed by that very specific compound. And even if the product is removed, similar chemicals that vary by only one or two atoms, but are likely to have the same physiological consequences can remain in circulation. With the vast amount of chemistry, biology, epidemiology and toxicity knowledge we have today, there should be a better way. The idea of synergy, where the sum toxicity of compounds mixed together is more than the toxicity of the components alone, becomes important to think about because of the enormous variety and combination of chemical-based compounds in our modern society. All these issues point to the need for a more holistic approach to chemical policy and regulation. By adopting Green Chemistry policies and initiatives, most of these issues can be addressed. Integrating toxicity training and the green chemistry principles at all levels of the educational process, and having real-time monitoring and innocuous degradation of starting materials will help prevent end-user exposure. These are main tenets of the 12 Principles of Green chemistry, which if adopted and promoted could vastly improve the safety of chemical-based products. In addition, we need to change our current, risk-based method of policy making, which limits the scope of chemical evaluation and puts people in harm's way before allowing the government to make chemical regulations. The only groups who benefit from "risk management" are chemical suppliers—they don't have to run toxicity tests or report their findings, they don't have to report quantities or end uses of potentially toxic substances, and they have no incentive to update manufacturing methods or reformulate, as that always comes with some monetary cost. They need markets and incentives to design better products, but won't comply without preventative regulation in place. Let's stop being reactionary and start being revolutionary. California is at the forefront of progressive policy and this is an extremely important issue that the European Union and many other countries have already begun to address. By adopting and practicing the green chemistry principles, in addition to a more preventative approach to policy making, we can demonstrate to the rest of the country that we can innovate and fulfill market demands while at the same time, protecting the health and safety of all living things.
F-TD-21	The following recommendations are submitted on behalf of the tens of thousands of California members of the Physicians Committee for Responsible Medicine and People for the Ethical Treatment of Animals. As California residents ourselves we appreciate the opportunity to contribute and look forward to continued involvement in California's Green Chemistry (GC) initiative. We are concerned that GC recommendations may include calls for large amounts of toxicity testing involving animals, and have prepared some comments and recommendations to address this concern. The timely and thorough evaluation of potential chemical hazards requires intelligent strategies for prioritization and evaluation, and we urge the California EPA to employ this approach when drafting its GC initiative recommendations. California cares about animals in laboratories Scientific experts representing animal protection groups such as PCRM and PETA work on a national and international level to push for the reduction and replacement of animals in laboratory testing, while ensuring the protection of the environment and human health. As awareness of the scientific and ethical problems with standard animal-based toxicity testing grows, our expertise is increasingly sought by the EPA and other federal agencies, the Organisation for Economic Co-operation and Development (OECD), the US's Interagency Coordinating Committee for the Validation of Alternative Methods (ICCVAM), the European Centre for the Validation of Alternative Methods (ECVAM), the European Commission, and within the chemical and toxicity testing industry. These organizations recognize that because we focus specifically on animal protection in context of regulatory assessment, our scientists are experienced at devising creative solutions that would circumvent the use of animals in laboratory testing. The contributing members of PCRM and PETA, nearly 75,000 of these living in California, entirely support efforts to reduce the use of animals in laboratories, as evidenced by the large number of posted recommendations generated by an e-mail to our California members,. Problems with animal-based toxicity tests One post on the Cal/EPA on-line Forum suggests that it is necessary to characterize the specificity and sensitivity of in silico and in vitro tests before their use and we are in agreement. A scientific evaluation of any new safety test is of course appropriate and necessary. However, one must also keep in

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	mind that the sensitivities and specificities of currently-employed animal-based toxicity tests have never been fully investigated or taken into account in any consequential way. While in vitro methods must be scientifically validated, there is no such requirement for in vivo tests to show reproducibility or relevance. For example, ECVAM estimated in a 2005 study that based on historical data for 171 rabbits that the rabbit pyrogen test had a sensitivity of 57.9% and a specificity of 88.3%. The 2-year rodent cancer bioassay is under increased scrutiny; a comprehensive review of all 502 the National Toxicology Program 2-year cancer bioassays conducted, and published reports, determined that results are reproducible only 57% of the time. An examination of teratology test data for 11 groups of known human teratogens across 12 animal species reveals a mean sensitivity of 61% . The developmental neurotoxicity test—a test that uses thousands of animals each time it is conducted—is a relatively new protocol currently in use that has still not been validated according to the principles of the OECD's own Guidance Document on validation. These examples illustrate a concept that regulators and others have recognized for years but have failed to communicate or act upon: statistically, animal-based toxicity assessments do not predict outcomes in humans. It is only recently that regulatory authorities have begun to face this problem—California must not fall back onto reliance on these methods as it is aiming to lead us into the future in chemicals policy. Barriers to the use of non-animal methods A workshop convened in 2005 by the International Society of Regulatory Toxicology and Pharmacology (ISRTP) and attended by a broad base of scientists and policy experts from industry, regulatory agencies, and animal protection groups identified major barriers to the acceptance and use of non-animal toxicity testing methods to be institutional. Inadequate funding and resources, as well as "regulator comfort," topped the list. This sentiment was echoed this year in a report by the Committee on Toxicity Testing and Assessment of Environmental Agents, convened by the National Academy of Sciences, at the request of the EPA, to draft a vision of the future of toxicity testing: "[C]urrent toxicity-testing practices are long established and deeply ingrained in some sectors. Thus, some resistance to the vision proposed by this committee is expected." International consensus among scientists and policymakers regarding ICCVAM, the entity charged with validating and promoting non-animal toxicity tests, is that progress has not kept pace with technology. Inadequate funding and personnel, lack of a focused vision, and inadequate leadership has led to the dismal record of three validated methods in ten years, one of which only partially replaces an animal test and two of which still use live animals. This can be compared with ECVAM's progress, with over 20 methods accepted and more than 150 undergoing development. In the event that Cal/EPA recommends or develops testing policies or procedures, guidance must include measures that insure the development and incorporation of relevant, reliable and predictive non-animal methods, and must not be limited to ICCVAM-validated methods. Lessons from other initiatives Throughout the GC initiative process, a number of chemical regulation programs have been reviewed in terms of how California should (and should not) proceed. These programs also have positive and negative characteristics from an animal protection standpoint. For example, a number of EPA scientists view work on prioritization and evaluation of new chemicals under TSCA, using QSAR and other tools they have developed, as a successful venture. The Canadian EPA can be applauded for its prioritization scheme. It took a realistic approach to chemicals information gathering and management by using simple tools to "bin" chemicals based on what it already knew and focusing on those of highest concern. For chemicals without any data, data from analogous chemicals, genetic toxicology, physicochemical properties, and QSAR tools were used to consider the chemicals' priority ratings. Animal protection scientists had extensive involvement in the EPA's High Production Volume Chemical Challenge Program (HPV), starting with a push for basic animal welfare considerations which were then transmitted to chemical producers and suppliers. We worked to suggest alternatives to proposed tests, often finding that manufacturers proposed duplicative tests due to incomplete data searches and missed opportunities for bridging data among similar chemicals. Additional animal testing was conducted when companies did not know about, or declined to apply, basic animal welfare principles. Other companies made stellar efforts to reduce animal testing by using the initial EPA strategies as well as strategies developed by animal protection scientists. These strategies were later used as a basis for further recommendations in the E-HPV program, a continuation of the original HPV program. Another, cautionary lesson of this program is that voluntary programs, while allowing for increased flexibility, make it difficult to enforce animal protection

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	measures. Although the European REACH legislation is held by some as a model for chemical evaluation programs, problems with implementation have yet to be discovered. Initial upper estimates regarding the number of animals killed while existing chemicals undergo the registration process neared 40 million. Fortunately, tireless lobbying by European animal protection groups and others has instituted policies that will reduce this number, such as in silico screening models, tiered testing, weight-of-evidence, category and read-across strategies, and the use of “scientifically appropriate” non-animal alternatives tests as they are developed and deemed so by ECVAM. The absence of appreciable exposures or production volumes can waive some toxicity testing in some cases. Additionally, the use of so-called “alternative” data, such as data generated under non-Good Laboratory Practice conditions and historical human data are allowed. These measures represent an important positive step in the incorporation of animal protection measures into the REACH chemicals program. However it remains to be seen whether these measures will be followed once the program is put into practice. In determining how chemical prioritization and evaluation will fit into the GC initiative, California must evaluate the positive and negative aspects of all past, existing, and future programs, and should determine how best to incorporate these aspects into its policies without duplicating them. All of these programs, as well as others not mentioned here, have generated toxicity data. It is of urgent and extreme importance that California negotiates access to this and other data, whether publicly available or not, to avoid duplicative testing. As experience has shown in the HPV program, chemicals companies cannot be relied upon to avoid duplicative testing. In many cases, it is easier and less expensive for them to simply check a box that requires animal testing than to comb through files of existing data or develop a thoughtful weight-of-evidence approach. Recommendations Based on the information above and to ensure appropriate chemical evaluation as part of a larger GC initiative, we make the following recommendations: Conduct a detailed, comprehensive assessment of existing laws, regulations§ and programs and ensure that recommendations for chemical screening, prioritization and evaluation include lessons learned from those programs. Cooperative agreements with existing programs are essential to avoid duplicative or ineffective efforts. Conduct a detailed, comprehensive assessment of existing chemical toxicity§ reporting and data availability programs and ensure access to those data as applicable to California. Assurances of some measure of formulation confidentiality would encourage producers and manufacturers to make toxicity and use data available. Information on chemical importation, use, and exposure patterns in§ California should be quantified and analyzed before requiring the generation of toxicity data; exposure and use data can and should be used to prioritize chemicals. A static, required list of toxicity tests should be avoided as§ check-the-box toxicology; instead, tiered, thoughtful testing strategies should be pursued with flexibility and creativity. For example, bioaccumulation, biopersistence, solubility, and other physicochemical parameters should be determined prior to conducting dose-related evaluations such as percutaneous absorption testing; moving up from there would involve a full characterization of the chemical or material using in vitro cell and tissue assays. For the sake of flexibility as science advances a list of required tests promulgated legislatively should be avoided. Ensure committees, meetings, and programs are publicly open at multiple§ stages. While the initial process for this initiative is public, and there were many opportunities for public comment and discussion, it is unfortunate that there will not be an opportunity for the public to react to the initial DTSC recommendations before they are transmitted to the Secretary for Environmental Protection for finalization. Seek input from animal protection stakeholders, who have a unique set of§ qualifications and can specifically address the reduction and replacement of in vivo animal tests, before recommending testing strategies or regulations. The National Academy of Science’s recent report addressing the future of§ toxicity testing should be embraced as part of a GC initiative, not only in the interest of animal welfare, but in the interest of a healthy environment. Issues of emerging concern, such as the toxicity of mixtures and synergistic

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	effects, nanotechnology, low-dose effects, and the timing of exposures in the life cycle, as well endocrine, immunological, and neurological effects, combined with the sheer number of existing and new chemicals, require a new way of evaluating chemicals. The vision of the NAS report, which calls for a reinvention of toxicity testing using high-throughput in vitro and in silico screens and tests based on human relevance, should be backed wholeheartedly by California. One tool that deserves special mention as a way to move this vision forward is the ToxCast program, in its first phase at EPA. The EPA is looking to enter into cooperative agreements with other entities in order to complete future phases. Additional information can be found on the Web: http://www.epa.gov/osp/ftta.htm. Funding, resources, ideas, and other contributions are necessary in order to help this vision come to fruition, and it is both within the capabilities of California and required by the vision of GC to do so. Other projects to promote more intelligent and/or human-based toxicity§ evaluation schemes are currently being pursued and should be incorporated into GC policy recommendations. These include: The OECD QSAR Toolbox and other International QSAR Foundation activities, OECD and NTP toxicogenomics initiatives, ILSI/HESI's Tiered Toxicology Testing Proposal for Pesticide Chemicals, the OECD Integrated Approaches to Testing and Assessment workshop (taking place in December of 2007), as well as others such as those presented during the Cal/EPA workshop October 1-2, 2007. We also encourage coordination with the FDA and pharmaceutical manufacturers. Despite the necessity of creating new human-relevant toxicity testing§ strategies, there are barriers to this goal as discussed above. As part of the GC initiative, California should put incentives into place for chemical manufacturers and testing laboratories to develop and validate human-relevant methods. These can include grant awards, tax incentives, or forms of product stewardship recognition.
F-TD-22	As a citizen of California who cares about the environment, scientific austerity, and animals in laboratories, CalEPA needs to focus on human-centered testing methods. Protecting the environment should be open and transparent with an opportunity for public input. The science used needs to focus on developing and using cost- and time-efficient high-throughput human cell and tissue methods, computer-based methods such as (Q)SAR, and intelligent, tiered testing schemes. Animal-based toxicity testing methods are inaccurate and can result in the painful deaths of hundreds or sometimes more than a thousand animals per chemical. California cannot ensure the health and safety of its citizens or wildlife by relying on these methods. Thank you for your time.
F-TD-23	During the course of the conversation with California, the High Production Volume (HPV) program has been the subject of discussion and criticism. The HPV program is a voluntary initiative that was launched as a cooperative effort among EPA, the chemical industry, and Environmental Defense in 1998. Through this effort, more than 300 companies and consortia volunteered to provide safety information on chemicals, which collectively represent nearly 95 percent of U.S. chemical production by volume. It has made more health and environmental data publicly available faster than any other regulatory or voluntary initiative before it. This significant contribution has been widely recognized as an important and successful program by EPA, state and foreign governments, public health officials and professional science organizations. By most measures, the HPV Program rates a solid A. Some have unfairly criticized the chemical industry and EPA's performance in this unprecedented program. However, more often than not, these criticisms are predicated on faulty analyses, and overly simplistic reviews of the program. For example, some critics want to look at raw numbers alone as a measure of the program's success or failure, without examining any underlying circumstances that might shed light on or explain the numbers more completely. ACC acknowledges that not all HPV Challenge submissions are complete and that the program did not meet its targeted end date, but industry commitments are strong and continue to be met. Sponsors have completed initial submissions for 97% of those chemicals sponsored in the U.S. Challenge component of the program. This includes submitting to EPA studies on more than 11,000 health endpoints. The HPV Challenge Program was unprecedented. Prior to the HPV program, no one had experience with an ambitious plan that sought to make a fairly significant amount of screening-level hazard information on some 2,200 chemicals publicly available in a relatively short 6- or 7-year period. Examples of

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	common problems encountered by sponsoring manufacturers that slowed work progress in the HPV Program are: insufficient technology for analytical method development; delays when preparing testing methodologies for substances that are difficult to test; guidance documents do not necessarily define all the requirements of a study, requiring sponsors to fine tune the guidance; and learning curves in the early stages of the program had to be overcome. In fact, manufacturers volunteering in the HPV program made commitments to use their best efforts to complete work by target deadlines. Comparing Speed of US HPV Submissions with Those Sponsored in the OECD Program Compares Apples to Oranges While it is true that a sponsor may fulfill a commitment either by submission to EPA in the U.S. component of the Challenge Program, or by submission to the OECD SIDS international program, comparing the completion rate between the two is not a fair one. In the OECD program, sponsors obtain a country sponsor to which a dossier and SIDS Initial Assessment Report (SIAR) are submitted for review and acceptance. Once the member country is in agreement with the content of the SIAR, the SIAR is then submitted to the OECD for review and comment by other member countries. Therefore, the sponsor country's review, comment, and agreement with the SIAR are imperative before a submission is deemed complete under the terms of the HPV Challenge Framework. This frequently involves a significant amount of discussion concerning data questions and data interpretation. In operational terms, this makes for a far lengthier process than is the case for those submissions to the U.S. EPA. Consequently, comparing the speed with which submissions are made in the two components of the Challenge Program results in a skewed interpretation of the submission rate. TSCA Is Strong and Robust Critics of the HPV program often maintain that the Toxic Substances Control Act (TSCA) is burdensome and blames it for the fact that EPA has not issued more test rules covering 243 HPV orphan chemicals, although these critics fail to offer any actual evidence to support this assertion. In fact, the requirements under TSCA are quite reasonable and not burdensome to meet. And, in point of fact, EPA plans to issue several section 4 test rules between the end of 2007 and 2009 on most, if not all, HPV orphan chemicals. Alternatives to Direct Testing Are Appropriate Some criticize the quality of HPV submissions based on their reliance on alternatives to direct testing, i.e., unpublished data; application of estimation methods; and category approaches. This criticism is unfounded. First, the fact that a study is not published does not mean that it is unreliable or less accurate than one that is published. Many scientific journals will not publish negative (finding that something did not happen)—studies having a bias for positive (something did happen) outcomes. The majority of the data and relevant studies were in company files and had not been published because TSCA does not require the submission of data that fails to show an adverse effect, and most companies generally were not inclined to share expensive test results with their competitors. Second, the use of estimation methods and category approaches was explicitly encouraged by EPA in the HPV Challenge Program. (See October 14, 1999, letter to HPV sponsors from EPA Deputy Assistant Administrator Susan Wayland). A quick review of the HPV guidance on EPA's and OECD's websites makes clear that these alternatives are appropriate when developing screening-level hazard information to complete the SIDS data sets, recognizing the significant animal welfare issues involved. Unfortunately, some choose to ignore the sensitive animal welfare issues presented in testing programs, which were a principal reason for the use of alternative approaches to testing under the HPV Program. All HPV Data Submitted Was Publicly Available, Readily Retrievable, and Usable From the Very Beginning of the Program Some critics claim that the HPV Program failed to have continuous, real-time access to program status and results on the Internet. However, every commitment, every robust summary, every test plan, every piece of data submitted was publicly available and readily accessible on EPA's website from the very beginning of the program's existence. http://www.epa.gov/hpv/

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F-TD-24	Toxics by design The chemical industry is responsible to putting chemicals on the market, & providing the society with all the benefits the chemicals bring. However, that also brings the responsibility to analyse the human health & environmental profile of the chemicals, and manage chemicals in an appropriate way in accordance with their profile. REACH is a good example of such responsibility. Risk assessments as described under RACH & the current Existing Substances Regulation of the European Commission do provide detailed evaluations of the chemical properties and risks they pose to health and environment, and quality data according to GLP & approved protocols should lay at the basis of such assessments. Such a system should give clear certainty to industry that a chemical can continued to be used once the assessment is completed and approved, & it should also not continuously be challenged on the basis of data which are not scientifically sound. Having said that, the concept is to drive improvement where possible, even if a substance is being accepted through the system. Even where acceptable risk levels are identified, continued risk reduction should be encouraged and rewarded, as well as development of products with improved characteristics. Product stewardship programs, designed to better management throughout the supply chain of the substance, & continued minimisation of the impact of the substance, should be recognised & encouraged.
F-TD-25	The below listed organizations appreciate the opportunity to provide comments on the California Environmental Protection Agency's (CalEPA) Green Chemistry Initiative. Our organizations represent many of California's and the nation's leading industries and employers. We fully support science and risk based chemicals management policies which protect health and the environment while assuring product safety and efficacy and promoting innovation in the marketplace in California. Chemistry is at the foundation of a wide range of industries. The science of chemistry helps to make the lives of Californians and others throughout the world safer, healthier, and more productive. Chemistry goes into modern materials used to make insulation, weatherization equipment, firefighting and other emergency response equipment, lightweight vehicle parts, coatings, lubricants, and energy-efficient appliances. Just a few of the many industries that use chemical or chemical-derived products include farming, new residential construction, emergency response services, plastic bottle manufacturing, electronics and high-technology, consumer products manufacturing, upholstered furniture manufacturing, dry cleaning services, building services and health care. We support the statement of CalEPA Secretary Linda Adams that this "…strategy, and the policy it champions, must have at its core and be governed by sound science." Advancements in science make possible product innovations that meet consumer needs, while increasing knowledge about the safety of chemical products and protecting the environment. A science-based assessment that evaluates human health and environmental considerations, performance, and cost and feasibility must include an examination of traditional and alternative technologies, materials and processes. Incentive-based approaches can allow companies to more easily and effectively share this knowledge, best management practices, and opportunities. Our industries and employees appreciate California's leadership in undertaking a comprehensive, scientific and risk based approach to this complex issue. Adhesive and Sealant Council American Chemistry Council AeA (American Electronics Association) American Sportfishing Association Association of Woodworking and Furnishings Suppliers California Chamber of Commerce California Circuits Association

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	California Manufacturers and Technology Association California Paint Council Chemical Industry Council of California Consumer Specialty Products Association Flavor and Extract Manufacturers Association Fragrance Materials Association Grocery Manufacturers Association Independent Lubricant Manufacturers Association International Association of Color Manufacturers International Sleep Products Association IPC – The Association Connecting Electronics Industries National Association of Home Builders National Paint and Coatings Association NFIB – California Soap and Detergent Association Society of American Florists U.S. Chamber of Commerce
F-TD-26	DTSC should look at the procurement and / or contractual use of existing data and software tools to implement the Green Chemistry Initiatives for the short-term and long-term program needs. Previous posts have indicated various available existing chemical data systems and tools, including Chemical Compliance Systems, the Canadian efforts, and the European REACH program. Use of these types of tools could facilitate implementation of voluntary and/or regulatory programs in the near future as a beginning effort and establishment of a foundation, to be built upon in future developments, meeting the Green Chemistry initiative goals and objectives. One example of a potential use of existing tools is the establishment of a product "green" certification program which would allow consumers to readily identify green products. This type of program is already available via use of Chemical Compliance Systems data tools that can provide an automated "Green" assessment of chemical products which can be readily tailored for use in California. The use of such existing programs can provide efficiency through the avoidance of "re-inventing the wheel" and expanding on proven technologies and / or approaches. Through the procurement and / or contractual use of existing data and software tools, DTSC should establish programs and/or partnerships by which these types of tools and data can be made available to other stakeholders (such as product manufactures, business and private consumers, other government agencies, etc.) on a free or lower-cost basis for the purpose of meeting or promoting the Green Chemistry Initiative goals and objectives.
F-TD-27	Toxics by Design The chemical industry or chemical importers should take the responsibility to describe the environmental characteristics of their products. The financial burden of testing chemical products appropriately lies with the producer or importer. Such testing should be carried out at independent test facilities, and it may be beneficial to California to encourage the creation of such test centers within the state – either as independent entities or as part of the CA University system. Self certification by the producer would be based on independently run tests of a chemical's characteristics in terms of whether the chemical should be considered persistent, bio-accumulative, and toxic (PBT), or should be considered a very persistent and very bio-accumulative (vPvB), or should be considered to have significant possibility of being carcinogenic, mutagenic, or reprotoxic (CMR category 2). These classifications are well recognized in global regulatory systems, and the data necessary for such classifications can be clearly defined. The data and rationale behind

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	the assessment shall accompany the submission. The submission would be reviewed by the CA EPA and final determination of the chemical's classification will lie with CA EPA. At the discretion of CA EPA, appropriate stakeholder involvement in this process can be encouraged. Materials classified as PBT, vPvB, or CMR category 2 should be subject to risk analysis. This is a primary focus for any policy – to address materials having clear areas of concern. If risk levels are judged too high, then industry should have the opportunity to introduce appropriate measures to reduce risk within a given time span, or face phase out of the material. Again the concept is to drive improvement where possible. Within a phase out strategy, the potential use of alternatives must address any risks associated with such substitution. It should not be acceptable to propose substitution by a material for which there is little data on its characteristics. Fundamentally, lack of data should not be rewarded. Even when there are acceptable risk levels, continued risk reduction should be encouraged and rewarded. Incentives could be given to develop products with improved characteristics, e.g. non-PBT or polymeric chemical additives. Similary, improved stewardship, such as driven by the BFR industry's Voluntary Emission Control Action Program (VECAP) should be encouraged and rewarded. Materials not classified as above, should be approved for use, unless there is a clear concern identified. Ideally all materials should be subject to risk analysis, but this may not be practicable.
F-TD-28	The Grocery Manufacturers Association (GMA) represents the world's leading food, beverage and consumer products companies. The association promotes sound public policy, champions initiatives that increase productivity and growth and helps to protect the safety and security of consumer packaged goods through scientific excellence. The GMA board of directors is comprised of chief executive officers from the Association's member companies. The $2.1 trillion consumer packaged goods industry employs 14 million workers and contributes over $1 trillion in added value to the nation's economy. GMA appreciates the opportunity to participate in a dialogue on California's Green Chemistry Initiative with California's Environmental Protection Agency (CalEPA) and other interested parties. Our membership includes leading consumer products companies that produce safe consumer products that are protective of human health and the environment while improving the quality of life and protecting the public health against dangerous diseases, infestation, and unsanitary conditions. Green chemistry is sustainable innovation. It is built upon a foundation of companies using hazard and exposure analysis to address safety prior to marketing. It is about moving toward products with improved environmental quality that also improve performance and consumer value to better meet all consumer needs. It uses analytic tools such as life cycle assessment to guide real product improvement and to protect against burden shifting or regrettable substitution with unintended adverse consequences, such as occurred with MTBE. Background Our members are committed to thoroughly evaluating their products for human and environmental safety through rigorous safety-based assessments before they are marketed. Our members provide clear and meaningful labeling on consumer products to ensure that consumers use products in accordance with label instructions. Our members routinely apply green chemistry and green engineering principles in their operations and have been honored with awards for their efforts. The consumer products industry develops products that meet or exceed the safety requirements of all state and federal agencies in the United States and Canada charged with regulating those products, including the California Department of Pesticide Regulation, the California Air Resources Board, other state agencies, the U.S. Consumer Product Safety Commission, the U.S. Environmental Protection Agency, the U.S. Occupational Safety and Health Administration, the U.S. Food and Drug Administration, Health Canada, and Environment Canada. GMA supports initiatives that continue to foster innovation and encourage universities, educational institutions, and industry to partner in developing effective "greener" ingredients that reduce environmental impact. We support company performed safety-based assessments of consumer products prior to the marketing of a product, considering all phases of the lifecycle of a product. Any chemicals management program must be based on sound scientific risk assessment to protect public health and the environment, and we support appropriate use-restrictions for chemical ingredients when those

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	scientific safety-based assessments indicate they cannot be used safely in consumer product or use application. We support initiatives by companies, government and interested parties to promote consumer awareness of the importance of reading and following label instructions for safe product use, storage and disposal. We applaud collaborative efforts to encourage public and private partnerships, with a goal of developing greener products and environmentally responsible ingredients based on life cycle considerations, rather than mandatory and voluntary state labeling programs that endorse green products or programs that stipulate a single third-party certification of green products or numerical ranking. We encourage research that shows opportunities for the use of green chemistry in consumer products, as well as policies designed to overcome barriers to commercial application of green chemistry research and development efforts. We support initiatives that create incentives for innovative companies that develop greener products that are technologically and commercially feasible, and we encourage recognition for companies that develop sustainable business operations, processes and/or products. General Principles We believe that the Green Chemistry Initiative should ensure the safety of consumer products through the use of sound science in the decision-making process. It must foster innovation and encourage the development of new chemistry technologies. The Initiative should be designed to promote products that are technologically and commercially feasible to produce without compromising product efficacy, performance and usability. It should build on existing statutory and regulatory structures, voluntary initiatives and data development efforts. Finally, CalEPA should seek guidance from all stakeholder interests. Key Elements for the Green Chemistry Initiative We respectfully submit that the framework for the Green Chemistry Initiative should include the following elements: (1) A Systematic, Collaborative Process to Address Priority Chemicals: We support California's initiative to move beyond a chemical-by-chemical approach and build a more systematic, scientific and collaborative process to address priority chemicals. As Governor Schwarzenegger recently stated: "I strongly believe there needs to be a systematic way to address these types of concerns where California's scientists can work together with experts throughout the world to evaluate the health effects of chemicals, assess the risks they pose, and ensure that the safety of possible alternatives receives the same consideration." It is eminently sensible for California's collaborative effort to proceed in tandem with ongoing work by other government agencies assessing chemicals. The Canadian Government announced their Chemicals Management Plan on December 9, 2006. Numerous substances that have been in commerce for more than 20 years were assessed against rigorous scientific criteria. As a result of that process, Health and Environment Canada are now addressing priority chemicals as part of the Industry Challenge Program within the Chemicals Management Plan. Since Canada is undertaking this proactive approach for existing substances against the most modern science, we respectfully suggest that CalEPA collaborate with the Canadian government not only on the priority list of chemicals but the program in general. In our opinion, this collaboration would avoid needless duplication, inefficiencies and burdens, as well as take advantage of credible, high-quality scientific work already completed. This will help the government of California to meet its goals in a faster, more cost-effective way. Working with the Canadians and the Plan undoubtedly would foster greater results for the regulatory cooperation agreement for chemicals announced by the President and the leaders of Canada and Mexico this past summer. As part of the agreement signed in Montebello, the three countries agreed to share data, information and safety assessments so that all North Americans would have continued access to safe and effective products with improved sustainability and environmental quality profiles. With California's expertise at the table, collaborating with the agencies involved could accelerate the benefits of this effort across the North American region. As indicated in Governor Schwarzenegger's comment, it is important that California proceed with a science-based approach that focuses on key

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	information, including toxicity and exposure of chemicals and possible alternatives, so that sound safety decisions can be made in the context of scientific risk assessment. This process must be the tool for focusing resources and attention on a limited number of chemicals that are important to evaluate. The process should be collaborative and should include scientific experts in toxicity and exposure from academia, chemical manufacturers, product formulators, and nongovernmental organizations. The manufacturers of the chemicals and consumer products could provide toxicity and exposure/use data to determine whether the uses of “priority chemicals” are safe or should be restricted. (2) Ingredient Communication: Some consumers have expressed a desire to know what ingredients are in the products they use in their everyday life. These consumers are interested in having this knowledge in order to make informed product choices. We support providing accurate information to consumers through ingredient communication. Manufacturers of essentially every name-brand product have programs to respond to the information requests and needs of consumers. For example, we actively work with consumers who call our toll-free numbers or send emails. We are always looking for better ways to communicate. Some third party assessments and information available on the Internet or through literature searches can be inaccurate due to the reliance on sources or on assumptions that may not be as current as the information provided by the manufacturers or industry groups representing the products. Industry has the obligation and continues to improve the methods it uses to communicate product information to consumers, especially in its efforts to ensure the safe and appropriate use of the products. We would like to work with California to implement a means of ingredient communication that would provide consumers with the information they can use to make even better informed decisions regarding the products they use in their homes. (3) Product Safety Assessments: Our members are committed to thoroughly evaluating their products for human and environmental safety through rigorous safety-based assessments before they are marketed. We support the continual improvement of safety assessments and methodologies including conducting life cycle assessments to help understand the health and environmental footprint of products and possible alternatives through their lifecycle. Our members have staff that includes experts in toxicology and environmental science to work on these assessments. CalEPA could work with scientific experts to examine best practices and to develop a toolkit for safety assessment programs and for safety assessments. Companies also could make a description of their safety assessment process available on the Internet. This could help provide context for product ingredient communication. In addition to product safety assessments, companies could adopt programs to ensure the safety of raw materials and packaging, operations, storage and distribution, and the use and disposal of products. (4) Supporting Innovation: The Green Chemistry report argues that there is a need to close the “technology gap” through market-based incentives to support green chemistry. This could include funding for university research grants, scholarships, and similar programs, as well as awards for innovation, tax credits, low-interest loans, and other incentives. These positive incentives should be open to all companies that are innovators and sell products in California -- not simply be limited to companies located in California. * * * * * Chemicals are useful and essential ingredients for many products that protect public health and improve the quality of our lives. We appreciate the importance of a scientific approach based on an evaluation of hazard and exposure information to determine the safety of these products that improve the well-being of the public.
F-TD-29	Here's a novel idea: how about we start using natural substances that are not toxic in the first place and end this absurd and relentless abuse of animals in toxicity testing that we all know is both inhumane and inaccurate. We will never progress in any area until we stop the needless suffering of all species

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	on this planet.
F-TD-30	There are certainly ways to help our environment without hurting any of the animals in our environment! There are ways to identify and eliminate toxic materials without hurting any animals!!! Please work to prevent any tests on animals for any reason. Tests on animals, in any form, are, in my opinion, inhumane and unjust. Thank you for your consideration. Nora Hull
F-TD-31	As a resident of california for over 35 years, I am deeply in favor of protecting our environment. However, CalEPA's consideration of large-scale toxicity testing could result in the deaths of thousands of innocent animals. Instead of employing animal testing, there are other less cruel and more effective alternatives, such as using human cell and tissue methods or computer based methods. As an environmentalist and animal rights advocate, I respectfully urge the EPA to consider using non-animal based testing to achieve its green chemistry goals.
F-TD-32	A recent report by the National Academy of Sciences, entitled "Toxicity Testing in the Twenty-First Century: A Vision and a Strategy," recommends an overhaul in the way chemicals are tested for toxicity. California's implementation of green chemistry goals should be consistent with this vision, and the state should commit resources to this effort. Animal-based toxicity testing methods are dismally inaccurate, and they result in the painful deaths of hundreds or thousands of animals per chemical. California cannot ensure the health and safety of its citizens or wildlife by relying on these outdated testing methods. Thousands of chemicals have already been tested in other government programs, and existing data must be gathered, fully evaluated, and used prior to initiating further testing requirements. Only human-focused testing methods such as cell and tissue assays should be used
F-TD-33	At Bayer MaterialScience we share society's values of developing, producing and putting into the marketplace products that are both beneficial and safe for humans and the environment. We respect and support the objectives of Responsible Care® along with sustainable development as a commitment for management and as a responsibility shared by each employee. We at Bayer continue to address green chemistry objectives through innovation and product stewardship. Innovation is essential to driving green chemistry and sustainability in markets such as automotive, green building and alternative energy. Products and their uses are evaluated to help assure intended benefits to society while also protecting public health and the environment. We follow the American Chemistry Council's Responsible Care® program, with a management system that is certified by third-party auditors. We integrate knowledge of potential hazards of chemicals with an understanding of potential use and exposure in our risk management programs. We appreciate the California Green Chemistry Initiative's request for comments on the program and support an approach that addresses the following points: • Look at the chemical information that is already available to California. • Make it clear that the Green Chemistry Initiative process will be governed by a risk-based science approach. • Support an understanding of both the benefits and the burdens of new regulatory proposals. • Consider process technology as part of a green chemistry program. Look at the chemical information that is already available to California: We believe that California should consider existing data and information already available to California and the public before making judgments on additional chemical specific data and information needs. There are existing programs such as the High Production Volume (HPV) Challenge Program

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	and the Extended HPV Program, which have provided valuable toxicology and exposure information that is publicly available. Hazard information from such sources can be used in light of exposure scenarios to evaluate potential risk and ensure appropriate risk management. In addition, the information from the recent evaluation and categorization of chemicals on the Canadian Domestic Substance List (DSL), Canada, should be considered by California. Make it clear that the Green Chemistry Initiative process will be governed by science with a risk-based approach: We believe that the Green Chemistry Initiative must be based on sound science with a risk-based and weight-of-evidence based approach. Objective and reproducible scientific methodologies are the keystones upon which regulatory policy should be based. Everything can be toxic at some level; the key is to minimize potential risks (risk = hazard x exposure). The Green Chemistry Initiative should be based on the principles of risk. That is, minimizing the use of toxics in light of the exposure scenarios, along with considerations of efficiency and economics. Support an understanding of both the burdens and the benefits of new regulatory proposals: To most efficiently use resources, we believe that consideration should be given to existing chemical management systems. Many existing regulatory and voluntary programs promote innovation and advances in chemical technology, govern areas of product life-cyle, and also promote pollution prevention and research into the use of less hazardous substances. We believe that the Toxic Substance Control Act (TSCA) is a comprehensive chemical management statute. Criticisms of the TSCA to protect human health and the environment often overlook the real need for resources to properly administer the statute. Without the proper staffing and financial resources, any regulatory program will have limited effectiveness. Innovation is critical to green chemistry. Rather than imposing regulatory burdens, innovation through green chemistry can be promoted with positive incentives and partnerships. Green Chemistry should be encouraged through the sharing of expertise, financial support for research, information exchange, and public education. Incentives could be offered for companies to pursue and foster Green Chemistry and Green Engineering. Consider process technology as part of a green chemistry program: Green chemistry is an important consideration in efforts that lead to sustainable development, but it is only part of a potential solution. In a broader sense, green chemistry programs should include process technology considerations as alternative chemistry is being evaluated. This technology can have a significant impact on minimizing potential adverse health or environmental effects of a chemical substance. Process technology can reduce both human and environmental exposures to chemicals, for example, through enclosed systems, recycling of by-products, and controlling potential environmental releases. Use of these process technologies can eliminate the need for substitution of critical raw materials. In conclusion, we believe that a green chemistry initiative must be based on sound science, be risk-based, leverage validated existing health and environmental information, and consider engineering and processing technology. We feel that innovation and partnership with industry should be encouraged. Industry should be brought in as a critical stakeholder in this Initiative as it develops. On behalf of Bayer MaterialScience LLC
F-TD-34	Give me a break! Going Green does not mean testing on poor defenseless animals! Testing is an outdated and barbaric practice in any society! This is outrageous!! Please do not do this!!

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F-TD-35	Our industry creates products and services that make life better for people around the world — both today and for tomorrow. The benefits of our industry are accompanied by enduring commitments to Responsible Care in the management of chemicals worldwide. Several of the Responsible Care® Guiding Principles require/encourage manufacturers to be responsible for concerns regarding their products and communicate these to the public. To provide chemicals that can be manufactured, transported, used and§ disposed of safely. To provide information on health or environmental§ risks and pursue protective measures for employees, the public and other key stakeholders. To support education and research on the health, safety and§ environmental effects of our products and processes. To work with others§ to resolve problems associated with past handling and disposal practices. We would encourage DTSC to rely on the work that will be developed as a result of the Montebello Agreement between the United States, Canada and Mexico. The environmental agencies of the three companies will coordinate efforts to advance chemical assessment and management in North America.
F-TD-36	Procter & Gamble Suggestions The California Green Chemistry Initiative holds a lot of promise for expanding the principles of Green Chemistry, accelerating innovation and creating important health, environmental, social and economic benefits. Through the Conversation with California—workshops, symposia and Blog contributions—it's clear that there is broad interest and excitement about moving the state forward, both in improving protections for the environment and the health of Californians, and in creating a more sustainable future. P&G supports the State's objectives. Here are some ideas that California can consider to advance GCI. Priority Chemicals—California should establish a program to identify, assess and manage priority chemicals based on an evaluation of hazard and potential for exposure - Move quickly by leveraging priorities identified in the Canadian Chemical Management Plan. Create a collaborative effort between California and Canada to accelerate progress in both geographies. - Include a means for adding and deleting priority chemicals based on unique California circumstances. - Leverage the recently assembled U.S. Inventory Update report to provide initial volume, use and exposure information. Identify uses and user industries for the high priority chemicals that raise the greatest concern. Expect producers of priority chemicals and manufacturers with high concern uses to provide hazard and exposure information on those chemicals/uses to the program. - Provide the agency with authority and a due process to establish restrictions for uses of priority chemicals that have unacceptable risks. - Facilitate informed substitution in moving to alternatives for restricted uses of priority chemicals - Organize this overall effort in a collaborative approach involving chemical producers, targeted users/industries, the agency and appropriate academic and other 3rd party experts. - Engage with US EPA and the recently announced Canada-US-Mexico Montebello Agreement to avoid duplication and expedite action on priority chemicals in California and throughout North America. Product Safety Management Systems—California should expect and encourage manufacturers of consumer and commercial products sold in California to employ comprehensive product safety management systems that include: - Assessments to ensure the safety of products prior to marketing; - Rigorous control of production from raw material specifications, to formulation management, to process and quality control; - Safe operations that protect the health and environment of employees and the surrounding community; - Compliance with all applicable product safety, labeling and regulatory requirements including transportation, waste management and product disposal; - Constant vigilance in post market surveillance with rapid response to identified concerns; - Innovation that improves product performance, value and environmental quality based on life-cycle considerations;

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	- Transparency in communicating information about safety management systems and products; and, - Ongoing evaluation and improvement of systems performance. Animal Welfare—In pursuing the objective of the Green Chemistry Initiative to expand toxicology information on chemicals, California should encourage the use of alternatives to animal testing and require testing only as a last resort. - The agency and UC university system could work with other experts to provide assistance on alternative screening methodologies that can be utilized to provide adequate toxicology information for recommendations and decisions about priority chemical uses. Transparency—California should take the lead in expanding the amount and ease of accessing Information on chemicals and product safety. - Expect and encourage manufacturers of consumer products to communicate information about the ingredients in products, either on the package or on the internet at the manufacturer's discretion and with appropriate provisions for protection of Confidential Business Information. - Expect and encourage chemical and product manufacturers to update their MSDS's to the new 16-section ANSI standard and to reflect the latest hazard information from voluntary (e.g. HPV) and regulatory (e.g. Canada CMP) programs. - Encourage companies in important value chain sectors to work together to identify "beyond MSDS" information needs both upstream and downstream and to establish processes for communication to meet those needs. - Leverage California's capability and interest to assemble a chemical information system on hazard, use and exposure from global sources. Stimulate Green Chemistry Innovation—California should prime the pump to initiate early and significant advancements in Green Chemistry and to recognize and reward success. - Provide economic incentives for business innovation in green chemistry. - Provide economic support and incentives for innovation at California's University system: scholarships, research funds, technology licenses, etc. - Focus the above programs on development and commercialization of alternatives for restricted priority chemicals, including for small business application and on innovations that create breakthroughs in performance, value and environmental quality. - Develop a registry in which all stakeholders can document Green Chemistry successes - Develop an extension service through the UC university system to expand reapplication of successes across the potential user community. - Establish an Annual Green Chemistry Recognition program for new chemicals, products and processes and for advances in research, analytical and toxicological methods that best exemplify the objectives of GCI, - Continue the Conversation with California via ongoing workshops, symposia, and other communication approaches to maintain and build on the momentum established in the program to date. November 15, 2007 Contacts: Bill Greggs, greggs.wj@pg.com Pat Hayes, hayes.pl.1@pg.com
F-TD-37	Fossil-fuel-based plastic use in our society continues to grow at an exponential rate, creating a plethora of environmental impacts for California, the oceans and, increasingly places like Lianjiao, China (see http://news.sky.com/skynews/video/videoplayer/0,,31200-greenbritain_china_p222,00.html). The State of California has one of the most impressive recycling mandates in the country but I am very concerned about where our recycling, especially our plastic, is going. Most consumers believe that their fossil-based plastic, once placed on the curbside for recycling has been taken care of in a way that renders any

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	potential problems with plastic waste solved. Myself and my colleagues at Green Sangha have been working over the past 2.5 years educating the public regarding plastic waste issues including pollution in the ocean. The central Pacific Gyre contains a plastic waste mass that has been measured to be larger than the state of Texas. Because plastic does not biodegrade, plastic entering the oceans remain there unless it is deposited on a distant beach. Fossil fuel-based plastic has entered the marine food web at many trophic levels impacting countless marine species (birds, salps, marine mammals, etc…please see: http://www.algalita.org/pelagic_plastic_mov.html) Small bits of plastic in the central Pacific Gyre outweighs zooplankton at a ratio of 6:1 (six pound of plastic for every pound of plankton!), according to research published by the Algalita Marine Foundation. Of greatest concern for my organization and me right now is what is happening to our plastic waste once it leaves the US shores not as litter but as commerce. At the link, http://news.sky.com/skynews/video/videoplayer/0,,31200-greenbritain_china_p222,00.html please find some news footage shot by Sky News in the UK. This news story highlights the situation that Californians don't know about and never see. It is the story of the dark side of plastic downcycling that all policy makers need to see, we believe. This short news piece is of great importance regarding plastic policy here in California. The plastic industry continues to repeat the mantra that plastic is fine; we must continue to use it but we need to do a better job recycling. I'd like the Green Chemistry Initiative to first acknowledge that fossil plastic is downcyclable not recyclable. And that most of our fossil plastic waste is being shipped overseas and being handled under conditions that are harming water, air, public health and the land surrounding so-called recycling facilities. In the video workers are exposed to mountains of unsanitary plastic waste. They melt it down and/or burn it; smoke and ash fills the air. Untreated polluted water runs into local streams turning them dark grey; they too are littered with plastic and ash. Workers are subjected to toxic fumes and heavy metals where PVC is downcycled without any idea that their work is dangerous…. Needless to say, there are no health or environmental standards in places such as Lianjiao, China. Our continued embrace of plastic needs to be looked at with a cradle-to-cradle perspective, which requires a close look at what is happening overseas. The Green Chemistry Initiative is for California, but for the initiative to have integrity in cannot be part of exporting waste that is causing great harm overseas. We in California need to develop closed-loop safe and just ways of handling our waste. The current model of exporting plastic to countries such as China needs to be stopped if California is serious about its Green Chemistry Initiative. Andy Peri Green Sangha Further information provided: a link to the short online version of the video described above and some articles regarding waste exports to China. on behalf of Andy Peri
F-TD-38	please stop testing on animals! there are alternatives--use them!

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F-TD-39	GREEN CHEMISTRY AND BEYOND: SUSTAINABILITY, SAFETY AND CONTINUAL IMPROVEMENT INTRODUCTION Earlier this year, California kicked off its Green Chemistry Initiative with the stated goal of taking a collaborative approach to significantly reduce the impact of toxic chemicals on public health and the environment. The Soap and Detergent Association provides the following comments on behalf of its members so that California may consider new ways to manage chemicals towards the continual improvement of public and environmental health. The Soap and Detergent Association (SDA) is the non-profit trade association representing manufacturers of household, industrial, and institutional cleaning products, their ingredients and finished packaging; oleochemical producers; and chemical distributors to the cleaning product industry (http://www.cleaning101.com/). SDA members produce more than 90 percent of the cleaning products marketed in the U.S. SDA members strive to meet the commitments of a sustainable industry: 1) advancement of social well-being, 2) advancement of human health and environmental quality, and 3) economic growth. Cleaning products have been an integral part of the dramatic advancements in public health and longevity, and the decline of communicable diseases throughout the world over the past two centuries. SDA and its members have been at the forefront of research on the environmental and human-health safety of their products for the past 50 years, and a culture of innovation and continuous improvement among its members has resulted in a robust industry that is a leading contributor to the public health across the country. SUSTAINABILITY Social Sustainability SDA members are committed to contributing to a better quality of life for our consumers, business partners, employees and the communities in which we operate, and to maintaining a high level of product stewardship throughout the chain of commerce. As such, we believe that decisions of preferability and substitution should be based on the comparative life cycle impacts of a chemical and its potential substitute. While a safety-based characterization scheme may focus on toxicity, persistence and bioaccumulation, there are a number of other parameters which are relevant to the sustainable use of a particular chemical in a formulation such as raw material sourcing and carbon footprint. All relevant aspects of sustainability should be taken into consideration for a potential substitution decision. Similarly, any plan to consider substitution of chemicals should require that the efficacy and benefits of that compound be considered as any diminution of efficacy may negatively impact public health and well-being through reduced hygiene and sanitation. Environmental Sustainability Cleaning products are chemical formulations, and generally each ingredient in a formulation will have some measurable toxicity. However, the use of cleaning products generally is well understood, leading to sound characterizations of exposures and risks. SDA members are committed to the enhancement of human health and quality of life through the responsible formulation, production and sale of cleaning products and ingredients, and their proper use. SDA members only market products that have been shown to be safe for humans and the environment, through careful consideration of the potential health and environmental effects, exposures and releases that will be associated with their production, transportation, use and disposal. In determining the safety of cleaning products, toxicity of ingredients to humans and wildlife is studied. Economic Sustainability The cleaning products industry is an important component of this nation's public health infrastructure and a contributor to the nation's economic well being. As such, it is important that the Green Chemistry Initiative not compromise this industry. SDA members are committed to innovating to improve products both in terms of performance and environmental impact. The Green Chemistry Initiative must ensure that product efficacy, performance, and usability are not undermined, and that the ability to innovate is not compromised. In fact, California is uniquely well positioned to foster innovation in Green Chemistry and product formulation. With a strong educational system including world-class research university and a robust high technology sector, California has the means to lead the world in developing and commercializing alternatives to high priority chemicals of concern. The Green Chemistry Initiative should include a significant component related to research and development of alternatives for high priority chemicals which

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	leverages California's intellectual resource. Through such efforts, California could facilitate the development and application of chemicals that will reduce negative impacts to the citizens of California. SUGGESTIONS FOR CALIFORNIA Confirming the Baseline Safety of Chemicals in Commerce In order to affect the impact of toxic chemicals on public health and the environment, the inherent hazards and potential for exposure should be integrated into a risk framework, and risks should be managed appropriately. Currently, there are several national and international programs designed to evaluate and manage the risks of chemicals. California should leverage existing efforts and customize results to meet their needs. For example, in Canada, Environment Canada completed a prioritization exercise of 23,000 chemicals on their Domestic Substances List (DSL) in 2006. Using information from Canadian industry, academic research and other countries' data, Government of Canada scientists worked with partners in applying a set of rigorous tools to the 23,000 chemical substances on the DSL. They were categorized to identify those that were: inherently toxic to humans or to the environment and that might be persistent and/or bioaccumulative, and substances to which people might have greatest potential for exposure. From this exercise there were over 4,000 chemical substances identified as needing further attention, and about 19,000 (over 80% of the total) were set aside as not needing further action based on their hazard and exposure profiles. Among the chemicals needing further attention, 500 were high priority, 2600 were medium priority and 1200 were low priority, and most of the low priority chemicals were eliminated from consideration. Additionally, about 150 of the high priority chemicals were determined to not be used in Canada and were restricted from further use without an evaluation. In the end, Canada has moved forward to consider about 350 high priority chemicals and 2700 medium priority chemicals. California could focus on the 500 high priority substances identified in Canada's program. To address unique circumstances that might exist in California, the State could have a process to add substances to the high priority list, as necessary, based on hazards, uses and exposures to workers and consumers in California. Once the high priority chemicals are identified, use and exposure should be considered to determine whether there are impacts on human health and/or the environment. The State could work in coordination with other North American initiatives (e.g., Canadian Domestic Substances List prioritization, EPA and OECD High Production Volume Chemical programs, Security and Prosperity Partnership (SPP) of North America Regulatory Cooperation Framework) in order to assess the risks of the highest priority chemicals. In undertaking such programs, SDA urges the State to proceed with any chemical assessments in a manner that would avoid unnecessary animal testing. In cases where real impacts exist, risk management strategies should be implemented in order to reduce those impacts, including use-specific restrictions where there are unacceptable risks. Continual Improvement of the Safety Profile of Chemicals in Commerce California can continually improve the safety profile of chemicals in commerce in the State by focusing on the high and medium priority chemicals in use, and using Green Chemistry and other tools to facilitate informed substitution with chemicals having an improved safety and life cycle profile. There are a number of opportunities for California to apply its resources towards traditional Green Chemistry activities. California could leverage the universities in the State and the high-tech business sector towards the development of alternative chemicals for those of the highest priority, and development of alternative manufacturing processes for those with high discharges of hazardous waste. For alternatives identified, there should be a separate Life Cycle Assessment by an outside party, or state-funded Center for Excellence in order to confirm that there is no loss in performance with the alternative, to avoid unintended consequences, and to assist in commercialization. The State also could develop a Cooperative Extension-type program to assist companies in Cradle-to-Cradle product design/formulation and assist in adoption of new alternative chemistries and processes. In order to facilitate informed substitution of high priority substances towards those with a more favorable environmental and human health profile, the State could develop database of chemical alternatives that compares a number of sustainability parameters: performance, price, human health and environmental (e.g., toxicity, bioaccumulation, persistence) including carbon footprint and source sustainability. Additionally, the State could map the flow of chemicals in California using information drawn from existing sources such as EPA's Inventory Update

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	Reporting (IUR), the data received by Canada during its data call-ins for high priority chemicals, and other contributions from the public. In order to assess the performance of these programs and measure the impact of these reforms, the State should monitor metrics that will assess releases of chemicals to the environment and exposure to humans. Increased Transparency and Access to Information on Chemicals in Commerce California could expand access to information on chemicals for consumers, businesses and regulators by leveraging its preeminence in data management and mining in order to organize the world's chemical data. For example, the dossiers for the EPA High Production Volume (HPV) Chemical Challenge program, and the related European program are often difficult to find and the data difficult to extract. By partnering with the information technology sector (e.g., Internet search firms), the State could expand access to chemical information, support its local industry and raise awareness of chemical safety information currently available. Additionally, California could expand product-specific chemical ingredient disclosure for consumer products which currently do not have that requirement. To increase transparency and improve the management of chemicals in the workplace, California should adopt the 16-section Material Safety Data Sheet (MSDS) described by ANSI Standard Z400.1-2004. Recognition and Rewarding Success As California's Green Chemistry Initiative unfolds, it will be important to recognize efforts and reward successes. The State could establish a registry for companies seeking to align their business practices with the Green Chemistry principles and acknowledge their intent. Similarly, the registry could accumulate examples of product development decisions and substitutions that have resulted in reduced waste produced and energy inputs. The registry could be the basis for recognition of successes in reducing impacts from chemical exposures similar to the Presidential Green Chemistry Challenge Award, but focusing on results achieved through implementation of a program or application of a new chemistry rather than development of a new technology. SUMMARY California's Green Chemistry Initiative should emphasize all three components of sustainability: the social benefits of chemicals and products, the economic contributions through innovation and improved performance, and the environmental and human safety. California can confirm the baseline safety of chemicals through a prioritization based on hazard and exposure, assessment of risk, and management of risks including use-specific restrictions where necessary. California can drive innovation, the benefits of products and the continual improvement of the safety profile of chemicals by leveraging the State's expertise, and applying resources to the application of Green Chemistry research and development. California can expand access to information on chemicals in order to improve decision-making by taking advantage of their data management industries to organize the world's chemical data, and by increasing the disclosure of chemical ingredients in consumer products. Once California has implemented its Green Chemistry Initiative, it should recognize the efforts of those industries seeking to apply the principles of Green Chemistry and provide recognition to those that have had notable success.
F-TD-40	We are sick of you scientists testing on animals for our needs. Find other alternatives. Now.
F-TD-41	please end testing of chemicals on animals....I want BOTH the earth and its animals to thrive. Living organically and chem-free is a must if nature is to come into balance.

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F-TD-42	The following is feedback to the questions provided by the Department of Toxics Substances Control. After over 16 years of environmental engineering experience working for the Department of Defense (DOD), two tools have been identified that require coordination and work to fully implement. These tools are standardization of the LCA process as feasible covering most products and the Chemical Compliance Systems (CCS) quanlitative analysis database programmed with data to rank any chemical relatively to the universe of chemicals (quantitative analysis) and compare to the regulatory limits using the standardized environmental performance characteristic data provided by EPA and CAL EPA. With some work, these approaches would significantly improve the environment. At DOD and with those I interface with in the DOD and industry, it not a question of the intention to improve the environment and work "beyond compliance," but is a question of providing key data to the chain of industries moving product to market. This is now possible utilizing the CCS tool or similar applied to the LCA stages. Beyond the work, is a key to require manufacturers of chemicals, substances and products to provide both the hazardous chemicals in the Materials Safety Data Sheet (MSDS) and the nonhazardous chemicals so that a valid green rank score and comprehensive report may be provided via the web on-line automatically and real time. The report contains all the CALEPA and FED EPA environmental characteristics of concern with a normalized Environmental SCORE organized by the key areas ECOLOGY, HUMAN HEALTH and HUMAN SAFETY. Utilization of the IS0 14001 Environmental Management System (EMS) continual improvement for the environment of sustainability is an active process in DOD and city municipalities in whole or part that provides the management approach. Key is feedback to the manufacturers of chemicals, academia, industry, consumers etc so that the best choice for the environment may be made by all. This will mitigate the predicted increase of toxic pollution in the environment by CAL BERKLEY (see www.ucop.edu/cpre) "Special Report" Green Chemistry in California despite all the effort. Beyond Compliance is normal standard practice by DOD and industry. The key is quality real time information feedback to make the best choices by all involved in the "Cradle to Cradle" process of manufacturing-construction-R&D. As a team much is possible. Playing this in parts and pieces is not efficient. Further comments on Cradle to Cradle, Green Chemistry and Toxics in Products by Design. on behalf of Ray Paulson, P.E. Fleet Readiness Center Southwest North Island
F-TD-43	I agree that information is key for companies and consumers to make the best decisions regarding the chemicals/products they choose. However, I would respectively suggest that an ideal model is not one with data to rank any chemical relatively to the universe of chemicals (quantitative analysis).Ultimately, we need a system that focuses on a chemical's rank relative to environmental performance and impacts on health, including worker health. While, in cases where there are not clear alternatives, we may have to gauge toxic chemicals in terms of the lesser evil, but our ultimate goal, and that of the Green Chemistry Initiative, should be in my view, one of measuring against the impacts of a particular chemical. The development of green chemistry should be seen and implemented as a means of developing alternatives that don't have to be compared on a scale of harm because they are designed so as not to be harmful. Granted that this is not easy, but what are goals are now will determine how successful we will be later. November 14, 2007 | Andria Ventura, Clean Water Action The CCS tools referred to by Mr. Paulson both "rank any chemical relatively to the universe of chemicals [across 43 ecological, health and safety endpoints] as he indicated AND rank each chemical "relative to environmental performance and impacts on health, including worker health" [and safety] as Ms. Ventura requested.

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F-TD-44	CCEEB believes that an effective green chemistry program should consider the concepts of risk management and net benefit as elemental to identifying topics of focus for this Initiative. “Risk” is usually expressed as a probability that an event will occur. Expressing risk in this way allows relative comparisons to be made about exposures to various substances and events. For example, expressing risks as a probability allows us to compare a variety of risks associated with daily living as shown in the table below: RISKS OF DAILY LIVING Relative Risk Type of Risk 0.2 Disease from PCBs in diet 0.3 Disease from DDT and DDE in diet 1 Disease from drinking 1 quart of municipal water per day 18 Dying by electrocution in any given year 60 Disease from drinking 12 oz. of diet soda per day (saccharin) 367 Falls, fires, poisonings in the home 667 Respiratory illness caused by air pollution (Eastern U.S.) 800 Dying in auto accident in any given year 2,800 Disease from drinking 12 oz. of beer per day 112,000 Disease from smoking one pack of cigarettes per day Chemicals are not inherently risky. Rather, risks result from a combination of several factors including a chemicals’ potential hazard, potential routes of exposure and dose- response relationships. An assessment of risk results in an understanding of the level and type of risk associated with a particular substance. Once that risk is understood, steps can be taken to manage it. Risk management efforts can involve a variety of approaches such as: • Substituting alternative input materials, • Making process changes during manufacturing, • Installing technological controls (e.g., pollution control equipment), • Requiring use of personal protective equipment, • Instituting a range of pollution prevention options, • Training, • Labeling, • Imposing various storage, transport and disposal requirements, This is a short list. There are many other regulatory and voluntary efforts to protect workers, the public and the environment. These efforts are embodied in the numerous Federal, state and local statutory and regulatory programs that require a wide range of existing, ongoing and active risk management

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	processes that are already being implemented by California's regulated community. Further, industries have undertaken many voluntary risk management efforts at their facilities worldwide. In addition, risk must be weighed against net benefit. There are many chemicals in use today that could pose a hazard if used improperly but have a net benefit that makes the risk acceptable. Common household cleaners like beaches and detergents are examples of chemicals that could pose a risk if used improperly, but are ubiquitously present in households in California because of their net benefit. Chlorine used to purify drinking water and fluorine added to drinking water by many communities to fortify teeth. Both of these elements are highly toxic in concentrated form and yet serve important community public health functions. Another example of the inherent net benefit of using individually toxic and highly reactive chemicals is the combination of butadiene and styrene to produce latex, a synthetic rubber and a safer paint product. Agencies developing California's Green Chemistry Initiative must realize the importance of applying the concepts of risk management and net benefit in developing and implementing the Green Chemistry Initiative.
F-TD-45	I respectfully disagree that we can rely on a risk management or risk assessment model to protect human health and the environment from the impacts of toxic chemicals. As stated in a recent letter submitted by the CHANGE coalition, of which Clean Water Action is a member, "Assessment of chemicals should focus on their intrinsic hazards and move away from reliance on time-consuming risk assessment methods that can be readily manipulated. Assessments should integrate the concepts of "cradle to cradle" and alternatives assessment to look for the least hazardous options in all cases. Furthermore, they should be based on the most sensitive criteria, such as the need to protect vulnerable human populations, endangered species, or water quality..." It has been our experience, working with communities, that in reality, toxic chemicals will out. If risk management is truly effective, why do we find toxic chemicals in our bodies, our water, and our air? Why is it that despite the difficulty of showing cause and effect in many cases, scientific evidence continues to mount demonstrating that many health and pollution impacts are tied to chemical use and release? Why are 1500 cases of preventable illness tied to chemical exposures in the workplace diagnosed monthly in California? And how do we determine cumulative impacts, even when the chemical mixtures we are exposed to contain "safe" levels of individual constituents? In fact, while we argue about the level of risk a hazardous substance may pose, the actual impacts occur. As for weighing benefits, such an analysis must also consider the "externalities", such as costs to communities in terms of lost wages from sick leave, health care costs, environmental degradation and the economic impacts that brings, expensive clean up actions, higher education costs due to higher rates of behavioral and developmental problems in highly exposed populations, etc. These are difficult things to quantify, but they are key if we wish to accurately weigh benefits vs. risk. No matter how well toxic chemicals are managed, there is the problem and cost of disposal at the end of the life of the products or processes in which they are used. We simply have to point to the mountains of electronic waste to demonstrate the impacts that these chemicals can have. It may be argued that we can impose rules on manufacturers, requiring take back and recycling, but we must also remember that those processes in themselves are expensive and have their own environmental or health impacts. Finally, I would suggest that moving toward a model in which hazard traits are prioritized will be essential in protecting and growing the California economy. As someone who comes from a business background, I believe that it really doesn't matter if stronger regulations in the EU and elsewhere are correct or not. The reality is that if our industries wish to compete in those markets, they will have to adapt. While the EU may accept risk management as a premise, hazard trait analysis can provide our companies with a competitive advantage by enabling them to develop/choose safer alternative chemicals and to respond to shifts in international regulatory frameworks as they occur. At the risk of sounding naive, I wonder why we want to stay with a model that requires us to accept a certain degree of harm (for example, acceptance that some percentage of the population will get cancer) and burdens us with the difficulty and cost of managing exposure instead of focusing on creating non-toxic alternatives from the beginning. I do not, for a moment think that we can change overnight, or that it will be easy. But by relying on old models,

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	we will not even approach a more sustainable way of production. Those industries and businesses that look at the real, unadulterated impacts of their decisions (in this case, the hazard traits of chemicals they use) will be in the best position to innovate and avoid negative consequences down the line. And they will be the ones that will enjoy a sustainable future.
F-TD-46	The California Green Chemistry Initiative (GCI) is an innovative mechanism with the potential to influence the design of products in ways that reduce the use of harmful chemicals and generate less waste and pollution. The objective to create partnerships between industry, the public, and government agencies to bring about this change represents an interesting social experiment. The success of such partnerships will surely rest upon the ability to simultaneously meet the competing needs of all stakeholders. Chemical Compliance Systems, Inc. (CCS) believes we have unique resources that can effectively assist California result in successfully establishing GCI partnerships. CCS has compiled the largest and most accurate relational hazardous chemical/product and regulatory databases in the world over the past 22 years. These unique databases have been derived from over 1,000 sources and are currently comprised of approximately 75,000,000 data elements for 210,000 chemicals, 350,000 products and munitions, and 650 local, state, federal, international and nongovernmental organization regulations. These databases are maintained current, expanded on a daily basis, and are constructed to facilitate utilization of discrete elements in a wide spectrum of analytical compliance systems. CCS has currently developed 13 nonmunition and 10 munition Web-based analytical compliance software modules that utilize different elements from these databases and could immediately be implemented, or easily be customized, to support GCI requirements/needs. In addition, CCS has developed eight detailed concepts that will apply to more broadly defined GCI considerations. CCS has been working to “green” products and the environment for nearly 10 years. We currently have four separate, but equivalent, Web-based “green” analytical compliance systems for chemicals, products, processes and munitions. Each of these four modules utilizes the same 43 specific ecological, health and safety criteria to quantitatively evaluate the “greenness” of a chemical, product, process (including wastestreams), or munition. Each of these systems also includes alternative product/process constituent chemical data tables to facilitate the selection of a less harmful ingredient. In combination, the “green” product/munition and process modules provide a complete life cycle (i.e., “cradle to cradle”) analytical capability. Each has product design and evaluation capabilities that enable chemists/engineers to design “greener” products/processes upfront, and acquisition, regulatory and ecological/health/safety professionals to assess, or compare, the “greenness” of the overall product/process (wastestream) to the level of detail they require. Each of these modules also simultaneously identifies the regulatory impact of the overall product/process, parts or components, or individual constituents. These tools will enable California regulatory agencies to partner with industry and the public to establish objective and quantitative “green” standards, or performance measures, for products and processes that can be incrementally increased over time and apply fairly to both small and large companies. The utilization of harmful chemicals will be reduced and less waste and pollution will be generated. The “green” standard will be a known, level playing field for industry, and the result will be greater protection for workers, the public, and for the environment. These “green” capabilities have also been incorporated into a Web-based Chemicals of Concern module that can quantitatively rank the concerns for a chemical/product inventory at a facility, thereby focusing alternative chemical acquisition, or research, on the worst offenders first, effectively accelerating pollution prevention. CCS regulatory compliance capabilities draw upon our List of Lists data that currently includes 650 state, federal, international, and nongovernmental organization lists and associated data. Our Web-based compliance capabilities are available as standalone modules, or incorporated into other analytical tools (as described above). Compliance assessments can be applied to facility inventories, products/processes, waste classification, and/or CERCLA/RCRA site remediation. CCS is scheduled to develop a new, Web-based Health Risk Assessment module for the U.S. Army that will utilize our

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	existing, Web-based Conceptual Site Model, and simplify RCRA Subpart X and CAA Title V Permit applications. Finally, CCS has conceptualized a Chemical Homeland Security System (C-HoSS) that will utilize existing facility chemical/product inventories to quantitatively rank resident chemical hazards, security risks and mortality risks by location at the facility. These three reports quickly prioritize inventory concerns. Entry of container accessibility constraints (i.e., storage conditions that control access) for chemicals of greatest concern enables C-HoSS to rank container vulnerabilities and identify accessibility requirements to nullify all vulnerabilities. C-HoSS concern levels are made proportional to the Homeland Security Advisory System daily risk levels. C-HoSS addresses all four levels in an effective security program (i.e., vulnerability assessment, corrective strategy, third party verification, and management system incorporation). C-HoSS will be a good tool for effectively eliminating terroristic chemical vulnerabilities at a facility. In addition, C-HoSS could have direct utility for preparation of California permit-required Security and Emergency Response Plans. Implementation of C-HoSS across the entire State of California can be accomplished “free,” utilizing a state grant for “equipment” from the Department of Homeland Security. CCS hereby offers to provide a remote demonstration of our existing Web-based capabilities and detailed concepts, at no charge, to any parties interested in their potential utilization in support of the California GCI, to achieve corporate “green” objectives, or to utilize in “green” product acquisition.
F-TD-47	As a taxpayer of California, I strongly urge you to stop all aanimal testing and instead implementdeveloping and using cost- and time-efficient high-throughput human cell and tissue methods, computer-based methods such as (Q)SAR, and intelligent, tiered testing schemes. Thank you, Janet Girard
F-TD-48	Please abstain from using animal-based toxicity testing. It is not necessary. I am a California resident and an environmentalist, and I would be very upset if your plan to save the environment included the degradation of animals. Please act responsibly and do not embarrass yourself any further. Devri Speaks of Laguna Beach CA
F-TD-49	Vivisection is scientific fraud and science GONE MAD. Its only purpose is to save corporations from lawsuits. How can these vivisectors have had such an extensive education - but haven't come to the conclusion that animals' physiological makeup is COMPLETELY different than ours. Animals' systems have such a different reaction to certain drugs and/or medications than we would. The slave trade is alive and kicking. Has been for years and years. Animals ARE NOT OURS to kill and eat, wear, experiment on, use for clothing. They are not ours to exploit either (circuses, zoos, Sea World, etc.) VIVIsectVI (Roman Numerals 666)
F-TD-50	Animal testing is NOT science! Animal-based toxicity testing methods are inaccurate and can result in the painful deaths of hundreds or sometimes more than a thousand animals per chemical. California cannot ensure the health and safety of its citizens or wildlife by relying on these methods.

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F-TD-51	My name is George Kopcsak. I am the former Deputy for Munitions in the Office of the Secretary of Defense. During that time efforts were initiated to accelerate the demilitarization (DEMIL) of approximately 1 million tons of old, outdated, unstable and/or incompatible munitions in our nation's stockpile. Initially this was accomplished through open burn and open detonation techniques. More recently there has been much focus on more environmentally friendly means to destroy munitions or to recycle the components. Some of this work is done within the state of California. Within the past decade a small business organization, Chemical Compliance Systems (CCS), has developed a metric to determine the environmental impact when differing DEMIL techniques are utilized. This metric is called the Green Munitions Analytical Compliance System (G-MACS) and was sponsored and initially funded by the US Army. I'm happy to say that this tool now exists on the web. Since this tool evaluates the ecological, health and safety risks associated with munitions by breaking each down to the chemical level I have learned that the tool can also be used by munitions designers and producers to evaluate the environmental impact of specific chemicals used to make the devices. The designer now has a tool to change specific components within a munition design and determine its positive impact on the "Greeness" of the design. The idea can now be carried forward to look at designing munitions to ease the environmental impact of its anticipated DEMIL 20 years down the road. Since CCS has focused on munitions at the chemical level they have been able to broaden their "compliance system" tools looking at any and all products being designed, produced, or destroyed as long as the chemical composition is known. This looks like a good fit with the California Green Chemistry Initiative. I believe that you should seriously consider its use. As a final note, the web-based CCS tools (G-MACS, GP-CAS, and G-MACS) appear to have the capacity to look at chemical compatibility issues related to their close proximity with a product design. This may well become important when one considers the environmental impact of munition/product aging or temperature cycling. Please give these tools a look.
F-TD-52	We know the material is already toxic. Use the computer formats and technology that we now have and stop committing sucide on helpless beings. You know they will die if you touch them with this stuff. Look what the oil spill did to thousands of birds and eco systems by just touching the oil. The planet is toxic enough. Stop wasting money on all of the toxic materials we are using and begin to look how we can stop this mania on beings which includes humans. Why don't you test the french fried potatoes at McDonalds. Now that is toxic to humans. They never break down - can you imagine what that does to a system of the body. Now that is toxic. Wake up people.
F-TD-53	I fully support the goal of protecting my native state's environment. It is important, however, that we use the best and most effective methods. In addition to being staggeringly cruel, animal testing is notoriously unreliable. The human body responds differently to toxins than do the bodies of other mammal. Human tissue tests and computer modeling are both ultimately more reliable and infinitely kinder. Green is good. But real "Green" ethics require a respect for life, including the lives of animal subjects. Please do not consider animal testing in any form for this program.
F-TD-54	A green research group would evaluate existing data first and pursue more modern testing techniques than utilizing and abusing animals for science. Animal testing for toxicity is both inaccurate and cruel. Please use alternate methods for your studies. Many chemicals have already been tested in government research programs.

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F-TD-55	The Dow Chemical Company (Dow) appreciates the opportunity to provide additional comments on a recent discussion initiated by the California Environmental Protection Agency on chemicals management policy. As a company providing products and services in over 175 countries, we comply with a broad range of chemical management policies and programs. Dow supports a consistent, coordinated regulatory environment for products at global, national and regional levels to complement industry voluntary efforts and to ensure a level playing field. Where new regulations are required, they should be based on established scientific risk assessment and risk management principles – predictable, flexible and capable of responsibly addressing society's economic, environmental and safety requirements. We recognize that regulatory systems will inevitably vary by country since they must work effectively within the broader statutory and regulatory framework for each country. Nevertheless, we generally support broad regional programs that provide the greatest consistency and uniformity for the industry as a whole. As a result, Dow is not an advocate for any particular program. Instead, we have developed a set of principles for effective chemical management programs. As governments select specific legislative or regulatory approaches to product safety or chemical control policies, we believe that certain principles should be adhered to, and we present them below. on behalf of Dow Chemical Company
F-TD-56	As an informed citizen of California, I must stress the importance of researching and developing human-focused testing methods, such as cell and tissue assays. California's implementation of Green Chemistry goals should mirror the vision for 21st-Century Toxicity Testing put forth by the National Academy of Science by committing funding and resources to this effort and ensuring any Green Chemistry initiatives related to toxicity testing take this groundbreaking report into account. Animal-based toxicity testing methods are inaccurate and can result in the painful deaths of hundreds or sometimes more than a thousand animals per chemical. California cannot ensure the health and safety of its citizens or wildlife by relying on these methods. It only makes common sense for data gathering requirements to take advantage of existing data gathered from other testing programs as well as intelligent testing strategies. Requiring a fixed list of toxicity tests for all chemicals is wasteful and unscientific
F-TD-57	The Bromine Science and Environmental Forum (BSEF) is pleased to offer the following recommendations to the California Department of Toxic Substances Control (DTSC) for your consideration in developing and implementing the Cal-EPA Green Chemistry Initiative. Summary: The guiding principle for this proposal is that it relies on successful management of chemicals already in the marketplace according to their characteristics and actual uses, rather than simply banning substances. This focus recognizes the important difference between risk and hazard, i.e., that hazardous substances properly managed may not pose actual risks, and would create a system that is based on successful management of indentified risks, as opposed to establishing prohibitions based on potential hazard. on behalf of the Bromine Science and Environmental Forum (BSEF)

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F-TD-58	In this day and age it is clear that hurting innocent animals in toxicity tests is unnecessary and beneath us as a race, as well as misleading and possibly seriously inaccurate. How toxins and potential toxins may affect longer-living creatures such as humans should be tested through human cell and tissue methods. There are already enough differences among humans' response to toxins with regard to our age, weight, gender, etc. There is no need to add information on how poisons will affect a completely different species when it involves intentionally harming them. I'm sure that our state, which presents itself as compassionate and forward-thinking, will have a humane, socially-elevated, intelligent approach to these tests and use non-animal methods. If not, then California would not be an example to the rest of the country and would fall short of most Californian's expectations. The goal should be to protect all life from harm whenever possible, especially under the title of "Environmental Protection."
F-TD-59	it would be rediculous to try to accomplish such a task and it is not efficient and is useless. California citizens should be embarassed that their state is trying to take technology and civility back a century.
F-TD-60	It is my hope that all of God's creatures be treated fairly, kindly and with respect. Be proud of what you do and the results you achieve at all times!
F-TD-61	Animal testing is unreliable, inhumane and selfish. I believe it was Gandhi who said "one can measure the progress of a nation by the way it treats it's animals." Based on this barometer, we Americans have much progress to make. As a citizen of California, I care deeply about protecting the environment and animals, whether wild, livestock or pets. Through circulating a petition to gain humane treatment of farm animals, I've learned how most people care as deeply as I do about these same issues. Protecting the environment is in the interest of every Californian. However, understanding the toxins in our environment need NOT be at the expense of defenseless animals. We need to get a handle on the toxic chemicals in our environment by developing and using cost/time-efficient high-throughput human cell and tissue methods, computer-based methods such as (Q)SAR, and intelligent, tiered testing schemes. California's implementation of Green Chemistry goals should align with the vision for 21st-Century Toxicity Testing put forth by the National Academy of Science by committing funding and resources to this effort and ensuring any Green Chemistry initiatives related to toxicity testing take this groundbreaking report into account. Animal-based toxicity testing methods are inaccurate and can result in the painful deaths of hundreds or sometimes more than a thousand animals per chemical. California cannot ensure the health and safety of its citizens or wildlife by relying on these methods. Data gathering requirements must take advantage of existing data gathered from other testing programs as well as intelligent testing strategies. Requiring a fixed list of toxicity tests for all chemicals is wasteful and unscientific. Thank you for your consideration and compassion for all living beings.
F-TD-62	Dear Sir, Using animals to test toxicity of drugs, chemicals, and other products makes about as much biological sense as using horse urine to produce PreMarin and other drugs for women who are going through the change of life. It makes no sense to develop a product from a creature whose biological structure is absolutely foreign to our own. In the end, the only result is that the animal dies. There are other, more accurate, and less costly (and less deadly) ways to test drugs, chemicals, and other products than to test them on an animal when you already know up front that the results that you get will have no relevance to how it would react on a human. With all of the science and technology, not to mention the people who do this work are usually highly educated, why doesn't someone (or a team) put their heads together and develop a method or methods that have true value, will yield results that actually make sense, and save money?

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F-TD-63	It is truly barbaric that we continue to test on animals in the 21st century. Surely, there are more accurate, humane ways of finding cures for diseases. We should treat all forms of life, not just humans, with reverence and respect. I don't know how anyone can look into the terrified eyes of a chimp, cat, dog, or mouse and inflict pain and suffering in the name of science.
F-TD-64	To know animals suffer, and to think, experiment anyway, shows "mental illness." The horrifying reality is, this lack of empathy is pervasive in most humans. We need to concentrate on the human brain, specifically to figure out how to fix this sickness.
F-TD-65	Please don't test on animals! It's not ethical, appropriate, or feasible to subject every chemical to a fixed list of animal tests. Animal tests do not protect human health and can use hundreds and even thousands of animals per chemical. In order to get a handle on toxic chemicals in our environment, California should develop and use cost- and time-efficient high-throughput human cell and tissue methods, computer-based methods, and intelligent, tiered testing schemes—not cruel and archaic animal methods. Only human-focused testing methods such as cell and tissue assays should be used. • Animal-based toxicity testing methods are dismally inaccurate, and they result in the painful deaths of hundreds or thousands of animals per chemical. California cannot ensure the health and safety of its citizens or wildlife by relying on these outdated testing methods. • Thousands of chemicals have already been tested in other government programs, and existing data must be gathered, fully evaluated, and used prior to initiating further testing requirements. CalEPA please protect both the environment and animals!
F-TD-66	Animal testing is cruel and unreliable. There are numerous examples of substances that are toxic to animals, but not to humans, and vice versa. Perhaps the most famous example is penicillin, fatal to some animals, but a lifesaver to humans. Far more accurate and humane alternatives to animal testing exist. Let's use them and ban all animal testing!
F-TD-67	animal testing is barbaric,immoral and wounds all of creation especially humankind! All of creation that shares this planet with us are inextricably linked with us more than we realize and when we violate any part of nature most especially the animals that are sentient beings we damage, wound and cause harm to all of us. Animal testing is spinning wheels in the dark and can only lead to a downward spiral of destruction for our whole planet earth!!! Animal abuse (which is testing as well) is based on lies and will bear no good fruit - seek the TRUTH and we will all be Blessed!!! Sincerely, Margaret Rose Rivera
F-TD-68	animal testing is barbaric,immoral and wounds all of creation especially humankind! All of creation that shares this planet with us are inextricably linked with us more than we realize and when we violate any part of nature most especially the animals that are sentient beings we damage, wound and cause harm to all of us. Animal testing is spinning wheels in the dark and can only lead to a downward spiral of destruction for our whole planet earth!!! Animal abuse (which is testing as well) is based on lies and will bear no good fruit - seek the TRUTH and we will all be Blessed!!! Sincerely, Margaret Rose Rivera

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F-TD-69	IF YOU SUPPORT SUFFERING, YOU WILL SUFFER. IF YOU SUPPORT TORTURE, YOU WILL BE TORTURED. IF YOU SUPORT KILLING, YOU WILL BE KILLED. IF YOU SUPPORT EATING LIVING CREATURES YOU SHALL BE EATEN. IF YOU SUPPORT LOVE, YOU WILL BE LOVED. IF YOU SUPPORT LIFE, YOU WILL LIVE. IF YOU SUPPORT FREEDOM FOR ALL LIVING CREATURES, YOU WILL BE FREE. Book: The World Peace Diet" by Will Tuttle, PhD. We are called to be caretakers of God's Creation not tyrants over God's creatures.
F-TD-70	There has to be a better way, please stop testing on animals.
F-TD-71	PLEASE ANSWER TO THE 21ST CENTURY AND FOREVER END, STOP ANIMAL TESTING!!!!!!!!!! NO MATTER WHAT YOU THINK, ANIMALS DO HAVE FEELINGS, BOTH EMOTIONAL AND PHYSICAL....CRUEL TESTS HAVE PROVEN THIS! PLEASE LEAVE A HUMANE LEGACY FOR YOUR CHILDREN AND THEIR CHILDREN! STOP AND END THE USE OF HELPLESS ANIMALS FOR TESTING POISONOUS CHEMICALS AND WASTE FOR THE SAKE OF OUR SELFISH HUMANITY. THERE ARE BETTER,SAFER AND WISER WAYS OF TESTING TOXIC MATERIALS. Animal-based toxicity testing methods are inaccurate and can result in the painful deaths of hundreds or sometimes more than a thousand animals per chemical. California cannot ensure the health and safety of its citizens or wildlife by relying on these methods. Data gathering requirements must take advantage of existing data gathered from other testing programs as well as intelligent testing strategies. Requiring a fixed list of toxicity tests for all chemicals is wasteful and unscientific.
F-TD-72	California can minimize animal testing by utilizing information from test programs that are planned or already underway. The U.S., Canada and Mexico have now agreed to a program to screen thousands of chemicals to see if further research is necessary to protect human health. It will follow work already being done in Canada prioritizing chemicals based on whether they show strong evidence of persistence, bioaccumulation and toxicity. USEPA has ongoing projects with the domestic chemical industry to gather data about large volume chemicals and fill in necessary information gaps. California should piggy-back any new chemical policy onto these programs rather than try to create its own testing agenda.
F-TD-73	This isn't the 1900 anymore, science as developed more reliable methods that do not involve the torture and destruction of helpless animals
F-TD-74	Animal testing should be outlawed. Thousands of innocent lives are lost fir testing and because Animal and Humans react differently with chemicals, testing is innacurate
F-TD-75	I'm writing in support of The Physicians Committee for Responsible Medicine (PCRM)in regard to CalEPA's proposed large scale chemical testing on animals. In a progressive state such as California, I'm surprised that this type of outdated horrific research continues to be done, especially knowing that there are more efficient, humane, & appropriate technologies available. We absolutely cannot say we're an advanced society by continuing to inflict cruelty on our fellow mammals and it's time to stop all animal testing. I say, "hands off the animals" and adhere to the National Academy of Science recommendations for tissue cultures, etc. Please, please work with PCRM!
F-TD-76	ALL Forms of ANIMAL TESTING are CRUEL and INHUMANE. Not to mention INCONCLUSIVE. There are OTHER Alternatives to Animal Testing. PLEASE USE THEM So MORE Animals DONT Have to SUFFER NEEDLESSLY and HORRIBLY !

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Number	**Full Comment**
F-TD-77	Rutgers University purchases thousands of chemicals and products for use in hundreds of buildings throughout our three campuses. We have implemented comprehensive acquisition processes to assure that the products we purchase are manufactured and distributed in compliance with all applicable laws and Rutgers standards. In the past six months, I have become aware of the Web-based “Green” Product Compliance Analytical System (GP-CAS) and the “Green” Process Analytical Compliance System (G-PACS) developed by Chemical Compliance Systems, Inc. (CCS). These two, quantitative, Web-based systems have been incorporated into a third party cleaning product certification program by the Chlorine Free Products Association (CFPA). Together, GP-CAS and G-PACS evaluate the entire life cycle of a product. Rutgers University is currently in discussions with CFPA and CCS about the possibility of incorporating these capabilities into our chemical and product acquisition processes. California may find these existing Web-based capabilities applicable to the objectives of your Green Chemistry Initiative. They certainly have the potential to achieve a voluntary product certification program that could increase the application of available chemical hazard information in a way that reduces labor and cost requirements for both the State and industry, while increasing the protection of the public and the environment.
F-TD-78	• A recent report by the National Academy of Sciences, entitled "Toxicity Testing in the Twenty-First Century: A Vision and a Strategy," recommends an overhaul in the way chemicals are tested for toxicity. California's implementation of green chemistry goals should be consistent with this vision, and the state should commit resources to this effort. • Animal-based toxicity testing methods are dismally inaccurate, and they result in the painful deaths of hundreds or thousands of animals per chemical. California cannot ensure the health and safety of its citizens or wildlife by relying on these outdated testing methods. • Thousands of chemicals have already been tested in other government programs, and existing data must be gathered, fully evaluated, and used prior to initiating further testing requirements.
F-TD-79	I am really for the enviroment and reducing my own carbon footprint as well as spreading awareness throughout my own community as to what anyone can do to be more enviromentally friendly. However I am not for cruelty to animals. Animal testing is barbaric, innacurate and unethical. I will not support YOUR organization if you support animal testing, plain and simple.
F-TD-80	Since I was a child, I have been active in trying to put an end to animal testing. As an adult, I know that animal testing can be avoided if those doing the testing put their minds to finding a better, non cruel method for producing test results. As a culture, we haven't evolved very much if we are still killing animals in the name of science for the fifty years that I have been alive. Come on= put your energy into finding other ways to test your toxic products. Don't kill defenseless animals in the name of science. It's cruel, inhumane, and not a reliable gage for testing results on humans. Find another way!!! I challenge you!

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F-TD-81	I want to join the voices urging green chemistry policies that do not involve using animals for testing, and are enacted quickly, as we are out of time. PCRM has said it best, so I will quote them below: Protecting the environment is in the interest of every Californian, and any programs or processes should be open and transparent with an opportunity for public input. We need to get a handle on the toxic chemicals in our environment quickly—that means developing and using cost- and time-efficient high-throughput human cell and tissue methods, computer-based methods such as (Q)SAR, and intelligent, tiered testing schemes. California's implementation of Green Chemistry goals should align with the vision for 21st-Century Toxicity Testing put forth by the National Academy of Science by committing funding and resources to this effort and ensuring any Green Chemistry initiatives related to toxicity testing take this groundbreaking report into account. Animal-based toxicity testing methods are inaccurate and can result in the painful deaths of hundreds or sometimes more than a thousand animals per chemical. California cannot ensure the health and safety of its citizens or wildlife by relying on these methods. Data gathering requirements must take advantage of existing data gathered from other testing programs as well as intelligent testing strategies. Requiring a fixed list of toxicity tests for all chemicals is wasteful and unscientific.
F-TD-82	Serious environmental scientists know that it's not ethical, appropriate, or feasible to subject every chemical to animal tests. Animal tests do not protect human health and can use hundreds and even thousands of animals per chemical. To test on animals to simply make health claims for humans is not only unreasonalbe, it's unethical and very unecessary. If this is what science has been reduced to, testing on animals to make health claims for humans, I think that science is the most pathetic and unevolved process that we have.It's a complete embarassing joke. However, there are alternatives. Please take human cell and tissue methods, computer based methods and tiered testing schemes into consideration. If we have spent all this time to create and produce such methods that are notibly more accurate than animal testing, and we do not use them, then what is the point. We already know what the majority of chemicals do to our bodies and the einvironment, why waste money, time, an innocent lives by conducting arcaic animal tests. Please reconsider, science reputation and the lives of millions of animals count on it!
F-TD-83	The people that test on animals clearly have conduct disorder...how can you hurt these harmless animals...you are sick and disgusting! I don't no how you sleep at night but all I do no is after you kill these animals they go to heaven where they stop suffering...and when you die you will rot in hell suffering from the same experiments that you did to them..You are sick people and you will get what comes to you.
F-TD-84	As a taxpayer of California I am concerned about wasteful spending in our state government. I find that nothing wastes our time and money more than animal research. It's a gravy train for most scientists since most research is funded in huge part by the pharmaceutical industry. 98% of all animal tests fail and cannot be applied to humans according to the FDA's own statistic! The latest Vioxx scandal is just the tip of the iceberg. Yet a lot of scientists keep using this outdated model because the FDA and NIH are slow-moving bureaucrats that are not prone to quick change. And a lot of companies are not interested in change since they make money off animal research. Bad habits are hard to break, yet there's hope on the horizon. There are new and more accurate testing methods that do not involve animals and are safer for us, safer for the environment and simply superior to the animal model. Even the NRC (National Research Council) found that current animal toxicity tests are time-consuming, expensive, unreliable in predicting human toxicity and concludes that animal testing should be greatly reduced and possibly eliminated.

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	I opt for cellular-based methods that are cheaper, faster and easier to use. In vitro tests can be automated to evaluate thousands of chemicals over a wide range and are able to identify the chemical's action on cell and gene function plus mode of action of toxicity. There are new and exiting technologies that use high-throughput cellular assays, microfluidics and computer models, all without using lab animals. I urge you not to go down the old road of costly wasteful animal testing but embrace the new and better research models. If not now, when? California is so much the frontrunner in so many ways, we should not be the rearguard when it comes to animal tests. Let these crude tests finally be a way of the past, not only for the animals' sake but for our sake. I also urge you to use existing data and not double-test what is already known to be toxic.
F-TD-85	Animal testing is dangerous because it has led to important errors when applied to humans. It is also an indication that a society still has much to grow in terms of morality and ethics.
F-TD-86	Please consider NOT testing on animals! Animal testing is cruel and useless. It does not give accurate results, as far as people go! If you want to be GREEN, respect all life -- including animals! Thank you for your time! PS: For more information, visit www.stopanimaltests.com!
F-TD-87	PLEASE DON'T TEST ON ANIMALS! Visit www.stopanimaltests.com for videos, photos, stories and what you can do to help animals in labs!
F-TD-88	Animal testing is sick, sad and sadistic... There are new advances in technology! We don't need to test on animals! That's a thing of the past. Please consider doing tests on computers --- not animals! Animals want to live free and happily; not be tested on in some dark, scary lab!
F-TD-89	Dear Sirs, Please protect the earth! Do what is best for Mother Nature and all her wonderful creations! We've got one planet and one change --- don't mess it up! Thank you for the time, Niki
F-TD-90	Animal-based toxicity testing methods are dismally inaccurate and can result in the painful deaths of hundreds or sometimes more than a thousand animals per chemical. California cannot ensure the health and safety of its citizens or wildlife by relying on these methods.
F-TD-91	Any good environmentalist knows that there is a balance within the envirnment and that balance includes animals. The use of animals in testing only helps to further corrupt our environment by taking away these creatures from either their natural habitats or helping to further the industries that breed animals so that the only future they have is loveless, cruel and painful lives. Humans are also animals and this planet belongs to us all, we have no right to say that furthering our existence is more important than letting the other earthlings that we share this planet with leading their lives as they were meant to be. Afterall, it is us as humankind that have lead to the slow deterioration of our home and innocent animals should not be left to foot the bill for it.
F-TD-92	As a native of California, I care deeply about the environment; I also care about animals in laboratories. CalEPA does not need animal testing to achieve its goals. On the issue of toxic animal testing (or any type of animal testing), I am in complete agreement with the position of the highly respected organization Physicians Committee for Responsible Medicine. NO ANIMAL TESTING!

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F-TD-93	Aside from being crual, tesing on animals is uselss because it is not scientifically valid.If the animal gets sickddies it is not necessarily true that a human will get sick/die from the same substance. If an animal does not get sick/die, it is not necessarily true that a human will not get sick/die from the same substance. Hence, the tests on animals do not guarantee safety for humans.
F-TD-94	We don't experiment on demented humans so how can we rationalize experimenting on animals? Non-human animals and human animals differ only in the quantity of their expression of certain characteristics not in the characteristics themselves. Non-humans have their own interests, they are capable of feeling pain and we should therefore extend moral significance to them. Speciesism is no different from racism and sexism. I believe we're ready to move beyond speciesism by stopping the use and abuse of nonhuman animals for our own pleasure and convenience. I don't believe any experimentation on animals should be done. But, in the event that some great benefit could accrue from such experimentation, the burden should be on the shoulders of the experimenter to prove without a doubt that this is so and that no other alternative would be acceptable. Again, there is no basis for setting non-human animals apart from our moral community. If we put our energies towards change, I'm certain we can discover many great alternatives to animal testing.
F-TD-95	There are other ways you can run tests. There are clones made from human cells and tissues that you can use, and also computer models of the human body. These human models are much more accurate then a rabbit or mouse. Please don't subject an innocent animal to unnecessary pain and suffering just for our benefit. Most people would never want an animal to suffer. The only reason most people are ok with these test are because they are behind closed doors where you don't not have to see them or think about them. If you saw the horrific things they did to these poor animals, I know you would try to stop it. Please think of the other methods that are available to run your tests. Thank you.
F-TD-96	Moving away from the use of animals in testing is a no-brainer. It's been demonstrated time and time again that data from animal subjects can't be trusted to extrapolate to humans. We should be researching and developing human- focused testing methods such as cell and tissue assays, which have proven to be more reliable than animal-based research. Moreover, we can take advantage of existing data gathered from other testing programs, preventing costly and needless suffering for animals.
F-TD-97	The scientific community has access to hypersophisticated technology so advanced that it makes animal testing seem even more archaic, barbaric and Draconian that it actually is. Isn't it about time that this technology is implemented to its fullest capacity, to save lives, both human and animal?
F-TD-98	Please use better testing methods that do not include harming other living creatures. Animal testing is not always a good predictor of how things will affect human beings anyway. Use the cell and tissue assay testing that has been developed to research the effects of toxins in the environment. This will give you the results you need and no living creature will need to be harmed in the supposed " name of science "!!!!!!
F-TD-99	...and the proposed large-scale toxicity testing initiatives aren't them. Let's not reinvent the wheel and cause undue animal suffering (and expense!), only to find in the end that the results have little bearing on humans. Why not commit funding and resources to the effort already initiated by The National Academy of Sciences? Not to do so would be wasteful in so many ways.

TOXIC BY DESIGN (FORUM)	
Number	**Full Comment**
F-TD-100	Animal-based toxicity testing methods are dismally inaccurate, and they result in the painful deaths of hundreds or thousands of animals per chemical. California cannot ensure the health and safety of its citizens or wildlife by relying on these outdated testing methods. Thousands of chemicals have already been tested in other government programs, and existing data must be gathered, fully evaluated, and used prior to initiating further testing requirements. I feel that it's not ethical, appropriate, or feasible to subject every chemical to a fixed list of animal tests. Animal tests do not protect human health and can use hundreds and even thousands of animals per chemical. In order to get a handle on toxic chemicals in our environment, California should develop and use cost- and time-efficient high-through put human cell and tissue methods, computer-based methods, and intelligent, tiered testing schemes—not cruel and archaic animal methods. A recent report by the National Academy of Sciences, entitled "Toxicity Testing in the Twenty-First Century: A Vision and a Strategy," recommends an overhaul in the way chemicals are tested for toxicity. California's implementation of green chemistry goals should be consistent with this vision, and the state should commit resources to this effort.
F-TD-101	There are human cell and tissue methods, computer-based methods, and intelligent, tiered testing schemes. Why hurt creatures of our environment? A Green Program should be friendly to all of the environment including all its animals!
F-TD-102	Protect the Environment Accurately!! Hi. We all want to protect the environment, but animal testing should play no part in that protection. That's because animal-based toxicity testing methods are inaccurate. Should we subject hundreds to thousands of animals--per chemical--to sometimes painful and always needless deaths? California cannot ensure the health and safety of its citizens or wildlife by relying on these methods. More accurate methods must be employed.
F-TD-103	Stop Cruel and Useless Animal Testing!!! Please stop testing on animals. It's cruel, unnecessary, outdated, and ultimately archaic. Serious environmental scientists know that it's not ethical, appropriate, or feasible to subject every chemical to a fixed list of animal tests. Animal tests do not protect human health and can use hundreds and even thousands of animals per chemical. In order to get a handle on toxic chemicals in our environment, California should develop and use cost- and time-efficient high-throughput human cell and tissue methods, computer-based methods, and intelligent, tiered testing schemes—not cruel and archaic animal methods. Don't believe me? Read this cold hard facts!: >A recent report by the National Academy of Sciences, entitled "Toxicity Testing in the Twenty-First Century: A Vision and a Strategy," recommends an overhaul in the way chemicals are tested for toxicity. California's implementation of green chemistry goals should be consistent with this vision, and the state should commit resources to this effort. >Animal-based toxicity testing methods are dismally inaccurate, and they result in the painful deaths of hundreds or thousands of animals per chemical. California cannot ensure the health and safety of its citizens or wildlife by relying on these outdated testing methods.
F-TD-104	Animal testing is disgusting STOP ANIMAL TESTING NOW! We Californians are better than that
F-TD-105	Animals Have Nervous Systems Just Like You How could you sleep at night while animals would scream with pains you would cause? BE HUMANE!

TOXIC BY DESIGN (FORUM)	
Number	**Full Comment**
F-TD-106	I love animals but not to the exclusiion of humans -- the results of testing on animals don't necessarily prove what the results would be on humans. Spare the aimals unnecessary testing and test only where results would be accurate for humans -- on human As a citizen of California who cares about the environment and animals in laboratories, I am concerned about CalEPA being involved in animal testing. The following points brought to my attention in an e-mail from the PCRM should be heeded by CalEPA: Protecting the environment is in the interest of every Californian, and any programs or processes should be open and transparent with an opportunity for public input. We need to get a handle on the toxic chemicals in our environment quickly — that means developing and using cost - and time-efficient high-throughput human cell and tissue methods, computer-based methods such as (Q)SAR, and intelligent, tiered testing schemes. California's implementation of Green Chemistry goals should align with the vision for 21st-Century Toxicity Testing put forth by the National Academy of Science by committing funding and resources to this effort and ensuring any Green Chemistry initiatives related to toxicity testing take this groundbreaking report into account. Animal-based toxicity testing methods are inaccurate and can result in the painful deaths of hundreds or sometimes more than a thousand animals per chemical. California cannot ensure the health and safety of its citizens or wildlife by relying on these methods. Data gathering requirements must take advantage of existing data gathered from other testing programs as well as intelligent testing strategies. Requiring a fixed list of toxicity tests for all chemicals is wasteful and unscientific. Thank you for your consideration.
F-TD-107	The planet will die (& us with it) unless we change to green ways Protecting the environment is in the interest of every Californian (and human), and any programs or processes should be open and transparent with an opportunity for public input. We need to get a handle on the toxic chemicals in our environment quickly—that means developing and using cost- and time-efficient high-throughput human cell and tissue methods, computer-based methods such as (Q)SAR, and intelligent, tiered testing schemes. California's implementation of Green Chemistry goals should align with the vision for 21st-Century Toxicity Testing put forth by the National Academy of Science by committing funding and resources to this effort and ensuring any Green Chemistry initiatives related to toxicity testing take this groundbreaking report into account. Animal-based toxicity testing methods are inaccurate and can result in the painful deaths of hundreds or sometimes more than a thousand animals per chemical. California cannot ensure the health and safety of its citizens or wildlife by relying on these methods. Data gathering requirements must take advantage of existing data gathered from other testing programs as well as intelligent testing strategies. Requiring a fixed list of toxicity tests for all chemicals is wasteful and unscientific. Likewise, somewhere in there should be the dire need for conservation. Grass is a ridiculous waste of future generations' water supply and it adds carbon with the power mowers, etc. Cutting back on wasteful practices also reduces the toxins released into the air, soil and water.

TOXIC BY DESIGN (FORUM)	
Number	**Full Comment**
F-TD-108	Animal Toxicity testing does not extrapolate to humans; it wastes our precious taxpayer dollars!!! I am a native Californian and I have a right to comment on and have input on any programs or processes that affect my health and the environment. I support quick results and that means developing and using cost and time efficient high through-put human cell and tissue methods, computer-based methods like (Q) SAR and intelligent tiered testing plans. "Green Chemistry" goals should be achieved by following the lead of scientists who advocate 21st Century Toxicity Testing of the National Academy of Sciences and by committing funding and resources to achieve this effort and ensuring that any Green Chemistry initiatives related to tox testing take this groundbreaking report into account. Animal based tox testing methods are inaccurate and can result in the painful deaths of hundreds or sometimes more than a thousand animals per chemical. California cannot ensure the health and safety of its citizens or wildlife by relying on these methods.Data gathering requirements must take advanatage of existing data gathered from other testing programs as well as intelligent testing strategies. Requiring a fixed list of tox tests for all chemicals is wasteful and unscientific. As a taxpayer, I am very tired of paying for animal based studies that can not be extrapolated to humans and that doing so can even cause harm to humans. Let's not repeat tox testing that has already been done, just to justify salaries. We already have a budget deficit for next year---let's not waste millions more taxdollars on "old" science that is already proven ineffective and wasteful. California is a proven trendsetter; let's keep it that way in this arena too!
F-TD-109	Animal testing cannot be the only option. Don't do it. Let's do it right by using any other available alternative. Ilaria
F-TD-110	No Animal Testing! There is no need to do animal testing for this. There are many other alternatives to get the data and conclusions that you need. Also, why waste all the money on suffering? Please do not test on animals.
F-TD-111	Animals should never be used for this horrific inhumane testing. We should set the precident by not being barbaric like China and other asian countries that cruely treats their animals. Please do not use animals for any testing.
F-TD-112	The traditional approach to gauging the potentially harmful effects of chemicals on humans has been to expose animals to the chemicals and look for overt signs of toxicity,such as death. Chemical toxicity should be assessed using a sophisticated array of non-animal approaches which can be done.This would completely eliminate the use of-animal-based testing.Humanely all animals need to be eliminated from any kind of testing.
F-TD-113	Animal testing ..... ? It is cruel and unnecessary to experiment on animals please rethink your strategy on testing methods.
F-TD-114	Animal tests are cruel and useless First, lets establish a few things here. * Animal testing is cruel and unethical. Period. In no way, shape or form do you even have the right to kill thousands of animals, especially when easy alternatives exist. * Animal testing is useless. First, for the obvious SPECIES DIFFERENCE. Animals bodies are not like ours, and the outcome you get from an experiment may end up harming humans. If you want to protect your california tesidents, use alternatives designed for humans, that will render the right results. In conclusion, the fine people who have posted above share my reasoning; we simply dont want pig-headed, ignorant people slaughtering thousands of animals in the sake of "science".
F-TD-115	end to crueil and painful treatment of animals Please help this country stop any and all animal testing and the pain and cruelty that is a result of it. Please set up standards for testing, research, development based on means such as human focused cell and tissue assays. Thank you.

TOXIC BY DESIGN (FORUM)	
Number	**Full Comment**
F-TD-116	Californians want their state to be forward-thinking. And that includes moving away from out-dated methods of testing chemicals. Please take into account the report from the National Academy of Sciences, "Toxicity Testing in the Twenty-First Century." If the National Academy of Sciences is calling for a re-tooling of the way toxicity is researched, shouldn't California be taking heed of this, and leading the way towards this goal? Please also take into account the many chemicals that have already been tested; it is a waste of time, money, and animal lives to compile redundant research on these. I'm proud of California for leading the way on so many environmental issues; let's stay cutting-edge on the issue of moving towards modern research methods, too. Please use only tissue and cell assays for whatever testing is necessary.
F-TD-117	Stop animal research... Cruel AND inaccurate! I cannot believe in our world today that you would still use animals to test upon when we have computer and cell culture technology! The use of animals is so cruel, redundant, as well as, so inaccurate! Get with the times!!!
F-TD-118	Animal testing is cruel and inhumane. We live in an advanced society where other methods can be used. If scientists continue using animals in these horrific experiments that are unfounded and useless, they are nothing more than barbaric beings of another kind.
F-TD-119	ANIMAL TESTS INHUMANE UNETHICAL AND NOT APPLICABLE TO HUMANS It is bizarre that we this we must tortune and kill others to make products safe for humans. In rality, the torture and killing is a given in these procedures but the benefits are simply not there - many animal tests have resulted in a false sense of safety in the past. THIS IS WRONG AND WASTEFUL. PLEASE STOP!
F-TD-120	No Animal Testing! Animal testing is ineffective and cruel. It's not necessary. Changing what's being allowed and cleaning up what has occurred will work. California’s implementation of Green Chemistry goals should align with the vision for 21st-Century Toxicity Testing put forth by the National Academy of Science by committing funding and resources to this effort and ensuring any Green Chemistry initiatives related to toxicity testing take this groundbreaking report into account. This is a critical decision. The end does not justify the means. We'll never get where we want to go by unnecessarily slaughtering animals. Thank you for your consideration.
F-TD-121	Protect Humans, but Use Tests that Work and Don't Harm Animals I want to be protected from toxic chemicals as much as anyone, but let's use methods that work. I understand the Physicians' Committee for Responsible Medicine is more than willing to assist you in developing methods for testing toxicity that are more accurate than outdated animal tests. Animal tests are torture and there is enough data showing that they often do not apply to humans. Let's use more cost and time efficient methods such as high-throughput human cell and tissue methods, computer-based methods and intelligent, tiered testing schemes. Thank you.
F-TD-122	Pain and suffering cannot be justified There is no justification for the use of animals for this testing. I will not vote for anyone who supports this initiative. Animals deserve our protection .
F-TD-123	LEAVE ANIMALS ALONE!

TOXIC BY DESIGN (FORUM)	
Number	**Full Comment**
F-TD-124	Painful Test to Animals Under the quise of "helping" humans we resort to painful,debilitating experiments on live animals which have uncertain, sometimes usless or undeterminate results. There are other ways to test the chemical's effects, which I am sure intelligent scientists that you are -can utilize. Testing put forth by the National Academy of Science that means developing and using cost- and time-efficient high-throughput human cell and tissue methods, computer-based methods such as (Q)SAR, and intelligent, tiered testing schemes. Another way -is to do the chemical tests on yourselves and get the results first hand Ed K
F-TD-125	Animal Testing Please do not continue with animal testing as it is not accurate. Going green is great but life is what you are trying to save so distroying it in the process is unthinkable. Thank you for listening and hopefully knowing what is right and helping the defenseless.
F-TD-126	No animal testing please, its not nessiscary completly unnessiscary.
F-TD-127	why animals who gives humans the write to torture our fellows animals for our own benefit? I certainly do not support this cruelty.Animals are living with us and are part of the world as we are.I respect every living thing and try my best to respect that in my everyday life and this is also why I am a vegeterian. can somebody explain me why is it acceptable to torture innocents creatures and why society accept proven murderers in jails and I pay with my taxes their food and habitat. What is wrong with that picture?
F-TD-128	Animal-based toxicity testing methods are CRUEL & INACCURATE Sir: Animal-based toxicity testing methods are dismally inaccurate, and they result in the painful deaths of hundreds or thousands of animals per chemical. California cannot ensure the health and safety of its citizens or wildlife by relying on these outdated testing methods. Thousands of chemicals have already been tested in other government programs, and existing data must be gathered, fully evaluated, and used prior to initiating further testing requirements. I feel that it's not ethical, appropriate, or feasible to subject every chemical to a fixed list of animal tests. Animal tests do not protect human health and can use hundreds and even thousands of animals per chemical. In order to get a handle on toxic chemicals in our environment, California should develop and use cost- and time-efficient high-through put human cell and tissue methods, computer-based methods, and intelligent, tiered testing schemes—not cruel and archaic animal methods. A recent report by the National Academy of Sciences, entitled "Toxicity Testing in the Twenty-First Century: A Vision and a Strategy," recommends an overhaul in the way chemicals are tested for toxicity. California's implementation of green chemistry goals should be consistent with this vision, and the state should commit resources to this effort

TOXIC BY DESIGN (FORUM)	
Number	**Full Comment**
F-TD-129	End Useless Animal Testing California's implementation of Green Chemistry goals should align with the vision for 21st-Century Toxicity Testing put forth by the National Academy of Science by committing funding and resources to this effort and ensuring any Green Chemistry initiatives related to toxicity testing take this groundbreaking report into account. Animal-based toxicity testing methods are inaccurate and can result in the painful deaths of hundreds or sometimes more than a thousand animals per chemical. California cannot ensure the health and safety of its citizens or wildlife by relying on these methods. Data gathering requirements must take advantage of existing data gathered from other testing programs as well as intelligent testing strategies. Requiring a fixed list of toxicity tests for all chemicals is wasteful and unscientific
F-TD-130	Don't listen to human-hating animal rights nuts Look -- There are two sides to this debate. You can be a realist and recognize that in order for humans to thrive, some animals must be sacrificed. Or you can be an intellectually incomplete bunny hugger and prefer to save lab rats over your neighbors, relatives, and friends. It's that simple. And tell the Physicians Committee for Responsible Medicine to mind its own business and admit that only 4 percent of its members are doctors. I would rather have science policy in California dictated by 100 random names from the San Francisco phone book, rather than these single-issue nut cases.
F-TD-131	GW not an excuse to waste $$ or lives Please don't use the miniscule degree of natural warming as an excuse to torture animals with archaic toxicity testing. There's going to be huge amounts of money spent on this scam, but don't pay for it with innocent lives of animals. Most testing done would be redundant anyway. Be fiscally responsible and use human based testing methods, which are much more accurate.
F-TD-132	Stop Toxicity Tests on Animals Protecting the environment is in the interest of every Californian, and any programs or processes should be open and transparent with an opportunity for public input. We need to get a handle on the toxic chemicals in our environment quickly, that means developing and using cost, and time-efficient high-throughput human cell and tissue methods, computer-based methods such as (Q)SAR, and intelligent, tiered testing schemes. California's implementation of Green Chemistry goals should align with the vision for 21st-Century Toxicity Testing put forth by the National Academy of Science by committing funding and resources to this effort and ensuring any Green Chemistry initiatives related to toxicity testing take this groundbreaking report into account. Animal-based toxicity testing methods are inaccurate and can result in the painful deaths of hundreds or sometimes more than a thousand animals per chemical. California cannot ensure the health and safety of its citizens or wildlife by relying on these methods. Data gathering requirements must take advantage of existing data gathered from other testing programs as well as intelligent testing strategies. Requiring a fixed list of toxicity tests for all chemicals is wasteful and unscientific. Thank you for considering my comments.

TOXIC BY DESIGN (FORUM)	
Number	**Full Comment**
F-TD-133	Mr I feel that it's not ethical, appropriate, or feasible to subject every chemical to a fixed list of animal tests. Animal tests do not protect human health and can use hundreds and even thousands of animals per chemical. In order to get a handle on toxic chemicals in our environment, California should develop and use cost- and time-efficient high-through put human cell and tissue methods, computer-based methods, and intelligent, tiered testing schemes—not cruel and archaic animal methods. A recent report by the National Academy of Sciences, entitled "Toxicity Testing in the Twenty-First Century: A Vision and a Strategy," recommends an overhaul in the way chemicals are tested for toxicity. California's implementation of green chemistry goals should be consistent with this vision, and the state should commit resources to this effort. Animal-based toxicity testing methods are dismally inaccurate, and they result in the painful deaths of hundreds or thousands of animals per chemical. California cannot ensure the health and safety of its citizens or wildlife by relying on these outdated testing methods. Thousands of chemicals have already been tested in other government programs, and existing data must be gathered, fully evaluated, and used prior to initiating further testing requirements.
F-TD-134	ms please stop any and all animal testing. Can you not create a scientific environment that is both safe for animals and humans and where you can perform your testings. Whenever I read where there is unwarranted animal testing is being practiced, it reminds me of the experiments the Nazis did in concentration camps. I have no doubt that if these scientists today could experiment on humans to get the most accurate data, they would.
F-TD-135	Animal torture is scientifically useless Animal testing results are routinely disregarded or disputed by the scientific community, government AND chemical companies anyway, so why do they keep doing them? Let's stop it, already! There are plenty of accurate, humane methods for testing chemicals (human cell tests...). Do not sponsor animal cruelty under the guise of helping/protecting people.
F-TD-136	Their physiology is slightly different from ours, as their systems are adapted to consume things we can not and vice versa, so the testing would undoubtedly be inaccurate. Even if I still ate animal anymore, I'd have to cook the creatures the Empress Panthera caught before I could consider eating them, but her idea of fine dining is freshly captured and played to death. If you must test, insist upon using the CEO of the company.
F-TD-137	Let's get past medieval methods for toxicity testing California’s Green Chemistry goals are laudible, and should not be sullied by use of cruel and inaccurate animal testing methods. Modern, humane, and more accurate methods should be used instead, and should follow the recommendations of the National Academy of Science’s “Toxicity Testing in the Twenty-First Century” report. Most Californians favor protection of the environment, and we also deserve a say in how this is accomplished and who (or what) is hurt along the way, so please allow for public input to decisions on methods to accomplish toxic chemical testing. Thank you
F-TD-138	no animals tests, please I respectfully encourage the state of california, which I am a resident of, not to subject hundreds or even thousands of animals to tests involving chemicals. There are a few reasons. First, many of these test may have already been conducted by other government agencies, so the data is available already. Second, what we learn from these tests on animals do not translate to humans. Third,computer programs are availabe now that make animal testing obsolete. Thank you.

TOXIC BY DESIGN (FORUM)	
Number	**Full Comment**
F-TD-139	No Animal Tests Please make Green testing animal friendly testing too. Human-focused tests are not only more humane, but also more reliable. For good science, and good ethics, create a policy that does not include animal tests. Animal-based toxicity testing methods are dismally inaccurate, and they result in the painful deaths of hundreds or thousands of animals per chemical. California cannot ensure the health and safety of its citizens or wildlife by relying on these outdated testing methods.
F-TD-140	Where do you draw the line? Animal testing? Come on, in case pharmaceutical and chemical companies didn't noticed, we are in the 21st century! Hello! First of all, we don't need more chemicals. Second, before we create more harmful products, we should figure out what to do with the mess that we created, that ends up in our water, our rivers, our lakes, our oceans and ultimately in our faucets (that's where people start to care). But that is another topic. But if we must continuously produce more and more(compliment of our capitalist world), then don't drag innocent animals in this ugly business, inflicting them unthinkable torture. If half of what is done to mice, rabbits, monkeys and who knows what other animals was done to dogs or cats, people would sue the companies for felony. Same goes for animal farming, but that is yet another hot topic that requires immediate action. What can companies do then? Get a handle on the toxic chemicals in our environment by developing and using cost- and time-efficient high-throughput human cell and tissue methods, computer-based methods such as (Q)SAR, and intelligent, tiered testing schemes. That would be a great place to start.
F-TD-141	Animal tests are CRUEL and INACCURATE for HUMANS I was outraged to hear that CA - one of the most progressive states in our nation - is passing off cruel animal testing as part of a "GREEN" initiative. LIving green is a life philosophy that includes humane treatment of all beings. As a resident of CA, I am exremely disappointed that you would sell this initiative to the public as Green when you plan to conduct inhumane animal tests. Yes, we need to understand the toxic chemicals in our environment quickly—but it should be done uisng cost- and time-efficient high-throughput human cell and tissue methods, computer-based methods such as (Q)SAR, and intelligent, tiered testing schemes. Animal-based toxicity testing methods are inaccurate and can result in the painful deaths of hundreds or sometimes more than a thousand animals per chemical. California cannot ensure the health and safety of its citizens or wildlife by relying on these methods.
F-TD-142	The preservation of our environment should go hand in hand with the preservation of life, not one for the other, otherwise it will ultimately defeat its purpose. There is no point in working to preserve our environment while condoning violence because it will all still lead to our own demise.
F-TD-143	Animal testing cannot be extrapolated to Homo Sapiens! As a citizen of California who cares about the environment and animals in laboratories, CalEPA needs to hear from you! You may want to include the following points: Protecting the environment is in the interest of every Californian, and any programs or processes should be open and transparent with an opportunity for public input. We need to get a handle on the toxic chemicals in our environment quickly—that means developing and using cost- and time-efficient high-throughput human cell and tissue methods, computer-based methods such as (Q)SAR, and intelligent, tiered testing schemes. California’s implementation of Green Chemistry goals should align with the vision for 21st-Century Toxicity Testing put forth by the National Academy of Science by committing funding and resources to this effort and ensuring any Green Chemistry initiatives related to toxicity testing take this groundbreaking report into account.

TOXIC BY DESIGN (FORUM)	
Number	**Full Comment**
	Animal-based toxicity testing methods are inaccurate and can result in the painful deaths of hundreds or sometimes more than a thousand animals per chemical. California cannot ensure the health and safety of its citizens or wildlife by relying on these methods. Data gathering requirements must take advantage of existing data gathered from other testing programs as well as intelligent testing strategies. Requiring a fixed list of toxicity tests for all chemicals is wasteful and unscientific.
F-TD-144	The Importance Of Life Protecting the environment should be in the interest of every Californian, and any programs or processes should be open and transparent with an opportunity for public input,as a democracy, people today should have a say on what decisions are being made!Another important topic we have to face whether we like it or not is that we need to get a handle on the toxic chemicals in our environment quickly—without further delay which means thatlife does not have to be sacrificed for science.There are many equally valuable alternatives such as developing and using cost- and time-efficient high-throughput human cell and tissue methods, computer-based methods such as (Q)SAR, and intelligent, tiered testing schemes. California's implementation of Green Chemistry goals should align with the vision for 21st-Century Toxicity Testing put forth by the National Academy of Science by committing funding and resources to this effort and ensuring any Green Chemistry initiatives related to toxicity testing take this groundbreaking report into account. Animal-based toxicity testing methods are inaccurate and can result in the painful deaths of hundreds or sometimes more than a thousand animals per chemical. California cannot ensure the health and safety of its citizens or wildlife by relying on these methods. Data gathering requirements must take advantage of existing data gathered from other testing programs as well as intelligent testing strategies. Requiring a fixed list of toxicity tests for all chemicals is wasteful and unscientific
F-TD-145	Stop useless animal testing As a citizen of California who cares about the environment and animals in laboratories, please develop and use cost- and time-efficient high-throughput human cell and tissue methods, computer-based methods such as (Q)SAR, and intelligent, tiered testing schemes. California's implementation of Green Chemistry goals should align with the vision for 21st-Century Toxicity Testing put forth by the National Academy of Science by committing funding and resources to this effort and ensuring any Green Chemistry initiatives related to toxicity testing take this groundbreaking report into account. Animal-based toxicity testing methods are inaccurate and can result in the painful deaths of hundreds or sometimes more than a thousand animals per chemical. California cannot ensure the health and safety of its citizens or wildlife by relying on these methods. Data gathering requirements must take advantage of existing data gathered from other testing programs as well as intelligent testing strategies. Requiring a fixed list of toxicity tests for all chemicals is wasteful and unscientific.
F-TD-146	ANIMAL TESTING DOES NOT WORK !! Why doesn't the scientific community admit to the fact that it has been proven a mulitude of times, that the results derived from testing on animals do not correlate to the results of testing on humans. There are also many test materials that can be used instead of animals and with far more accuracy and far less cost. California's implementation of Green Chemistry goals should align with the vision for 21st-CenturyToxicity Testing put forth by the National Academy of Science by commiting funding and resources to this effort and ensuring any Green Chemistry initiatives related to toxicity testing take this ground breaking report into account
F-TD-147	Violence toward animals boomerangs as disease in humans When we sow seeds of inflicting disease on otherwise healthy animals, we reap disease in ourselves - it's unavoidable. Very stupid, except for those making big bucks from animal and human misery and suffering.

TOXIC BY DESIGN (FORUM)	
Number	**Full Comment**
F-TD-148	Animal Testing is NOT Necessary in this Day and Age Some sicko must have thought up this one. I do believe that the people that think up animal tests are enjoying torturing them and this is an excuse. It certainly is not a necessity in this day and age. Please do not allow them to stoop to this low level.
F-TD-149	Animal tests are misleading and are torture Scientists do not gain valid information about the toxicity of a substance by giving an animal one times the dose a human would get and "testing" the result. A civilized and compassionate nation does not allow its people or its animals to be tortured.
F-TD-150	Testing on animals is not only cruel, it's dangerous. Animal-based toxicity testing methods are inaccurate and can result in the painful deaths of hundreds or sometimes more than a thousand animals per chemical. California cannot ensure the health and safety of its citizens or wildlife by relying on these methods. Data gathering requirements must take advantage of existing data gathered from other testing programs as well as intelligent testing strategies. Requiring a fixed list of toxicity tests for all chemicals is wasteful and unscientific.
F-TD-151	Is this 2007? You would think that it would not be necessary to torture animals with the technology we have now.
F-TD-152	mr. Please stop all tests on animals. It is unnecessary.
F-TD-153	Please don't use animals, I've heard them cry! If you've ever been to animal testing facility, you wouldn't been able to sleep for the rest of your life. I've heard rabbits scream and dogs cry, please, don't test on animals. We live in 21 century and have better ways to test without killing innocent helpless animals jailed in their cages for torture.
F-TD-154	anti-animal testing reason Animal testing is no longer necessary because chemicals always react differently in different animals than in humans! This means that a product might be safe for an animal but dangerous to us humans!
F-TD-155	Therefore, the animal-testers could test the products on themselves in order to determine whether or not the animal-tested products are safe!
F-TD-156	Why would any agency consider animal testing? It's hard to believe that inhumane animal testing is still being considered by any agency or lab, after so many results from it have proved unreliable and/or useless. It's time to stop this terrible cruelty and begin to obtain better results from better lab tests.
F-TD-157	animal testing? are you kiding me? seriously now, theres no need

TOXIC BY DESIGN (FORUM)	
Number	**Full Comment**
F-TD-158	No More Animal Testing I'm asking CalEPA to stop using animal testing. I do not support it and do not want my tax dollars supporting animal suffering. Please put funding toward R&D of cost- and time-efficient human-focused testing methods such as cell and tissue assays and computer-based methods such as (Q)SAR. Also, please refer to the groundbreaking report put forth by the Nat'l Academy of Science and take advantage of existing data. Requiring a fixed list of toxicity tests for all chemicals is wasteful and unscientific. Animal tests are barbaric. The cruelty and suffering it inflicts on animals is unethical and unacceptable. This is 2007. With today's technology we'd all be better off using advanced testing methods, not crude animal testing. Thank you. Sincerely, CF
F-TD-159	Useless, outdated information. Testing on animals is outdated science! Its expensive, ineffective, and a waste of time, not to mention CRUEL. They feel pain exactly like we do, only they can't scream. Instead, use other methods of testing, computer based tests or tests involving human cells & tissue. STOP THE MASSACRE.
F-TD-160	Vioxx legacy Merck has agreed to pay $4.85 billion to settle 45,000 lawsuits by people who claim they or their family members suffered injury or died after taking Vioxx. Vioxx was tested on animals and presumed to be safe, but obviously animal testing is a poor substitute for human cell and tissue methods. From now on, the "knew or should have known" standard will be applied to medical research, both private and public. Who wants to be associated with another Vioxx scandal? We need to move forward with more meaningful research that yields results humans can count on.
F-TD-161	NO MORE EXCUSES FOR BAD SCIENCE AND TAKING OF LIVES Every time toxicity tests for human-use products are done using members of other species, they certainly show the effects on those members of other species; they do NOT show any valid results on humans, and are nothing but a senseless waste of time, money, and precious lives, and therefore unconscionable. Modern methods such as tissue assays, cell cultures, and computer modeling have existed for some time, and they are far better models than members of other species for testing human-use products; moreover, they do not result in senseless suffering, the taking of lives, or the waste of yet more of our taxpayer dollars. It is way past time to stop this antiquated and barbaric practice and use modern methods.
F-TD-162	animal testing IT IS SO VERY IMPORTANT THAT WE CONTINUE TO RESEARCH AND DEVELOP HUMAN-FOCUSED TESTING METHODS IN PLACE OF THE BARBARIC DESCARTESIAN METHODS WE HAVE IN PLACE TODAY. WHAT A TERRIBLE LEGACY DESCARTES LEFT US. LET'S MOVE BEYOND THE ANIMALS' INQUISITION, THE ANIMALS" AUSCHWITZ. THE ANIMALS ARE INNOCENT, AND HAVE DONE NOTHING TO DESERVE THIS CRUEL AND INHUMANE SENTENCE INTO INFINITY! WILL CAL EPA MOVE INTO THE 21ST CENTURY, OR WILL IT, ALONG WITH THE OTHER INSTITUTIONS THAT TORTURE ANIMALS, REMAIN FOREVER IN THE DARK AGES? CAL EPA - DO YOU HEAR THE ANIMALS' SCREAMS OF PAIN? HAVE YOU SEEN THE UNDERCOVER VIDEOS OF THE SAD, PATHETIC, AND TORMENTED ANIMALS IN THE ANIMAL RESEARCH LABS? PEOPLE LAUGHING AND JOKING, MUSIC PLAYING IN THE BACKGROUND, WHILE ANIMALS ARE SUBJECTED TO UNSPEAKABLE PAIN AND SUFFERING? WHILE THE ANIMALS ARE DRIVEN INSANE? I HOPE WITH ALL MY HEART AND SOUL, THAT SUCH HEARTBREAKING ATROCITIES WILL SOON BE A THING OF THE PAST. AND I WILL CONTINUE TO SPEAK OUT, AGAIN AND AGAIN, WITH ALL MY HEART AND SOUL, AND FIGHT AGAINST THESE TERRIBLE INJUSTICES WHEREVER I FIND THEM.

TOXIC BY DESIGN (FORUM)	
Number	**Full Comment**
F-TD-163	END ANIMAL TESTING There is no need to test on animals in this day and age. It is cruel, ineffective and inhumane, and you know it!! You need to end it!!
F-TD-164	Stop Useless Animal Testing Please stop all inhumane and useless animal testing. Just because something works on a mouse, doesn't mean it will do the same on a human; because something is not toxic to a guinea pig, doesn't mean it will not poison a human. Surely, computer modeling and other methods can give better an more accurate results
F-TD-165	No more animal tests animal testing is unnecessarily cruel. Enforce other options instead of cruel ones.
F-TD-166	saving lives both animal and human a like by wathcing - www.supremememastertv.com - i've evolved and learned that animals are our co-inhabitants. and we should treat them with dignity and respect. Please, lets spare our loving friends and use technology instead of torture
F-TD-167	Come out of the Dark Ages--stop animal testing. Come out of the Dark Ages--stop animal testing. How often must we say this??
F-TD-168	Mr. Protecting the environment is in the interest of every Californian, and any programs or processes should be open and transparent with an opportunity for public input. We need to get a handle on the toxic chemicals in our environment quickly—that means developing and using cost- and time-efficient high-throughput human cell and tissue methods, computer-based methods such as (Q)SAR, and intelligent, tiered testing schemes. California's implementation of Green Chemistry goals should align with the vision for 21st-Century Toxicity Testing put forth by the National Academy of Science by committing funding and resources to this effort and ensuring any Green Chemistry initiatives related to toxicity testing take this groundbreaking report into account. Animal-based toxicity testing methods are inaccurate and can result in the painful deaths of hundreds or sometimes more than a thousand animals per chemical. California cannot ensure the health and safety of its citizens or wildlife by relying on these methods. Data gathering requirements must take advantage of existing data gathered from other testing programs as well as intelligent testing strategies. Requiring a fixed list of toxicity tests for all chemicals is wasteful and unscientific
F-TD-169	If you wouldn't test it on your child, don't test it on an animal Protecting the environment is in the interest of every Californian, and any programs or processes should be open and transparent with an opportunity for public input. We need to get a handle on the toxic chemicals in our environment quickly—that means developing and using cost- and time-efficient high-throughput human cell and tissue methods, computer-based methods such as (Q)SAR, and intelligent, tiered testing schemes. California's implementation of Green Chemistry goals should align with the vision for 21st-Century Toxicity Testing put forth by the National Academy of Science by committing funding and resources to this effort and ensuring any Green Chemistry initiatives related to toxicity testing take this groundbreaking report into account. Animal-based toxicity testing methods are inaccurate and can result in the painful deaths of hundreds or sometimes more than a thousand animals per chemical. California cannot ensure the health and safety of its citizens or wildlife by relying on these methods. Data gathering requirements must take advantage of existing data gathered from other testing programs as well as intelligent testing strategies. Requiring a fixed list of toxicity tests for all chemicals is wasteful and unscientific.

TOXIC BY DESIGN (FORUM)	
Number	**Full Comment**
	As Californians, we must lead the world in rational and humane practices. Thank you.
F-TD-170	Animal Tests Are Ineffective It has been proven repeatedly that information from animals does not extrapolate to humans. Animal testing is archaic,unscientific and barbaric. If CalEPA cares about protecting us stop the farce of animal testing and start utilizing methods that actually give sound data
F-TD-171	The difference between a baby and an animal = nothing Well Would ya ever think that human are the most well placed to be tester instead of poor animal without any defense... D'ya think I am NOT right to think about it??? Well, YOU'LL surely think about that the next time a rat or a puppy please you to stop these filths... Think one more thing : THEY SUFFER, RIGHT????
F-TD-172	Animals feel pain just as people do only they do not have a voice I live in CA and I am disgusted that animals will be used for this test. How does that make this world a better place? Animals are not substitutes for humans. If there are toxins that is self explanatory and toxin usually means poison. One does not need to test them on animals to find that out. If we all pitched in and recycled, the earth would be cleaner without torturing innocent animals. Education is where the dollars should go and where the data should be collected. Teach students about repairing the envioronment along with the value of life for all animals. Children today lack empathy and this is a way to improve the enviornment while teaching empathy for all living things.
F-TD-173	Tell CalEPA to Stop Toxicity Tests on Animals and Use Instead Sound Alternative Methods As a citizen of California who cares about the environment and animals in laboratories, I urge you to develop green chemistry policies and regulations, including developing and using cost- and time-effective testing methods. Alternatives to animal testing should be used, including (but not limited to) human cell and tissue methods, computer-based methods, and tiered testing schemes. These green chemistry goals should align with the vision for 21st-Century Toxicity Testing as articulated by the National Academiy of Science.
F-TD-174	It is time to stop testing on animals and use other methods that have proven to be more accurate, such as tissue methods and human cell testing. Please do your part to save animals from torture and death for unnessary testing. Thank you.
F-TD-175	Please Stop! Please stop testing on animals! It is not only cruel and inhumane, but unreliable and unneeded.
F-TD-176	Do not use animals for testing Animal-based toxicity testing is barbaric. We are better than that. Please stop this. November 9, 2007 | Scott Hurlbert To test on the little ceatures that God gave us to take care of is truly barbaric!
F-TD-177	To test on the little ceatures that God gave us to take care of is truly barbaric!
F-TD-178	Animal Testing is Unreliable I only want human-focused testing methods such as cell and tissue assays to be used in developing green chemistry technologies. Animal-based testing methods are not only inaccurate, but result in painful deaths to innocent animals.

TOXIC BY DESIGN (FORUM)	
Number	**Full Comment**
F-TD-179	Testing on Animals Some businesses, agencies etc. have been able to do away with animal testing, still protect the public without diminishing their profits. If some can do so I urge all people to follow suit. As someone once said people, a country, a race can be judged by how they treat their animals.
F-TD-180	Animal Testing ... Are you kidding me? You are asking us for permission to test toxic substances on animals? Well the short answer is NO. There are alternative ways to test chemicals without the loss of life. Please consider them.The PCRM has more information if you are not sure of the alternatives. Keep California residents healthy.
F-TD-181	No need for outdated science There are other more efficient, effective ways to test products besides animal testing. California is a leader in innovation, let's set an example that California will no longer take part in causing animals to suffer needlessly...STOP ANIMAL TESTING!!!
F-TD-182	ANIMAL TESTS ARE CRUEL AND USELESS! PLS STOP! ANIMAL TESTS HAVE BEEN PROVEN INEFFECTIVE WAYS TO HELP HUMANS. THEY ARE CRUEL AND USELESS. OTHER METHODS ARE NOW AVAILABLE THAT ARE MUCH MORE USEFULL TO HUMANS. THESE METHODS SHOULD BE USED AND ANIMAL TESTING STOPPED.
F-TD-183	Do not do Animal Testing! I note the many inputs to you on not using animals in your toxcity testing. I support that request, strongly. In this modern day such methods are not justified, Thanks for paying attention to the citizens of CA. Bill Kleinbauer
F-TD-184	NO ANIMAL TESTING We want our environment to be clean however this will NOT be supported if animals are used. There are other methods to use for testing and on animals is by far NOT one of them!
F-TD-185	Ms. Animal-based toxicity testing methods are inaccurate and can result in the painful deaths of hundreds or sometimes more than a thousand animals per chemical. California cannot ensure the health and safety of its citizens or wildlife by relying on these methods. Data gathering requirements must take advantage of existing data gathered from other testing programs as well as intelligent testing strategies. Requiring a fixed list of toxicity tests for all chemicals is wasteful and unscientific.
F-TD-186	No Animal Testing As an educator, I know the importance of protecting our environment, and as a native Californian I appreciate how our state has stringent rules regarding pollution, especially when it comes to protecting humans and other species we coexist with. Regarding the toxic chemicals in our environment, we need to use 21st century methods for testing. Human cell and tissue methods, computer-based methods such as (Q)SAR, and intelligent, tiered testing schemes are the responsible and clearly ethical way to go. The National Academy of Sciences has put forth green methods for toxicity testing, and California should take note of this, because animal toxicity testing is not only outdated and cruel, but the results cannot be trusted, which in turn means the citizens of California aren't truly being protected. Lastly, it seems absurd not to use existing data and intelligent testing strategies when determining toxicity. It's high time humans realized that we are intelligent enough to protect ourselves without the need to use and abuse other species.
F-TD-187	Intelligent Humane Testing is the Way to Go Toxicity tests based on animal testing are not the direction we need to go in this day and age. There are other humane, accurate and intelligent data

TOXIC BY DESIGN (FORUM)	
Number	**Full Comment**
	testing methods available. Animal testing is archaic, inhumane and barbaric.
F-TD-188	Please use human-focused testing methods to keeps CA healthy! Animal-based toxicity testing methods are inaccurate and can result in the painful deaths of hundreds of animals per chemical. Please use the methods suggested by PCRM to keep California residents healthy.
F-TD-189	Please stop animal testing Serious environmental scientists know that it's not ethical, appropriate, or feasible to subject every chemical to a fixed list of animal tests. Animal tests do not protect human health and can use hundreds and even thousands of animals per chemical. In order to get a handle on toxic chemicals in our environment, You should develop and use cost- and time-efficient high-throughput human cell and tissue methods, computer-based methods, and intelligent, tiered testing schemes—not cruel and archaic animal methods.
F-TD-190	ANY ANIMAL TESTING IS CRUEL..USE ALTERNATIVE METHODS..NO ANIMAL KILLING (TWICE) Animal-based toxicity testing methods are INACCURATE and can result in the painful deaths of hundreds or sometimes more than a thousand animals per chemical. California CANNOT ENSURE ensure the health and safety of its citizens or wildlife by relying on these methods. Data gathering requirements must take advantage of existing data gathered from other testing programs as well as intelligent testing strategies. Requiring a fixed list of toxicity tests for all chemicals is WASTEFUL and UNSCIENTIFIC
F-TD-191	Abandon animal-based toxicity testing. While it is true that we are all animals,tests using the non-human variety of subjects,as a whole, have little reliability when it comes to relating them to human physiological responses. The tendency to use out-dated testing methods is likely based on a number of factors: habit, laziness, grant funding, unwillingness to search out and employ more effective and humane methods of testing, etc. My state, California, in spite of a general reputation for advancing enlightened pursuits, still utilizes in its institutions and labs cruel, non-productive and wasteful tests, and, where humans are concerned, tests that create misleading results that can pose a dangerous potential for human health. Outdated tests methods will not keep us safe. Humanity, common sense, compassion and ethics, all demand that we abandon animal-based toxicity testing.
F-TD-192	Ms I'm a concerned citizen of California - concerned for the poisoning of our waters and air...and concerned for the wellbeing of animals cruelly and needlessly, repeatedly and wastefully subjected to 'testing'. We know the toxins are virulent. We know that they must be removed. Stop cruel use/misuse of animals and misuse of funds that could contribute -instead of to animal suffering and death- to progress in controlling toxins in our environment. Please follow PCRM's suggestions and guidelines. Thank you, Ruth Feldman
F-TD-193	Abandon Unnecessary and Cruel Animal Testing With new technology we can no longer use animals as our 'guinea pigs' to test on for human purposes. There is no reason to subject animals to toxic and painful tests for the purpose of the betterment of human health. Along with the use of human tissues and cells for experimentation, computer programs can be used to determine needed testing outcomes. Green the testing procedures and leave animals out of the equation.

TOXIC BY DESIGN (FORUM)	
Number	**Full Comment**
F-TD-194	Stop the Testing on Animals The CalEPA should not only take care of the enviremont but also animals because they live in our enviremont and they are part of it.
F-TD-195	No Animal Testing We MUST stop using animals for testing -- most tests do not equate to human use. Animal-based toxicity testing methods are inaccurate and can result in the painful deaths of hundreds or sometimes more than a thousand animals per chemical. California cannot ensure the health and safety of its citizens or wildlife by relying on these methods. Let us start being humane.
F-TD-196	Please do not allow more animals to be used for needless testing!! This has got to stop!! Animals deserve love, and a warm home, NOT a wire cage with little or no human contact only to be taken out out long enough to be poked and prodded! What an awful life!
F-TD-197	Dow Chemical's Comments on Educational Programs The Dow Chemical Company (Dow) is pleased to provide the attached paper on the role educational programs could play in California's Green Chemistry Initiative (GCI). We have appreciated the open, collaborative environment utilized for this process and have taken advantage of opportunities to participate in a variety of ways. Attached is a brief paper on educational programs where Dow has been engaged with the objective of improving science education and understanding of sustainability. This is intended to catalyze DTSC's thinking about the role education can play and the types of programs to consider. Dow believes that education must play a key role in California's Green Chemistry Initiative for the effort to reach its full potential. on behalf of the Dow Chemical Company
F-TD-198	Step Testing on Animals To Whom It May Concern at the California Environmental Protection Agency: It is unethical and unscientific not to mention downright contradictory to conduct toxicity tests on animals in the name "environmental protection." You should focus your energy on banning the use of the toxic pesticide "methyl iodide" once and for all as the EPA has admitted it can cause thyroid tumors. Period. End of story. No testing on animals whatsoever. Your agency should promote organic products, and land management on a manageable humane scale to humans, the other animals (besides the humans who think they are celestial beings and can do whatever they want to other species) and the environment. And you should focus on developing human-focused testing methods such as cell and tissue assays. It is downright shameful and backwards to continue testing on animals. I hope your agency is making sure to attend all of the Green Festival conferences (www.greenfestivals.org) to continue to grown and advance your knowledge in a positive proactive pro-environmental way rather than to inflict pain and suffering on innocent animals in the name of progress. Sincerely, Adrienne Guy
F-TD-199	sad legacy (TWICE) Testing on animals is unnecessary and inhumane. There are many technological advances that can replace animal testing. I don't want to see any money used for animal vivesection.
F-TD-200	Ms As a biologist and fellow inhabitant of planet earth,I strongly recommend toxicity testing which focuses on human tissue culture techniques-rather than the often inaccurate and always cruel animal tests!!!

TOXIC BY DESIGN (FORUM)	
Number	**Full Comment**
F-TD-201	No more animal cruelty with testing Animal cruelty in testing is unnecessary. Just get rid of the toxins. Stop creating toxins. Listen to the ancient cultures still alive today and knowledgeable about plant cures. Western science has lost its way. Find your heart - connect those brains with your soul and heart. NO MORE TESTING ON ANIMALS! They too have heart, soul, a longing for a life of love and care. Ever watch them with their young and mates? NO MORE TESTING ON ANIMALS!
F-TD-202	Please don't test on animals. Please find alternative methods rather than using animals.
F-TD-203	Stop animal testing Please stop all animal testing. It is cruel and not necessary as animals do not give the same results as a human would because their systems and bodies are not like ours. Isn't it time that we decided that we don't need to do tests any longer? We already know what is and is not safe for us, why is it necessary to continue to inflict such hurt and suffering on innocent creatures for our benefit?
F-TD-204	stop testing on animals and use alternative methods Protecting the environment is in the interest of every Californian, and any programs or processes should be open and transparent with an opportunity for public input. We need to get a handle on the toxic chemicals in our environment quickly—that means developing and using cost- and time-efficient high-throughput human cell and tissue methods, computer-based methods such as (Q)SAR, and intelligent, tiered testing schemes. California's implementation of Green Chemistry goals should align with the vision for 21st-Century Toxicity Testing put forth by the National Academy of Science by committing funding and resources to this effort and ensuring any Green Chemistry initiatives related to toxicity testing take this groundbreaking report into account. Animal-based toxicity testing methods are inaccurate and can result in the painful deaths of hundreds or sometimes more than a thousand animals per chemical. California cannot ensure the health and safety of its citizens or wildlife by relying on these methods. Data gathering requirements must take advantage of existing data gathered from other testing programs as well as intelligent testing strategies. Requiring a fixed list of toxicity tests for all chemicals is wasteful and unscientific.
F-TD-205	Please! Be Humane! Can you even begin to imagine what it must be like to be strapped down and injected with who knows what and be in pain and suffering and not be able to move or get away from it? To have something done to you and not be able to escape, the burning, the pain, for days, months or even years? Can we as people think that is even ok to do to any living thing? And then on top of that to cause animal testing when you are trying to save the enviroment? Do these kind of companies even want to have to do that? Do we want to cause something bad to be done for a good cause? Please don't ask for anything that causes this kind of pain to another living being
F-TD-206	WASTEFUL, CRUEL AND UNETHICAL It is a waste of valuable resources and fraud to expose non human living beings to drugs and chemicals which at best can only produce unreliable data due to incompatibility of species. Furthermore, ignoring all the technological alternatves to animals available for testing drugs and chemicals which are many times more accurate than using other species is immoral, unethical and right out criminal. In fact the only reasonable explanation one can reach from this outrage is that it is done for the sake of scamming large sums of moneys for greedy, scrupless corporations and individuals.
F-TD-207	No more animal testing Please stop the cruel animal testing and test on something that will have results that pertain to humans.

TOXIC BY DESIGN (FORUM)	
Number	**Full Comment**
F-TD-208	Stop unnecessary & cruel animal testing, NOW! Please listen to the voices of the citizens of California -- we oppose the archaic and unethical testing on animals in the name of environmental welfare. Have a conscience and exercise other options for conducting toxicity testing.
F-TD-209	please stop these cruel experiments on helpless animals.
F-TD-210	Stop Animal testing Animal testing is cruel and will not solve the problem.
F-TD-211	Stop Animal Testing Animal testing in inhumane. Stop!!!! Animal-based toxicity testing methods are inaccurate and can result in the painful deaths of hundreds or sometimes more than a thousand animals per chemical. California cannot ensure the health and safety of its citizens or wildlife by relying on these methods
F-TD-212	Toxics In Products By Design The question posed by California's Department of Toxic Substances Control (DTSC) in this section of the "Conversation with California" goes to toxics intentionally contained in a product, and the possible policy responses to address those cases. It has been noted elsewhere that everything is or can be toxic in some measure. The inherent toxicity of a substance (based on its hazard characteristics) needs to be distinguished from the apparent toxicity of the substance as it is used. While a human exposure to a single molecule may not constitute a serious threat, a massive exposure to even a benign material can have significant consequences. So dose matters, and exposure matters. Risk–the combination of exposure and inherent toxicity–must be considered. It is particularly important to understand how DTSC construes the term "in products by design." If DTSC interprets the term to mean a toxic "used to create the product but not present as the product is used," the possible policy responses are very different from an interpretation that focuses on a toxic "in the product as used and from which the user has a possible exposure." Indeed, the latter case may be more appropriately considered the case of a toxic present by accident. Let's assume for the moment that California intends the Green Chemistry Initiative to articulate some particular principles that might be applied to minimize the potential risks of toxics. Because everything can be toxic in some measure, there should be no absolute principle against the use of toxics per se. Perhaps California might base its future policies on a general principle about minimizing the use of toxics to the extent possible consistent with environmental and health considerations, efficiency, economics, and product performance, or encourage the design of products so that at the end of their use no new or elevated threat to health or environment is created. Indeed, from those very general principles it becomes evident that the DTSC may wish to focus on those materials that persist unnecessarily in the environment or that accumulate in biological materials. There are objective criteria for these two hazard characteristics that can be measured and are widely accepted, and provides a more productive direction for the discussion of "toxics" in products by design. Taking persistence and bioaccumulation into account provides a sharper tool to distinguish chemicals for potential regulatory attention. If a precautionary approach suggests doing no harm, even DTSC should be careful to design measures that do no harm overtly and that do not unintentionally do harm by removing truly useful substances. Several existing programs provide sound models for characterizing and assessing the persistence and bioaccumulating properties of chemicals. The U.S. Environmental Protection Agency (EPA) has for some time made its "PBT Profiler" evaluation tool freely available. See http://www.epa.gov/pbt/tools/toolbox.htm. The tool is an important risk screening tool, and has been used effectively in assuring that EPA's policy on new chemicals that exhibit persistence and bioaccumulation is followed.

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	Canada, Mexico, and the United States recently agreed to a program to complete screening level risk assessments on approximately 9,000 substances in North American commerce by 2012–the vast majority of the chemicals in U.S. commerce. The program builds on Canada's efforts to prioritize chemicals for further review according to their persistence, bioaccumulation, and toxic characteristics. The Canadian program identified some 500 high priority chemicals that will require additional assessment and possible regulatory action. The program also "set aside" some 19,000 chemicals on the Canadian inventory as being of low or no regulatory concern (like the U.S., the Canadian chemical "inventory" is a historical database of chemicals that were on the market; both inventories contain more chemicals than are actually in commerce). More information on the regional screening program is available at http://yosemite.epa.gov/opa/admpress.nsf/0cd7fdf95b701616852572a000658ef2/77660c0da9fe643e8525733e0065d48b!OpenDocument. DTSC should determine how it can leverage the results of this assessment program in its recommendations, as well as identifying and finding alternatives for those chemicals identified as priority chemicals. As DTSC considers recommendations under the Green Chemistry Initiative, persistence and bioaccumulation are appropriate priorities in a focus on toxics in products. Such an approach can leverage the considerable number of assessment tools and information that already exists, while providing important assurance that potential impacts on health and the environment from particular risks have been addressed.
F-TD-213	No more testing on animals Animal-based toxicity testing methods are inaccurate and can result in the painful deaths of hundreds or sometimes more than a thousand animals per chemical. California cannot ensure the health and safety of its citizens or wildlife by relying on these methods. Data gathering requirements must take advantage of existing data gathered from other testing programs as well as intelligent testing strategies. Requiring a fixed list of toxicity tests for all chemicals is wasteful and unscientific. Advanced computer programs can now simulate any necessary testing method vs the cruel use of animals in experiments.
F-TD-214	toxicity testing on animals Protecting the environment is in the interest of every Californian, and any programs or processes should be open and transparent with an opportunity for public input. We need to get a handle on the toxic chemicals in our environment quickly—that means developing and using cost- and time-efficient high-throughput human cell and tissue methods, computer-based methods such as (Q)SAR, and intelligent, tiered testing schemes. California's implementation of Green Chemistry goals should align with the vision for 21st-Century Toxicity Testing put forth by the National Academy of Science by committing funding and resources to this effort and ensuring any Green Chemistry initiatives related to toxicity testing take this groundbreaking report into account. Animal-based toxicity testing methods are inaccurate and can result in the painful deaths of hundreds or sometimes more than a thousand animals per chemical. California cannot ensure the health and safety of its citizens or wildlife by relying on these methods. Data gathering requirements must take advantage of existing data gathered from other testing programs as well as intelligent testing strategies. Requiring a fixed list of toxicity tests for all chemicals is wasteful and unscientific.

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F-TD-215	Understanding TSCA Sections 4 and 6 At several of the Green Chemistry Initiative stakeholder meetings held over the past few months, and in several entries in the "Conversation with California," the U.S. Federal Toxic Substances Control Act (TSCA) has come under attack. Some have suggested that the law provides no basis for California to assume that health and the environment have been protected from unwanted or unnecessary chemical exposures. In fact, some say that the U.S. Environmental Protection Agency (EPA) is unable to ban chemicals. California's Department of Toxic Substances Control (DTSC) is going to make recommendations on chemical regulatory matters as a result of the Green Chemistry Initiative. Some of those recommendations may include additional regulatory programs, actions that the legislature should consider, and some will likely be related to how the state drives a "green chemistry" approach through policy and the marketplace. As far as I know, no one is suggesting that California simply rely on the U.S. EPA and TSCA when it comes to chemical regulatory decisions. But it is important that Californians understand that the Toxic Substances Control Act provides an effective chemical management system, so that the state does not duplicate effort or waste scarce resources. Some of the misperceptions about TSCA involve EPA's testing authority under Section 4. Some claim that the law imposes too great a burden on the agency, making it difficult for EPA to justify issuing test rules. The truth is EPA only needs to meet a modest burden to support a test rule on a chemical. The law only requires EPA to show that a substance MAY present an unreasonable risk, or MAY reasonably be anticipated to enter the environment in substantial quantities, or that there is or MAY be significant or substantial human exposure. EPA has even said that when it considers whether a chemical "may present" a hazard, it does not require definitive scientific data, but of necessity looks to reasonable scientific assumptions, extrapolations, and interpolations. EPA has even stated that it only need to establish that exposure MAY arise because of activities associated with the manufacture, use, etc. of the chemical. Federal courts have ruled that EPA can rely on the mere POTENTIAL for human exposure in deciding whether a chemical "may present an unreasonable risk." Section 6 of TSCA gives EPA authority to regulate the manufacture, processing, distribution, use, or disposal of a chemical if the agency has a "reasonable basis" to believe the chemical "presents or will present an unreasonable risk to health or the environment." Section 6 identifies various regulatory options—from an outright ban to warning and labeling requirements—and provides that EPA may impose one or more of the listed requirements "to the extent necessary to protect adequately against such risk using the least burdensome requirement." That was Congress' way of telling the agency to take the most efficient regulatory approach consistent with the potential threat to health and the environment. When acting under Section 6, EPA must, among other elements, take into account the health and environmental effects of the substance, the magnitude of exposure, the benefits of the substance, the availability of substitutes, and the reasonably identifiable economic consequences of the proposed rule. Some say that EPA can't regulate effectively under Section 6 because of a federal court decision that overturned an EPA ban on certain asbestos-containing products. Critics like to say, "If EPA cannot ban asbestos, then what can it ban?" The truth is that EPA's failures in the asbestos regulation were not deficiencies in the statute, they were failures in implementation. Simply put, EPA did not do what Congress told it to do. The fact is, EPA has used Section 6 rulemakings since the asbestos case was decided, albeit not very frequently, largely because TSCA provides multiple authorities for EPA to achieve its desired risk management results. TSCA critics want to suggest that these perceived failings in the federal statute should persuade California that the state must step in to correct these "deficiencies," by establishing its own chemical regulatory system, among other approaches. The fact is, TSCA is protective of public health and the environment. There may well be important opportunities to improve the timing, quality and transparency of EPA's chemical management decisions, and important opportunities to enhance the level of cooperation and coordination between the California and U.S. EPA. Which leads back to one of the fundamental questions that the Green Chemistry Initiative needs to grapple with—what is the problem that needs to be addressed?

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F-TD-216	In claiming that TSCA Sections 4 and 6 work well and are easy for EPA to use, Mike Walls of the American Chemistry Council (ACC) omits or glosses over key aspects of what EPA must do to use these authorities. I address some of these below. But first consider that the real proof of the effectiveness of these provisions is, as they say, in the pudding: • Over the 30 years TSCA has been in effect, EPA has succeeded in issuing test rules or enforceable consent orders under Section 4 for fewer than 200 of the many tens of thousands of chemicals that have been in commerce over that same period. • Over that same period, EPA has succeeded in restricting only five chemicals (and then, only certain uses or occurrences of them) using its Section 6 authority: 1. PCBs (accomplished through an additional statutory mandate); 2. fully halogenated chlorofluoroalkanes used as propellants in aerosol spray containers (superseded by a ban under the Montreal Protocol); 3. the removal for disposal of certain wastes containing dioxin at a specific site in Arkansas; 4. asbestos, but limited to products no longer in commerce, because the initial rule was vacated by U.S. courts after legal challenge (see more below); and 5. hexavalent chromium-based water treatment chemicals for use in comfort cooling towers. Here's some of what Mike left out in his discussion of TSCA Section 4 test rules: To require testing of a chemical under Section 4, EPA must issue a rule using full notice-and-comment rulemaking. It can do so only if it makes a number of findings, not just one as Mike claimed. EPA must find, based on sufficient evidence, that: • the substance "may present an unreasonable risk," based on evidence of more than a theoretical risk of exposure, OR: • it is or will be produced in "substantial" quantities and either: o it is entering or may enter the environment in "substantial" quantities, or o there is or may be "significant or substantial" human exposure to the chemical, AND: • insufficient information exists to assess potential risk, AND: • testing is necessary to develop the needed data. Making the latter two findings is non-trivial; each requires substantial time and resources and is frequently the basis for challenges by industry (ACC members among them) during the comment period for a proposed rule, and sometimes via lawsuits brought against the Agency after a final rule is issued. EPA itself has noted that using its Section 4 authority is difficult and imposes substantial burdens, for a number of reasons. In practice, EPA says it rarely has enough information to make the "may present an unreasonable risk" finding, and instead is usually forced to rely on making the exposure-based finding. But EPA reports that obtaining the requisite exposure information needed for rulemaking is particularly difficult. EPA also indicates that finalizing rules under Section 4 can take from 2 to 10 years and require the expenditure of substantial resources – resources that are in increasingly short supply as its budget has been declining. (EPA provided these comments to the Government Accountability Office, and they are discussed in GAO's 2005 report, Options Exist to Improve EPA's Ability to Assess Health Risks and Manage Its Chemical Review Program, pp. 25-26, at http://www.gao.gov/new.items/d05458.pdf, and GAO's 1994 report, Toxic Substances Control Act: Legislative Changes Could Make the Act More Effective, pp. 45-47, available at archive.gao.gov/t2pbat2/152799.pdf.) Two examples: • EPA has succeeded in issuing one test rule covering only 16 of the more than 250 unsponsored chemicals under its voluntary HPV Challenge Program.

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	That rule took more than 5 years to promulgate. Proposal of a second rule that will cover only about 40 more unsponsored HPV chemicals is already years late. EPA will not be able to require testing for many of these unsponsored chemicals because it cannot make the requisite findings. • In 1991, OSHA identified 658 chemicals for which it needed data on dermal (skin) absorption due to potential worker exposure, and requested that data be developed for them using a relatively inexpensive in vitro test. OSHA cannot itself require companies to test chemicals, and must instead request that EPA do so using its Section 4 authority, as it did in this case. Eight years later, EPA proposed a test rule covering 47 of these chemicals, because these were the only ones for which EPA could make the required Section 4 findings. This proposed rule was heavily challenged by industry, with the result being that the final rule covered only 34 chemicals and was not issued until 2004 – 13 years after identification by OSHA of many hundreds of chemicals for which it needed the data. As for TSCA Section 6, Mike's rendition of the asbestos saga reflects what has become a fashionable storyline of late among some in the chemical industry: He essentially resorts to "blaming the victim" – in this case EPA – by claiming the agency simply didn't do a good job. In fact, EPA spent over a decade and millions of dollars developing the Section 6 rule, in the process compiling a 45,000-page record, making it one of the most extensive and expensive rulemakings in EPA history. (For more balanced views of the history of Section 6, see, for example: Carnegie Commission on Science, Technology, and Government, Risk and the Environment: Improving Regulatory Decision Making, 1993, available online at www.carnegie.org/sub/pubs/science_tech/reg.txt; and Lisa Heinzerling, Testimony Before the Subcommittee on Environment and Hazardous Materials of the Committee on Energy and Commerce, U.S. House of Representatives, July 13, 2004, at www.law.georgetown.edu/faculty/Heinzerling/Testimony/POPs_Testimony_ July_2004.pdf.) This "blame the victim" argument also demonstrates considerable chutzpah on Mike's part, since of course groups like ACC and its members stand at the ready to challenge any rule EPA does manage to propose or finalize. Here's what EPA is required to assess and the findings it is required to make under TSCA Section 6 to control any chemical in commerce: It must first find that the chemical "presents or will present an unreasonable risk of injury to health or the environment." To do so, EPA must evaluate not only health and environmental effects and exposure, but also the benefits of the chemical; the availability of substitutes; and the economic and social effects of the rule it proposes, including impacts on the economy, small businesses and innovation. EPA must prepare analyses of hazard and exposure, conduct a risk assessment, develop a substitution analysis for each use it proposes to restrict, and provide a full economic (cost-benefit) analysis. Then it must demonstrate that the proposed control is the least burdensome it could have proposed. Finally, it must demonstrate that no other statute could address the concern. EPA must also develop and finalize its regulation through full notice-and-comment rulemaking. Is it really any wonder EPA has given up trying?
F-TD-217	Stop Toxicity Tests on Animals I am a resident of California and was dismayed to learn that the CalEPA is considering large scale, cruel labratory tests on animals, which would result in the torture and death of thousands of animals. CalEPA can still support "green chemistry" by researching and developing human-focused testing methods, such as cell and tissue assays. "The greatness of a nation and its moral progress can be judged by the way its animals are treated." --Mahatma Gandhi California should lead the nation as well as the world in how we treat our animals.
F-TD-218	Testing toxicity on animals is unethical, wasteful and counter-productive We should use good science responsibly as we begin to take responsibility for our own mess. Testing toxicity on animals is shameful as well as poor

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F-TD-219	Create a Priority List A list of the most toxic chemicals should be compared with the importance of their use and the degree of difficulty of their removal, change in usage, or substitution. There are many toxic chemicals which find usefulness, such as zinc oxide (a carcinogen at certain levels) which are in fact food additives (this one is a vitamin additive in cereals). Zinc oxide ointment is also useful. The list should also prioritize on the basis of quantity. Perhaps zinc oxide quantities are less than, say, thalate or bispenol-A quantities.
F-TD-220	Dr. We must develop was to eliminate toxic chemicals in our environment now. In the last 50 years we have polluted our air, water and soil blindly. If we don't change our practices now what will be left for future generations. We must develop humane methods and consider Green Chemistry.
F-TD-221	Toxicity testing on animals As a citizen of California who cares about the environment and animals in laboratories, I wish to comment on toxicity testing. - Protecting the environment is in the interest of every Californian, and any programs or processes should be open and transparent with an opportunity for public input. -We need to get a handle on the toxic chemicals in our environment quickly—that means developing and using cost- and time-efficient high-throughput human cell and tissue methods, computer-based methods such as (Q)SAR, and intelligent, tiered testing schemes. -California's implementation of Green Chemistry goals should align with the vision for 21st-Century Toxicity Testing put forth by the National Academy of Science by committing funding and resources to this effort and ensuring any Green Chemistry initiatives related to toxicity testing take this groundbreaking report into account. -Animal-based toxicity testing methods are inaccurate and can result in the painful deaths of hundreds or sometimes more than a thousand animals per chemical. California cannot ensure the health and safety of its citizens or wildlife by relying on these methods. -Data gathering requirements must take advantage of existing data gathered from other testing programs as well as intelligent testing strategies. Requiring a fixed list of toxicity tests for all chemicals is wasteful and unscientific. Thank you for the opportunity to comment.
F-TD-222	California need to lead the way for the environment Protecting the environment is not only a matter of personal interest, it is in the best interest of every Californian. Any program or process must be open and made available for public input and total scrutiny by our gifted scientific community. We need to get a handle on the toxic chemicals in our environment quickly. What this means is developing and using cost- and time-efficient computer-based methods such as (Q)SAR, and intelligent, tiered testing schemes. California's implementation of Green Chemistry goals should align with the vision for 21st-Century Toxicity Testing put forth by the National Academy of Science. All efforts related to toxicity testing should take this groundbreaking report into account. Animal-based toxicity testing methods are inaccurate and can result in the painful deaths of hundreds or sometimes more than a thousand animals per chemical. California cannot ensure the health and safety of its citizens or wildlife by relying on these methods. Data gathering requirements must take advantage of existing data gathered from other testing programs as well as intelligent testing strategies. Requiring a fixed list of toxicity tests for all chemicals is wasteful and unscientific. I am a concerned citizen of California and I know for a fact that we as a state are capable of setting the goals and achieving greatness when it comes to environmental legislation and stewardship.

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	Please consider my comments when devising strategies to encourage manufacturers to take greater responsibility for the products they produce that contain toxic materials.
F-TD-223	CalEPA- recommendations on protect human health w/o to cruel lab. tests on animals. Protecting the environment is in the interest of every Californian, and any programs or processes should be open and transparent with an opportunity for public input. We need to get a handle on the toxic chemicals in our environment quickly-that means developing and using cost- and time-efficient high-throughput human cell and tissue methods, computer-based methods such as (Q)SAR, and intelligent, tiered testing schemes. California's implementation of Green Chemistry goals should align with the vision for 21st-Century Toxicity Testing put forth by the National Academy of Science by committing funding and resources to this effort and ensuring any Green Chemistry initiatives related to toxicity testing take this groundbreaking report into account. Animal-based toxicity testing methods are inaccurate and can result in the painful deaths of hundreds or sometimes more than a thousand animals per chemical. California cannot ensure the health and safety of its citizens or wildlife by relying on these methods. Data gathering requirements must take advantage of existing data gathered from other testing programs as well as intelligent testing strategies. Requiring a fixed list of toxicity tests for all chemicals is wasteful and unscientific.
F-TD-224	mr The California Environmental Protection Agency (CalEPA) is looking for recommendations for “green chemistry” policies and regulations, which could include large-scale toxicity testing initiatives that would result in the deaths of thousands of animals. You can help prevent these animal tests by contacting the CalEPA today! PCRM scientists have attended meetings and workshops held at CalEPA in order to provide the agency with recommendations on how to protect human health without resorting to cruel laboratory tests on animals. CalEPA is also accepting public comments from Californians until Friday, Nov. 16. Please take a moment to compose a short statement on the importance of researching and developing human-focused testing methods, such as cell and tissue assays. Follow this link, scroll to the bottom, click on “Create New Post,” and compose a personal comment. As a citizen of California who cares about the environment and animals in laboratories, CalEPA needs to hear from you! You may want to include the following points: * Protecting the environment is in the interest of every Californian, and any programs or processes should be open and transparent with an opportunity for public input. * We need to get a handle on the toxic chemicals in our environment quickly—that means developing and using cost- and time-efficient high-throughput human cell and tissue methods, computer-based methods such as (Q)SAR, and intelligent, tiered testing schemes. * California’s implementation of Green Chemistry goals should align with the vision for 21st-Century Toxicity Testing put forth by the National Academy of

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	Science by committing funding and resources to this effort and ensuring any Green Chemistry initiatives related to toxicity testing take this groundbreaking report into account. * Animal-based toxicity testing methods are inaccurate and can result in the painful deaths of hundreds or sometimes more than a thousand animals per chemical. California cannot ensure the health and safety of its citizens or wildlife by relying on these methods. * Data gathering requirements must take advantage of existing data gathered from other testing programs as well as intelligent testing strategies. Requiring a fixed list of toxicity tests for all chemicals is wasteful and unscientific. Thank you so much for your compassion and commitment. Best regards,
F-TD-225	Chemical Testing: Use Only Cell & Tissue Assays It has come to my attention that chemical testing activities directed at live animals continue in the state of California. Departments, labs, and organizations should cease and desist activties of this nature. It is reasonable, prudent, ethical, and ultimately more accurate and effective to use only human-focused testing methods such as cell and tissue assays. Please note the following: A recent report by the National Academy of Sciences, entitled "Toxicity Testing in the Twenty-First Century: A Vision and a Strategy," recommends an overhaul in the way chemicals are tested for toxicity. California's implementation of green chemistry goals should be consistent with this vision, and the state should commit resources to this effort. Animal-based toxicity testing methods are dismally inaccurate, and they result in the painful deaths of hundreds or thousands of animals per chemical. California cannot ensure the health and safety of its citizens or wildlife by relying on these outdated testing methods. Thousands of chemicals have already been tested in other government programs, and existing data must be gathered, fully evaluated, and used prior to initiating further testing requirements. Thank you for your time and consideration.
F-TD-226	Science Without Sadistics As a citizen of California who cares about the environment and animals I strongly support the importance of researching and developing human-focused testing methods, such as cell and tissue assays. CalEPA should focus on developing and using cost & time efficient high-throughput human cell and tissue methods, computer-based methods such as (Q)SAR, and intelligent, tiered testing schemes. Animal-based toxicity testing methods are inaccurate and result in the painful deaths of many animals. Protect human health without resorting to cruel laboratory tests on animals. Furthermore, California’s implementation of Green Chemistry goals should align with the vision for 21st-Century Toxicity Testing put forth by the National Academy of Science by committing funding and resources to this effort and ensuring any Green Chemistry initiatives related to toxicity testing take this groundbreaking report into account.

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F-TD-227	No animal testing: both a scientific and moral imperative In silicon valley for may years we had been told about our "clean industries." It is now apparent that the high tech industry is a major source of chemical pollution in all phases of production (manufacture to disposal). Dealing with these problems is important to the health of all; and so is the approach we take. I urge CalEPA to reject animal testing as part of any program to develop chemical policies and regulations. In addition to being inaccurate, animal testing results in the the torture and death of many animals to address a mess we humans have made. We have both a scientific and moral imperative to use currently available and superior methods to address the damage we have caused to the environment.
F-TD-228	Going green does not require testing on animals. 1. Protecting the environment is in the interest of every Californian, and any programs or processes should be open and transparent with an opportunity for public input. 2. We need to get a handle on the toxic chemicals in our environment quickly—that means developing and using cost- and time-efficient high-throughput human cell and tissue methods, computer-based methods such as (Q)SAR, and intelligent, tiered testing schemes. 3. California's implementation of Green Chemistry goals should align with the vision for 21st-Century Toxicity Testing put forth by the National Academy of Science by committing funding and resources to this effort and ensuring any Green Chemistry initiatives related to toxicity testing take this groundbreaking report into account. Animal-based toxicity testing methods are inaccurate and can result in the painful deaths of hundreds or sometimes more than a thousand animals per chemical. California cannot ensure the health and safety of its citizens or wildlife by relying on these methods. 4. Data gathering requirements must take advantage of existing data gathered from other testing programs as well as intelligent testing strategies. Requiring a fixed list of toxicity tests for all chemicals is wasteful and unscientific
F-TD-229	No animal testing Please, let's move into the 21st century and use humane alternatives to cruel, barbaric animal testing. The alternate testing exists and it is more accurate. Going "green" means good for everyone and everything effected. Let's follow that true standard.
F-TD-230	Sustainability - the jigsaw puzzle Putting the Jigsaw Puzzle Together: Comprehending the bigger picture of global sustainability encompasses inextricably interconnected issues such as geometric population growth, escalating increases in per capita consumption, toxic environmental pollution, global warming and climate change, externalities which are not incorporated into economic and business models, rapidly depleting non-renewable natural resources and materials, damaging ecological impacts of activities such as monoculture, aquifers sucked dry, animal/ecosystem habitat destruction and population collapse, soil erosion and desertification, exhausted ocean fish-stocks, wholesale mammal species extinctions, rainforest logging and clearing – the biomass capital of the world being rapidly consumed, following encroachment of apex-predator humans into every part of the world – these are all pieces of the same jigsaw puzzle. The extinction of most other life forms on the planet is the price being paid for untrammeled increases in human population. But its unsustainable. How will it end? Humans need to change to holistic social, political and economic paradigms in conducting our activities on the planet, both for the survival of Spaceship Earth as an ecosystem, and for every species in it, including humans, so succeeding generations can live into a future that is worth living.

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F-TD-231	Animal Testing is wrong and unnecessary Most animal testing produces results that are unreliable since animals do not respond the same way as humans do in most tests. Other testing models exist that produce faster, less expensive and more reliable test results. In addition, it is immoral to test on animals. That is not God's purpose for His animals. Humans are poor stewards of the earth and its creatures and we all need to change that.
F-TD-232	No more animal testing! I can't believe that California is even considering doing further animal testing on reaction to toxics! It is absolutely reprehensible, and we must cease and desist immediately, so as to set a god example to the rest of the nation! You have only to consult the Union of Concerned Scientists and Physicians for the Ethical Treatment of Animals to find other cheaper ways to test toxics.
F-TD-233	abolish animal testing and research Protecting the environment is in the interest of every Californian, and any programs or processes should be open and transparent with an opportunity for public input. We need to get a handle on the toxic chemicals in our environment quickly—that means developing and using cost- and time-efficient high-throughput human cell and tissue methods, computer-based methods such as (Q)SAR, and intelligent, tiered testing schemes. California's implementation of Green Chemistry goals should align with the vision for 21st-Century Toxicity Testing put forth by the National Academy of Science by committing funding and resources to this effort and ensuring any Green Chemistry initiatives related to toxicity testing take this groundbreaking report into account. Animal-based toxicity testing methods are inaccurate and can result in the painful deaths of hundreds or sometimes over a thousand animals per chemical. California cannot ensure the health and safety of its citizens or wildlife by relying on these methods. Data gathering requirements must take advantage of existing data gathered from other testing programs as well as intelligent testing strategies. Requiring a fixed list of toxicity tests for all chemicals is wasteful and unscientific
F-TD-234	California needs to be smart, not cruel ... Protecting the environment is in the interest of every Californian, and any programs or processes should be open and transparent with an opportunity for public input. We need to get a handle on the toxic chemicals in our environment quickly—that means developing and using cost- and time-efficient high-throughput human cell and tissue methods, computer-based methods such as (Q)SAR, and intelligent, tiered testing schemes. California's implementation of Green Chemistry goals should align with the vision for 21st-Century Toxicity Testing put forth by the National Academy of Science by committing funding and resources to this effort and ensuring any Green Chemistry initiatives related to toxicity testing take this groundbreaking report into account. Animal-based toxicity testing methods are inaccurate and can result in the painful deaths of hundreds or sometimes more than a thousand animals per chemical. California cannot ensure the health and safety of its citizens or wildlife by relying on these methods. Data gathering requirements must take advantage of existing data gathered from other testing programs as well as intelligent testing strategies. Requiring a fixed list of toxicity tests for all chemicals is wasteful and unscientific.
F-TD-235	STOP DOING CRUEL TOXICITY TESTS ON ANIMALS This practice is outdated in todays times. It needs to be stopped!
F-TD-236	Please stop all toxicity tests on animals. They are outdated and we don't need them any longer. Animals feel pain and suffering like we do. Please stop the suffering now.
F-TD-237	Stop all toxicity tests on animals NOW!

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F-TD-238	please stop all animal testing there is no need for them and the animals feel pain and fear the same as we do
F-TD-239	Thoughts on Fostering Product Stewardship The Consumer Specialty Product Association's (CSPA's) members are committed to manufacturing and marketing safe products which are protective of human health and the environment while providing essential benefits to consumers. To demonstrate this belief and practice, in 2001, CSPA initiated our Product Care program. CSPA's Product Care program is a stewardship program for the consumer and institutional specialty products industry where participating companies have agreed to go beyond government regulations in emphasizing health, safety and environmental concerns by carefully designing products, purchasing raw material and packaging, operating safe manufacturing facilities, promoting safe storage and distribution, providing useful product information, answering consumers questions and anticipating product disposal needs. CSPA believes that these types of product stewardship programs should be considered as frameworks for programs developed under the Green Chemistry Initiative. Product Care provides a framework for companies to identify and commit to stewardship principles, share ideas and information and benchmark better performance. Participating companies have pledged to develop management principles for each of seven areas in a product's life cycle from development in a research facility through product use and disposal. In doing so, Product Care participants commit to the following concepts: • We will strive to improve our efforts to protect and reach out to our employees, our customers, the community and the environment, as they are affected by our products and operations. • We will seek and value public comment regarding our products and operations. • We will provide information on safe and effective use of our products, as well as their health and environmental risks, to consumers and other affected stakeholders, encouraging them to partner with us in the appropriate use and disposal of our products. • We will, through CSPA, work with government and other stakeholders in the ongoing review and development of responsible laws, regulations and industry practices to help safeguard the home, workplace, community and environment. • We will promote our values to our contractors and other business partners. • We are committed to the sustainability of our environment and economy, and will work in partnership with governments and other stakeholders to encourage sustainability. 1. Product Design • We will independently seek to design products, packaging and labeling that are appropriate for the intended uses, and seek to minimize potential harm to our employees, customers, consumers and the environment. • We will have our products evaluated for health and safety in an effort to identify the consequences of potential exposures. 2. Raw Material, Package and Service Supply • We will have an internal process for our independent selection of raw material, package and service suppliers to promote our product stewardship objectives. • We, as suppliers, will share our expertise and information to assist our customers in using our materials and services safely and effectively in their operations. • We, as formulators, will make full use of the expertise and information of our suppliers to help us use their materials and services safely and effectively in our products and operations. 3. Manufacture and Production Site Management • We will have systems in place to identify potential risks to our workers, the community and the environment presented by our operations, and design prevention measures to manage, reduce or eliminate those risks.

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	• We will have emergency response programs for our facilities. 4. Product Storage and Distribution • We will establish and make available procedures for the handling, storage and distribution of our products to protect personnel, property and the environment. • We will have an emergency response plan to address the risks associated with our handling, storage and distribution. 5. In-market Support, Incident Evaluation and Follow-up • We will support dissemination of safety related product information regarding routine use of our products that is accurate, complete and in context to the inquiry or concern. • When product-related incidents occur, we will have systems in place to minimize adverse effects, assist our consumers/customers and provide needed information. • We will strive to influence product and label design as well as develop educational messages on safe and responsible product use based on information regarding unintended events and other types of exposures involving our products. 6. Consumer Education and Outreach • We will support public education programs that promote the safe and effective use of our products, and that help consumers put exposure and toxicity in proper context with hazard and risk. This can be done through programs of CSPA and the Alliance for Consumer Education (ACE). • We will provide appropriate training materials when necessary to assure the proper and safe use of our products that are intended for commercial, institutional or industrial consumers. • We will communicate appropriate environmental, health, safety and efficacy information, as well as warnings, to employees, distributors, and consumers, and ensure that labels, labeling, bulletins, material safety data sheets, and other appropriate product information, are designed to be accurate and not misleading. 7. Product Disposal • We will strive to make our products and packages compatible with typical municipal solid waste or sewage handling systems, encourage recycling of our products where recycling exists, and support other forms of waste minimization. • We will support programs of Integrated Waste Management (IWM) in communities, recognizing the distinct roles of manufacturers, retailers, governments, and consumers in the cost-effective management of waste. Stewardship did not begin when CSPA's Product Care program was initiated in 2001. Responsible companies have long followed policies promoting safe products that provide important health benefits while not adversely affecting the environment. CSPA believes it is vital that these types of product stewardship programs and companies that participate in these programs be recognized and fostered through any program developed under the Green Chemistry Initiative.
F-TD-240	Stimulating Green Chemistry "Green Chemistry" is an intellectual framework that aligns technology innovation with improvements in the health and environmental "footprint" of materials used in our society. It requires inter-disciplinary collaboration among a variety of experts in chemistry, toxicology, and environmental science that work in business, government, and academia. Government cannot, and should not, dictate by statute or regulation precisely how this process for innovation and collaboration should occur. Importantly, a "Green Chemistry" program, in and of itself, should not be picking "winning" or "losing" products. Instead, it should be removing barriers and creating objective tools to allow companies to create new products and enable consumers to recognize and choose them. According to a March 28,

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	2002, publication of the Organisation for Economic Co-operation and Development (OECD) (of which the United States is a member) entitled, “Need for Research and Development Programmes in Sustainable Chemistry” (available at http://www.oecd.org/dataoecd/9/55/2079870.pdf), “For government, sustainable chemistry is a non-regulatory way of making regulations work more effectively.” OECD at 15. Member companies of the American Chemistry Council (ACC) are leaders in Green Chemistry and Green Engineering in their operations and have been honored for their efforts (e.g., see http://www.epa.gov/greenchemistry/pubs/pgcc/past.html for a list of EPA Presidential Green Chemistry Challenge winners). Our members view both the American Chemical Society’s (ACS) Green Chemistry Principles and the ACS Green Engineering Principles as useful approaches to resource efficiency, pollution prevention, and safety. These principles, however, were never intended to be applied as government mandates. In fact, prominently displayed on the home page of the Green Chemistry Institute is the statement: Green Chemistry differs from previous approaches to many environmental issues. Rather than using regulatory restrictions, it unleashes the creativity and innovation of our scientists and engineers in designing and discovering the next generation of chemicals and materials so that they provide increased performance and increased value while meeting all goals to protect and enhance human health and the environment. So, how can California encourage Green Chemistry rather than attempt to mandate it? Several actions may be taken to stimulate Green Chemistry in California and the United States broadly. For example, government can and should provide encouragement for Green Chemistry collaborations through the sharing of expertise, financial support for research, information exchange, and public education. In fact, a variety of federal agencies (including EPA and DOE), companies, professional associations such ACS, Non-Governmental Organizations (NGO), and universities are already working together to encourage Green Chemistry strategies. Additionally, government should consider offering incentives for companies to pursue and foster Green Chemistry and Green Engineering to help ensure these products/technologies can become economically viable and gain initial access to a competitive marketplace. These incentives might include tax incentives, low interest loans, awards, and marketing exposure. I. Education and Research/Development Industry is always working to drive down production costs. For specialties and fine chemicals, the synthetic chemists working in developing these materials have to know how to ask the Green Chemistry questions. This stands squarely in the realm of science education, especially in schools of chemistry. Not only do chemists and others involved in chemistry need to understand toxicology, but they also need to better understand the interaction between health and environmental protection, toxicology, and price. It is therefore essential that California support education in the methods and principles of Green Chemistry for all its state colleges and universities (and in its high schools and vocational schools, as appropriate). Anywhere that chemistry is taught, toxicology and Green Chemistry should also be taught. Additionally, California should encourage innovative research in Green Chemistry and Green Engineering. Research funding into new Green Chemistry methods is always welcomed by colleges, universities, and others, and should be an important part of any Green Chemistry program. According to the OECD (again referring to their March 2002 publication): Governments can promote sustainable chemistry R&D…by establish[ing] and fund[ing] programmes on sustainable chemistry R&D. … In addition, parts of industrial programmes are often supported by government funds. Governments, in general, can provide funds for basic and pre-competitive research. …Practically, governments can orient sustainable chemistry R&D programmes by adjusting the distribution of funds for fundamental and applied research or by commanding competitive and targeted funds depending on policies. OECD at 15. II. Incentives To further stimulate Green Chemistry and Green Engineering, California should consider the following incentives: (1) awards like EPA’s Green Chemistry Challenge (see http://www.epa.gov/greenchemistry/pubs/pgcc/presgcc.html for more information); (2) tax incentives/subsidies/grants/low interest loans

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	for research and development; and (3) marketing exposure for Green Chemistry processes and products. For example, when California purchases chemicals for state contracts, it could decide to pay a modest premium for a set period of time for new “green materials” that show promise. The goal of this subsidy would be to help a new material achieve greater economies of scale, but avoid locking in an inefficient permanent subsidy. California could additionally make capital available to companies at preferential terms, whether via grant or lower interest loans, to encourage Green Chemistry and Green Engineering manufacturing process development. And California could also consider a marketing program (perhaps akin to the “California cows” and dairy ads currently on television) whereby the state would promote companies that are actively engaged in Green Chemistry and Green Engineering, and products that are the result of Green Chemistry and Green Engineering. The OECD suggests: [G]overnments can facilitate the consideration and application of sustainable chemistry R&D by supporting efforts which aim at educating and informing industry and the general public of the importance and benefits of sustainable chemistry. One possible role for government would be to identify incentives and disincentives for the promotion of sustainable chemistry and to use this information to modify or develop their policies accordingly. When appropriate, the use of incentives, such as a reduction in taxes or the use of subsidies, can be an effective way of supporting R&D by academia and industry in the field of sustainable chemistry. … It is essential that any sustainable chemistry technology or product be competitive in the marketplace, at least in the long term. However, some of those technologies, even if they are beneficial in the long term, will not be able to survive economically without incentives. Economic incentives, such as subsidies or tax reductions, could be effective in these cases. OECD at 15 and 17.
F-TD-241	A Modern Chemicals Policy For California CALIFORNIA MEDICAL ASSOCIATION A MODERN CHEMICALS POLICY FOR CALIFORNIA (2007) Introduced by: San Francisco Delegation Whereas, the state, national, and global scale of industrial chemical production is immense and is expected to grow four-fold by 2050, and the chemical industry is an important industry with wide contributions to health and human development; and Whereas, ever-expanding research confirms that many chemicals that are useful to society are also known to be hazardous to human biology and health, particularly in utero and in developing children; and Whereas, for new and existing medications, the Food and Drug Administration has long required pre-approval evaluation of safety as well as efficacy, and many industrial chemicals with known impacts on human biology are present in human bodies at levels similar to active doses of medications; and Whereas, numerous other nations including Canada and the European Union are adopting more proactive health-oriented chemicals policies, based upon scientific knowledge, assessment, and accepted public health principles; and Whereas, there are long-standing deficiencies in the federal regulation of industrial chemicals, most notably in the Toxic Substances Control Act (TSCA), as confirmed by the National Academy of Sciences and others, and the University of California documented in a 2006 report to the California Legislature that TSCA's deficiencies are important and can be remedied; and Whereas, these problems include the projected appearance of 600 new hazardous waste sites each month in the U.S. over the next 25 years; the appearance of hundreds of industrial chemicals in human tissues and fluids, including those of infants; and the development of chronic diseases caused by chemical exposures on the job among 23,000 California workers each year; and

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	Whereas, the American Public Health Association's leadership has recently endorsed a policy titled "Calling on the U.S. Congress to restructure the Toxic Substances Control Act and implement a modern, comprehensive chemicals policy", to be considered for adoption at the annual APHA meeting in November; Therefore, be it Resolved: That the CMA calls upon the State of California and United States to implement a modern, comprehensive chemicals policy in line with current scientific knowledge on human health, and which requires a full evaluation of the health impacts of both newly developed and existing industrial chemicals now in use; And be it further RESOLVED: That this matter be referred for national action (AMA). REFERENCES: http://www.healthandenvironment.org/science/papers on behalf of the California Medical Association
F-TD-242	Check out This Tool that Will Work!!! Last week I attended the Western Regional Pollution Prevention conference in San Diego and had a chance to see a demo of a software tool that would be incredibly effective in addressing some of the concerns here. In fact I understate my excitement because it is so eye-popping to see to see the software in action, I can only hope to do it justice here. The software is very sophisticated but unlike other solutions I've seen, this one is actually very user friendly. It is the first real tool I've seen that can be used by industry experts, academia and the general public. Wow, let me say that again…the general public can actually use this tool it is that user friendly. The implications for Compliance Managers, Risk Assessment Departments and Purchasing agents are enormous. In addition to these individuals who must regularly make decisions that affect their organization, colleagues, and communities, there are also many in the medical profession, biotech, agriculture, ecologists and yes even economists (!) can plug in use this tool to get the results they need. Those of us posting here can dig into the inner workings of the software, because behind the easy-to-use interface is a complex, meticulous database that has been so well tested and refined that it is virtually bulletproof with respect to passing peer-based reviews. Dr. George Thompson has spent 25 years creating a chemical database of 75 million data elements for more than 210,000 chemicals, 350,000 products complied from over 1,000 sources. His software can generate a score that can accurately and effectively measure the toxicity levels in a given chemical recipe, process, or product and give specific information about the impact on Health, Safety and Ecology. Not only that, it is possible to cross reference information regarding the chemicals, CAS numbers, regulatory lists, (very exciting!) and can eliminate redundant data so that it's easier for departments to work together and get things done faster. There is much more detail that I can go into, however what's more important is that you, as you're reading this, get curious enough to check out Dr. Thompson's tool. It is worth the time to take a look, and even more than that, I would be thrilled to see the technology implemented as part of California's comprehensive solution. For this reason, I'm getting the word out on the other forums too. We need to be looking at this solution. There is no more time to wait. We must involve people at the business and community level. We must give people at the business and community level a tool that will work for them. Not just us.

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	Check out www.chemply.com Read more about this man's work. It is phenomenal!!!!!!
F-TD-243	Ch Last week I attended the Western Regional Pollution Prevention conference in San Diego and had a chance to see a demo of a software tool that would be incredibly effective in addressing some of the concerns here. In fact I understate my excitement because it is so eye-popping to see to see the software in action, I can only hope to do it justice here. The software is very sophisticated but unlike other solutions I've seen, this one is actually very user friendly. It is the first real tool I've seen that can be used by industry experts, academia and the general public. Wow, let me say that again…the general public can actually use this tool it is that user friendly. The implications for Compliance Managers, Risk Assessment Departments and Purchasing agents are enormous. In addition to these individuals who must regularly make decisions that affect their organization, colleagues, and communities, there are also many in the medical profession, biotech, agriculture, ecologists and yes even economists (!) can plug in use this tool to get the results they need. Those of us posting here can dig into the inner workings of the software, because behind the easy-to-use interface is a complex, meticulous database that has been so well tested and refined that it is virtually bulletproof with respect to passing peer-based reviews. Dr. George Thompson has spent 25 years creating a chemical database of 75 million data elements for more than 210,000 chemicals, 350,000 products complied from over 1,000 sources. His software can generate a score that can accurately and effectively measure the toxicity levels in a given chemical recipe, process, or product and give specific information about the impact on Health, Safety and Ecology. Not only that, it is possible to cross reference information regarding the chemicals, CAS numbers, regulatory lists, (very exciting!) and can eliminate redundant data so that it's easier for departments to work together and get things done faster. There is much more detail that I can go into, however what's more important is that you, as you're reading this, get curious enough to check out Dr. Thompson's tool. It is worth the time to take a look, and even more than that, I would be thrilled to see the technology implemented as part of California's comprehensive solution. For this reason, I'm getting the word out on the other forums too. We need to be looking at this solution. There is no more time to wait. We must involve people at the business and community level. We must give people at the business and community level a tool that will work for them. Not just us. Check out www.chemply.com Read more about this man's work. It is phenomenal!!!!!!

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F-TD-244	Total lifecycle evaluation Cal EPA should begin by picking a product, any product, and evaluating the entire lifecyle of that product. One or more companies may be interested in partnering with Cal EPA to evaluate their product. Cal EPA should analyze every aspect of that product's lifecyle, from the harvesting and processing of raw materials, to that product's ultimate disposal or "end of life" management. Cal EPA should focus on forms and quantity of energy used, and environmental harm done, for everything from mining the metals that go into the product, to the source of wood in the product, to what kinds and amounts of energy are used to transport raw materials, to what kind of and how much energy the manufacturer uses to make the product, in addition to the products formulation, and what happens to the product at its end of life. Questions to answer include: Are sustainable mining and timber harvesting providing raw materials. Are their more environmentally friendly ways to process and transport the raw materials. Is the manufacturer using renewable and sustainable energy (i.e., solar). Is the product designed for end of life management (recycling, reuse, materials recovery) What impact is the manufacturing and disposal of the product having in developing countries. Can hazardous materials in the product be replaced by less hazardous materials. And so on, and so on, and so on... This type of exercise would then be the paradigm for the evaluation of other products
F-TD-245	Green Energy and Renewable Resources It seems that most options have focused on designing products with different or new chemical formulations that are less harmful to the environment or human health. Something that may have been overlooked is efforts to use renewable resources and "clean" energy to support manufacturing. Cal EPA ought to encourage the use of renewable resources, continuously recycled materials, and green energy (i.e., alternative fuels and solar power) in manufacturing. Any program to reward or recognize "Green Chemistry" efforts ought to recognize companies that use renewable or continuously recyclable materials, and/or implement the use of green energy to support their manufacturing operations. Although the substitution of dangerous chemicals with less dangerous chemicals is definitely worthwhile, it is not the only approach to reducing the global and environmental impact of manufacturing. Cal EPA should think outside the box.
F-TD-246	Thoughts About Substitution Contributions from chemistry bring many benefits to society, but there are chemicals which can pose risks to health or the environment in certain circumstances. Some argue that the most sensible approach to these chemicals is to replace them with substances considered less hazardous—a seemingly simple concept, but substitution is not always feasible and not always the right choice. American Chemistry Council (ACC) members, through Responsible Care®, regularly consider substitution as an option in their broader green engineering and process design efforts. When doing so, companies must closely examine the implications for the safety, functional performance, and cost of alternatives to avoid ineffective changes with unintended negative health and environmental impacts. A good cook knows that you cannot arbitrarily change ingredients in a recipe. Whole wheat, rye, all purpose, and pastry are just a few of the many different varieties of baking flour. Yet, bakers know that while all flour is similar, many cannot be substituted without creating a result nobody would want to eat. The same holds true for chemical processing. You cannot simply replace one chemical ingredient for another without impacting the final product. Therefore, significant problems would result if chemical substitution were mandated as the solution of first choice without careful consideration of potential consequences. This is very much the approach taken by an international group of experts to the Intergovernmental Forum on Chemical Safety

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	(IFCS) earlier this year in talking about “informed substitution”. (see the background elements of the IFCS paper available at http://www.who.int/ifcs/documents/forums/forum6/12_original_prop.doc) SUBSTITUTIONS MAY CHANGE THE NATURE OF THE PROBLEM RATHER THAN SOLVE IT Mandatory bans and forced substitutions often are not a complete solution because, as one issue is addressed, another set of concerns may arise. This is the difference between “informed substitution” and “regrettable substitution”, with the goal of “informed substitution” being to avoid “regrettable substitution”. For example, the health and convenience of our lives has been greatly enhanced by modern refrigeration. Refrigerators originally used ammonia, a toxic chemical, as a coolant. As scientific discoveries were made, chlorofluorocarbons (CFCs) replaced ammonia. While CFCs are practically non-toxic, they were later implicated in depleting the ozone layer and eventually banned. CFCs were then replaced with hydrochlorofluorocarbons (HFCs), which have no impact on the ozone layer, are non-flammable, have low toxicity, and high energy efficiencies. Scientists have now learned that HFCs could contribute to global warming if released into the air. Alternative coolants such as hydrocarbons and carbon dioxide have been considered, but both need to be carefully examined because of the potential for emissions and the possible dangers from higher operating pressures. In another example, consider the Peruvian government’s decision to stop chlorinating drinking water. The result in 1991 was a five-year epidemic of cholera which spread to nineteen Latin American countries, causing more than one million illnesses and 12,000 deaths. After the outbreak, U.S. and international health officials criticized Peruvian water officials for not chlorinating the entire water supply. An official with the Pan American Health Organization (PAHO) blames the inadequate chlorination, at least in part, on concern over disinfection byproducts. In a 1997 article in the Journal of the American Water Works Association, Horst Otterstetter states, “Rather than being abated by increased use of chlorination, the waterborne transmission of cholera was actually aided because of worries about chlorination byproducts.” Substituting one material for another is never as simple or straightforward as it might at first appear. SUBSTITUTIONS MAY RESULT IN UNINTENDED ADVERSE CONSEQUENCES Trading in a fuel-hungry SUV for a moped may address energy efficiency concerns, but it’s probably not a reasonable option for a mother of four. Like the moped, forced substitution, without full consideration of the potential impacts, is impractical and unwise. For example, some substitute chemicals require higher processing temperatures and greater pressure conditions in order to achieve the same result as the original chemical. Additionally, if the substitute chemical is not compatible with the processing equipment, it can cause break downs or failures. In some circumstances, the substitute is not as effective as the original chemical and more quantity must be used which results in larger amounts of waste materials and increased waste disposal management and risks. All of these factors can lead to increased safety concerns for the worker population, as well as increased energy consumption by the company. This unintended consequence of substitution was clearly demonstrated in Europe when energy companies decided that fuel derived from plants would be more environmentally friendly than fossil fuels. Those companies developed specialized generators for palm oil, which increased demand. To keep up with that demand, palm plantations cleared large tracts of land by draining and burning peat land, resulting in huge carbon emissions into the atmosphere. The production of the plant derived fuel had an unintended consequence of creating more harmful emissions than the fossil fuels they were intended to replace. SUBSTITUTION IS NOT THE ONLY VIABLE APPROACH TO CONTROL RISK The principle of risk reduction is and always has been part of the normal day-to-day operations for the business of chemistry. Industry’s ability to innovate allows us to respond to society’s evolving needs for better, safer products. Beyond substitution, the chemistry industry considers many other options to minimize potential hazards, such as operational management systems, engineering controls, modifications to the chemical product, and waste management innovations. The industry also provides specialized consumer

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	training and works with communities to implement effective recycle/reuse programs. Through ACC's Responsible Care® initiative, ACC member companies go above and beyond government rules and regulations to continuously improve their environmental, health, safety, and security (EHS&S) performance. ACC members employ a rigorous EHS&S management system that is certified by third-party auditors. Among numerous other elements, auditors verify that our companies have systems to manage risk associated with chemical products including management of product development, transport, use, and disposal in a safe and secure manner. Companies are also audited on their programs to protect the environment and to conserve resources, as well as their efforts to dialogue with community stakeholders about the organization's impact on human health and the environment. Company performance under Responsible Care® is publicly shared through americanchemistry/responsiblecare.com. For more information on Responsible Care®, please visit http://www.responsiblecaretoolkit.com.
F-TD-247	CHANGE's Perspective on a Successful Program We write to you today on behalf of CHANGE, Californians for a Healthy and Green Economy. Ours is a broad-based growing coalition of approximately 35 environmental and environmental justice groups, health organizations, labor advocates, community based groups, parent organizations, and others who are concerned with the impacts of toxic chemicals on human health and the environment, as well as the lack of a regulatory framework that seeks to prevent exposures to toxic chemicals. We thank you for your leadership initiating the Green Chemistry Initiative and would like to take this opportunity to join the Conversation with California by offering our perspective on what would make the program successful in addressing the critical human and environmental issues related to chemical use. on behalf of CHANGE
F-TD-248	Dow Chemical's Green Chemistry Thoughts The Dow Chemical Company (Dow) is pleased to provide the following comments on California's Green Chemistry Initiative (GCI). On June 29, 2007 Dow provided initial comments that represented our principles for sustainable chemistry at a corporate level. That letter spoke of Dow's accomplishments in sustainability, Dow's aggressive 2015 Sustainability Goals, and Dow's suggestions for framing California's GCI. We have engaged fully in the DTSC's process; Dow people have spoken at two of the three Green Chemistry Symposia and have participated in the workshops, including serving as break-out session facilitators. This current submission offers Dow's more-detailed thoughts in the specific areas of: § Life-Cycle Assessment § Eco-Labels § Consumer Choice § Environmentally-Preferred Purchasing § Incentives on behalf of the Dow Chemical Company

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F-TD-249	Chemistry is Essential to California Chemistry is essential to California. When the science of chemistry is applied, it helps make the lives of Californians and others throughout the world safer, healthier, and more productive. American chemistry also plays a fundamental role in helping the California economy be more energy efficient. Our products go into modern materials used to make insulation, weatherization equipment, firefighting and other emergency response equipment, lightweight vehicle parts, coatings, lubricants, and energy-efficient appliances. ACC members are proud to be doing our part to reduce greenhouse gas emissions and intensity and improve energy efficiency. In fact, we've improved energy efficiency by 46 percent since 1974 and reduced absolute greenhouse gas emissions by 10 percent since 1990 – exceeding the Kyoto Protocol's target and deadline. In addition to the 84,802 jobs directly created by the chemical industry in California, a total of 524,584 jobs in California are generated indirectly by chemical industry activity in California and other states. For every chemical industry job in California, a total of 4.5 jobs are created within the state, a total of 300,627 jobs. In total, 609,386 jobs in California are supported by the chemical industry. These jobs generate $30 billion in earnings and $1.7 billion in state and local tax revenues. Industries that use chemical or chemical-derived products include: farming, new residential construction, emergency response services, plastic bottle manufacturing, upholstered furniture manufacturing, dry cleaning services, building services and health care, to name just a few. In California, more than 4.9 million jobs (or 31.8% of all California jobs) are dependent on chemical products. These jobs generate $230.8 billion in earnings and generate state and local tax revenues of $13.4 billion. The principles of sustainable chemistry are at the heart of our everyday business of producing chemical products. ACC member companies incorporate Green Chemistry and Green Engineering in their operations, and have been recognized for their efforts; having won 9 Green Chemistry Challenge Awards issued annually by the US Environmental Protection Agency. For California, American Chemistry is essential to producing the products, jobs, and innovations that will help us achieve a more sustainable future.
F-TD-250	Have EPA programs really closed the data gap? These comments respond to the American Chemistry Council's comments titled "Addressing the Data Gaps" posted on October 15, in particular those characterizing the types and amounts of information reported to EPA under: (1) the TSCA Inventory Update Rule (2) the US HPV Challenge Program and the industry's Extended HPV Program. (1) Information submitted to EPA under the TSCA Inventory Update Rule For certain chemicals in commerce, limited and infrequent reporting of production, use and exposure information by manufacturers has just been initiated under EPA's Inventory Update Rule (IUR). Such reporting is required only of chemical manufacturers (and in some cases, processors), but not of companies that use chemicals, whether directly or as ingredients in products. Beginning in 2006, manufacturers of non-exempt chemicals produced or imported in amounts of 25,000 pounds or more per year per site are required to report to EPA the information noted by ACC – to the extent it is "known or reasonably ascertainable." For chemicals manufactured in amounts of 300,000 pounds or more per year per site, the additional information on downstream processing and use noted by ACC must be reported – but only to the extent that it is "readily obtainable." Fewer than 10,000 chemicals are covered by the basic production information reporting requirements, and only a few thousand of these will be subject to the more extensive reporting that extends to downstream processing and use information. Reporting is required only once every five years and then only for a single reporting year. Much of the information reported to EPA is designated confidential business information (CBI). Under TSCA, EPA is prohibited from divulging any CBI to

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	the public or to other governments, including the State of California. (2) Information developed under the US HPV Challenge Program and the industry's Extended HPV Program. For more detail and documentation of my comments below, see my recent report, High Hopes, Low Marks: A Final Report Card on the High Production Volume Chemical Challenge, available online at www.environmentaldefense.org/hpvreportcard. The Challenge represents the only systematic effort by the US Environmental Protection Agency (EPA) to foster the development of and public access to basic hazard data on a relatively large number of chemicals in commerce. It should be acknowledged that the program is developing and making public basic hazard information for more chemicals in less time than any prior effort, and it represents the first significant step taken in the US toward closing the gap between what we know and what we should know about widely used chemicals. But the limitations of this voluntary program and the information it is providing need to be understood as well. Because the Challenge is voluntary, it side-steps the onerous findings EPA must make to exercise its authority under Section 4 of TSCA to compel hazard testing of chemicals. However, for the same reason, EPA also has limited recourse to ensure full participation by manufacturers or the timely submission and high quality of hazard data sets developed for HPV chemicals. The following statistics on the status of the HPV Challenge, which began in 1998, are current as of July 2007. MORE THAN 18 MONTHS AFTER THE ORIGINAL DEADLINE, THE HPV CHALLENGE IS FAR FROM COMPLETE • Two-and-a-half years after final data sets were due, fewer than half (47%) have been submitted. • 10% of eligible HPV chemicals were not volunteered for the Challenge by the companies that produce them; EPA has issued rules to compel testing for only 6% of these chemicals. THE QUALITY AND COMPLETENESS OF FINAL DATA SETS HAVE YET TO BE DETERMINED • The average quality of sponsors' initial submissions, while originally quite good, has declined over the course of the Challenge, especially in the past 18 months. The grade point average for initial industry submissions has declined from a solid B-plus in 2001 to a C-minus in 2006. • Of the final submissions examined so far by EPA, covering about 100 HPV chemicals, EPA has found that data gaps remain in about a third of them. THE HAZARD DATA SUBMITTED ARE SCREENING-LEVEL DATA ONLY • Hazard data being collected under the Challenge are limited to a subset of the Screening Information Data Set (SIDS), developed under the auspices of the OECD. • The SIDS data are generally acknowledged to be insufficient to provide the basis for a full hazard assessment, let alone a risk assessment, for a chemical. It relies primarily on testing of acute or subchronic toxicity, for example, and its ecological endpoints only include toxicity to aquatic organisms. THE PROGRAM FOCUS IS LIMITED TO HAZARD DATA • By design, the Challenge did not call for submission of use and exposure information, although some sponsors did submit some such information. • As a result, the program will provide little if any reliable, comprehensive information about the use of and exposure to HPV chemicals. EPA HAS LITTLE RECOURSE IF DATA QUALITY IS POOR OR DATA ARE INCOMPLETE • Because the HPV Challenge is voluntary, EPA has very limited ability to ensure that the data submitted by sponsors are of high quality and complete. While EPA and other commenters have often identified deficiencies in initial submissions, there is no legal or binding obligation on the part of sponsors to heed those comments. • EPA has agreed to conduct a quality and completeness review on final submissions, and to make known the results, but cannot compel sponsors to address any problems that are identified. THE REGULATORY "BACKSTOP" FOR THE PROGRAM IS WEAK • EPA's authority under TSCA to compel testing of the 10% of HPV Challenge chemicals that were not voluntarily sponsored is seriously constrained; to

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	date, EPA has issued test rules for only 16 (6%) of the 265 unsponsored “orphan” HPV chemicals. THE MAJORITY OF CHEMICALS IN COMMERCE ARE NOT HPVS • While, as ACC notes, HPV chemicals constitute the bulk of chemicals in commerce when measured by tonnage, non-HPV chemicals far outnumber HPV chemicals. • The TSCA Inventory contains more than 82,000 chemicals that have been in commerce at some point since 1979. Based on the 2002 TSCA Inventory update reporting, EPA reported some 5,400 so-called medium production volume (MPV) organic chemicals manufactured in 2002 in amounts above 10,000 pounds per year; an unknown number of chemicals below that threshold are in commerce in the US, because they are not required to be reported. • The European Union (EU) estimates that about 30,000 chemicals are produced there in quantities at or above one metric ton (2,200 pounds) per year, fewer than 3,000 of which are HPV chemicals. THE EXTENT OF SPONSORSHIP OF NEWLY EMERGED HPV CHEMICALS IS POOR • Of nearly 600 newly emerged HPV chemicals – those that have reached HPV levels of manufacture since the Challenge was launched – eligible for sponsorship, only 40% have been sponsored through the chemical industry’s Extended HPV Program. • EPA has found wide gaps in publicly available hazard data for these chemicals. • No test plans for these chemicals have yet been made available, and industry has not provided any tracking system to monitor the status of these commitments. • No final data sets have been submitted, despite a claim when the program was launched that data would be submitted starting in 2006. • These findings indicate that the chemical industry is not making the development of, and public access, to hazard data on all HPV chemicals “evergreen” practices.
F-TD-251	Some ideas for what California can do to start advancing chemicals policy Here are some ideas for what California can do to start to advance chemicals policy and promote green chemistry. They are derived from ideas I have presented at several GCI forums, but I wanted to add them into the mix being collected via the Conversation. What can California do? • Ensure access to information gathered by others – Negotiate for access to confidential business information (CBI) submitted under the European Union’s REACH Regulation and under the Canadian Environmental Protection Act (CEPA) – Require companies making/importing chemicals in California that are subject to REACH or CEPA to submit the same information to California officials – Enhance existing IT infrastructure to receive and share the large volumes of REACH data • Set clear criteria to identify chemicals of concern – Can be hazard-based (e.g., PBTs) and exposure-based (e.g., chemicals detected through biomonitoring) – Use these criteria to drive further assessment and control of chemicals meeting the criteria – Require adherence to clear timelines for conducting assessments and making control decisions • Map the flow of chemicals in California by developing and sharing production/use info – Require California producers/importers and users to submit and update information on production and processing (amounts, facility locations), uses (including in products), and post-use management – Require updating of MSDSs to reflect all available data (US HPV Challenge, REACH, Canada) – Require disclosure of chemicals in consumer products

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	• Could focus initially on priority chemicals (Canada priority list, REACH Substances of Very High Concern (SVHC) list) • Advance the science – HPV, REACH data sets use 20+ yrs. old tests (“old toxicology”) – Fail to account for: > Emerging issues, e.g., endocrine disruption, development neurotoxicity > Emerging science, e.g., low-dose effects, timing of exposure during development > Emerging methods, e.g., toxicogenomics, high-throughput screening and mechanistic assays > Perpetual concerns: e.g., cumulative, aggregate exposures, susceptible subpopulations – California is well-positioned to help move toxicology into the 21st century – Can help to develop, road-test and share new methods, testing strategies – Utilize biomonitoring data and methods to advance dose and exposure measurement – Press industry, federal government to move forward – Collaborate with universities Why do this? • Casts a broad net – to identify not only “bad actors” but also chemicals of low concern • Influences and informs chemical and product design decisions • Identifies and fills gaps – information (data and safety) and technology gaps • Empowers a range of actors – government, industry, academics, public – to advance knowledge and make better decisions about chemicals
F-TD-252	Limitations to Risk-Drive Approaches to Chemical Prioritization [NOTE: This post is based on a paper I published in the OECD Series On Testing And Assessment, No. 51, Approaches to Exposure Assessment in OECD Member Countries: Report from the Policy Dialogue on Exposure Assessment in June 2005, Chemicals Committee, Organization for Economic Cooperation and Development, p. 109, available at http://appli1.oecd.org/olis/2006doc.nsf/linkto/ENV-JM-MONO(2006)5. It is provided in part to respond to the American Chemistry Council's comments arguing for sole reliance on risk-based evaluation for chemicals.] While both hazard and exposure are clearly relevant in determining chemical risks, there are critical differences between our ability to assess hazard and exposure that have implications for the development and application of risk and exposure assessment policies. And real-world experience in chemical assessment programs that have attempted to rely on exposure information to prioritize chemicals also offers lessons for exposure assessment. In this paper I first address these issues, and then discuss their implications for risk and exposure assessment policies. Critical differences between assessing hazard and exposure Approaches to integrating exposure assessment into regulatory decision-making need to acknowledge and account for a number of critical differences between the nature of hazard and exposure information and their relative extent of availability. While both hazard and exposure are clearly relevant in determining risk, certain characteristics of exposure information pose serious challenges to sound decision-making: 1. Hazard is largely inherent to a chemical, and doesn’t fundamentally change over space or time, whereas any exposure information necessarily represents only a “snapshot” in both space and time. A chemical’s hazard is relatively intrinsic, largely or entirely independent of how the chemical is used, where or how it enters the environment, or other factors that vary with time and place. Hazard data are therefore relevant (i.e., necessary though not sufficient) in characterizing risk whatever the use of a chemical, and hence are useful in understanding any and all potential uses of or exposures to a chemical -- and what kind of exposure-reducing efforts

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	may need to be taken. Just the opposite is true for exposure, the potential for which changes depending on how a chemical is produced, used, transported and discarded. Conditions that determine exposure can and often do differ enormously for every setting and point in time that a chemical is present. And even if a "snapshot" of current exposure were able to be assembled, the next new use or activity leading to a release would alter the exposure picture. The variable nature of exposure poses a major challenge to exposure (and risk) assessment: It means that exposure assessment must be an ongoing activity, with the scope and frequency of its measurement sufficient to characterize the variation in as well as magnitude of exposure. 2. Voluntary and regulatory mechanisms for generating and collecting exposure information are undeveloped relative to those for hazard information. Extensive international consensus exists as to how to test a chemical for most hazardous properties. Detailed government-sanctioned procedures, guidelines, criteria and standards are already in place for conducting hazard tests, for assuring the quality and reliability of the results, and for determining whether the results constitute evidence of a particular hazard. Moreover, these measures allow that results are reproducible and can be independently verified. In contrast, virtually none of these mechanisms are in place to assure that exposure information is complete and accurate. Debates over what constitutes adequate exposure assessment and how to address the "moving target" nature of such information are far from resolved. Government-sanctioned procedures for generating, evaluating the adequacy of and interpreting exposure data have yet to be developed or validated, including testing and measurement standards, guidance, methods and tools. Even use and exposure information reported in sufficiently qualitative terms or sufficiently aggregated form so as to eliminate any confidential business information (CBI, see next bullet) concern is rarely systematically collected and made public. For the first time, beginning in 2006, USEPA has begun to require the reporting of basic information relevant to understanding uses of and exposure to chemicals, although it will be limited to several thousand chemicals, and will be collected only once every five years – despite enormous documented variability in these chemicals' production volumes that presumably reflects changes in their underlying use patterns. 3. Differential access to both exposure data and the means to generate them severely limit the "reproducibility" of such data. In addition to the variability and absence of agreed-upon procedures noted above, other factors limit "reproducibility," that is, the ability to readily and independently measure or verify exposure data. Most exposure data and the means to generate them reside virtually exclusively with industry. It must be acknowledged that industry has a strong interest in maintaining that exposure to its products is low, so the ability to independently measure and verify exposure data is critical. Yet physical access to many exposure "settings" (e.g., workplaces) is very limited and infrequent at best, even for government officials. Broader access to exposure-relevant information is even more restricted: Wide latitude is typically provided to claim chemical use and exposure information as CBI, preventing even its review outside government; this situation is often in contrast to that applying to hazard data, which is more likely to be deemed ineligible from designation as CBI. Finally, even chemical manufacturers have incomplete access to and information on their customers and how their chemicals are used. Intermediaries (vendors, brokers, distributors) are a formidable information flow bottleneck, as is the often-proprietary nature of information concerning downstream use and competition among suppliers. These factors serve to impede information-sharing even within supply chains, which in turn affects the extent and accuracy of exposure-relevant information that any one entity in a supply chain can provide if asked or required to do so. For all of these reasons, we believe that risk and exposure assessment at this time are simply too uncertain and unreliable to serve as a basis for deciding for which chemicals hazard data should be developed. While ultimate decisions concerning risk identification and management need to account for exposure as well as hazard, in all but the most exceptional cases, chemical prioritization approaches should be hazard-, not risk-driven. Difficulty of using exposure information in chemical priority-setting: OECD experience as a real-world example

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	The ongoing work of the OECD Existing Chemicals Program vividly illustrates the limitations to available exposure information – and to efforts to prioritize chemicals based on such information. In that program, chemical-by-chemical assessments of high-production volume (HPV) chemicals are conducted. Typically, industry collects existing information and conducts any testing needed to fill gaps in the required set of hazard information. Industry then prepares draft assessment documents, which are reviewed by health and environmental agency officials in member countries. While the primary emphasis is on hazard assessment, program procedures currently allow for exposure information to be included to "place the hazard information into context." As we have documented in detail elsewhere, in practice this exposure information is routinely being used to decide that chemicals that have been identified as possessing clearly hazardous properties are nevertheless low priorities for further work based on "anticipated low exposure." Unfortunately, the exposure information typically being relied upon has truly massive deficiencies with respect to scope, quality and completeness. Such information typically is: • very limited in scope, and hence incomplete or even haphazard in its coverage of potential exposures, because it: - covers only a portion of known production and use; - covers only a subset of relevant activities, e.g., production, transport, storage, processing, use by customers, use in consumer products, product disposal, waste management; - covers only a subset of exposed entities, e.g., workers, consumers, the general population, sensitive populations, and wildlife; - addresses only a subset of relevant routes of exposure, e.g., by inhalation, ingestion or dermal contact; through food, water, air; - rarely is based on ongoing or sufficiently frequent measurement to address variation or changing conditions; • unverified, unpublished, rarely peer-reviewed and of uncertain or undetermined quality; • frequently based on judgment or speculation, rather than on actual measurements, monitoring or validated methods of exposure modeling. Some of these deficiencies are related to the limited requirements under the program governing what exposure information is to be provided. However, others reflect the fundamental characteristics of exposure information described in the first section of this paper, as well as limitations on the extent and quality of information actually available and the capacity for effective review, and the lack of agreed-upon measures of scope, quality and completeness. The OECD Existing Chemicals Program has wrestled repeatedly with this problem over its history. Indeed, because of what many saw as an over-reliance on exposure-related considerations in the absence of an agreed-upon approach, the program went through a major refocusing to return to a primary focus on hazard characteristics as the primary driver for the program. However, despite the refocusing effort, inconsistent and insufficient exposure-related information – more than any other factor – drives the recommendation process for chemicals being assessed through the program. Implications for risk and exposure assessment policy All of the factors discussed above mean that assembling a complete and reliable exposure picture even for a single point in time faces obstacles and has proven exceedingly difficult in practice. So how should risk and exposure assessment policies – and practices – address these current realities? Guidelines development: We continue to strongly support the development of comprehensive guidelines for collection, analysis, validation and presentation of exposure information, as the much-needed foundation of any exposure assessment policy and practice. In our view, the OECD program needs to invest at least the same effort in developing a process for exposure assessment as was invested in developing the hazard screening program. There remain a number of substantial obstacles that must be solved in order to ensure that adequately robust data on exposure can be gathered. Resolving these challenges will not be easy. These obstacles include: • lack of agreement as to what exposure information is relevant and needed; • lack of consensus as to the framework and methodologies needed to conduct an exposure assessment; • limited availability of and access to internationally accepted, comprehensive measured exposure information or models for predicting exposure; and • limited information available on all uses and other exposure pathways of chemicals. Guidelines need to ensure that the measured and modeled or estimated data address and are representative of the full range of actual and potential

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	exposures that can or do occur. Procedures are needed to govern, for example, the minimum number of samples, the frequency of sampling, and other parameters so as to ensure that the results of any exposure measurements are both statistically meaningful and representative of the spatial and temporal variations present in the sampled environment. Quality assurance/quality control procedures to ensure data quality are needed. Where data are available for only a subset of production sites/release points/exposure sources, procedures are needed to determine whether and if so how extrapolations from available data can be used to characterize exposures arising from the missing sources. Adequate expert review: Policies need to provide for thorough review of exposure information. This starts with ensuring exposure-related expertise among reviewers is sufficiently diverse to address each of the various relevant exposure settings (workplace, consumer, environmental), and data generated through direct measurement as well as modeling. The review process should yield an explicit assessment of the scope, completeness and quality of the exposure information, in which any conclusions are qualified to accurately reflect the actual extent and nature of exposure information provided and hence the degree of associated uncertainty. Specific factors to be assessed should include: • Scope and Completeness: geographic, temporal extent of applicability and associated limitations; to what fraction of total production and use, to what uses, and to which specific facilities, processes, activities and products the provided information applies; which activities associated with the chemical's full lifecycle (production, processing, storage, transport, use and disposal) are covered; whether information on releases and exposures relate to workers, consumers, public or the environment; whether information is based on measurements, modeling, judgment, extrapolation. • Quality: extent of documentation provided/cited; reference to/description of procedures used; representativeness of sampling underlying any measured data; validation of any model used; peer review and extent of access to underlying data; assignment of measures of reliability; reproducibility. Accounting for the variable nature of exposure: Policies need to acknowledge and account for the inherent variability in exposure over time as well as space. For example: • For new chemicals, the nature or extent of production, use and exposure needs to be tracked and revisited/reassessed over time, not only as a chemical enters commerce but as its production level and range of uses change. During the initial review/approval process, conditions should be included that require reporting of any changes in the nature and extent of production and use and other exposure-relevant factors, and such reports should trigger a reassessment of exposure potential. • For existing chemicals, policies should also be responsive to changes in the production level or use profile of a chemical. One recent illustration of this need in the U.S. is the change that has accompanied the phase-out of pentabromodiphenyl ether and its replacement with a different chemical, the production and use of which has increased dramatically as a result. Data verification and model validation: To the extent data from industry are relied on, policies need to incorporate mechanisms to ensure and demonstrate that such data are accurate and representative, and wherever possible, to be able to independently verify such data. To the extent that modeled as opposed to measured data are relied on to provide exposure estimates, policies need to outline procedures to be employed to validate the models, provide public access to the models and their underlying data sets. Just as for measured data, policies also need to ensure that models effectively account for variation in exposure over time. Differential access: The differential access to exposure-related information (as discussed above) is a serious barrier to public confidence in both industry- and government-derived exposure assessment. In addition to adopting and abiding by comprehensive guidelines covering all aspects of exposure assessment, government needs to develop and implement mechanisms to demonstrate that it can independently verify the reliability of industry-generated exposure information; and industry needs to be encouraged or required to implement its own measures to increase confidence in the information it provides, including routine third-party review and a commitment to make information public whether exculpatory or not. In addition, policies need to consider means to break through the supply-chain bottlenecks that effectively prevent development of a full understanding of chemical processing and use. In our view, one of the key innovations offered by the European Union's REACH regulation is its intent to compel information-sharing up and down the chemical supply chain.

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	Finally, in our view, serious reconsideration of the currently overbroad broad allowances for CBI claims related to exposure-relevant information is warranted. Transparency: Policies should ensure that any descriptions of exposure information are clear and transparent in describing the scope and nature of the information and its limitations, including by addressing all of the elements specified above under Scope and Completeness and Quality. Policies should require that conclusions or recommendations be carefully written and explicitly qualified so as to limit their perceived and actual applicability to those settings for which information has been provided and deemed sufficient to warrant the conclusion or recommendation. Furthermore, the degree of uncertainty associated with a conclusion or recommendation should be stated and should reflect the extent of exposure information available. Lastly, policies should ensure that in the absence of good exposure information, exposure should be assumed possible or likely. Additional challenges Cumulative and aggregate exposures: A common limitation of exposure assessments in practice is to examine exposures only to single chemicals at single points in time, or from single sources or products, as if they occur in isolation from other exposures that are in fact relevant to understanding the true nature and magnitude of exposure. While understandable given the complexity involved in going further, this frequent failure to consider or even acknowledge the need to ultimately examine cumulative and aggregate exposures undermines the credibility of an exposure assessment. Policies, therefore, need to ensure that an accurate context is provided within which to judge a particular exposure assessment, one that accounts for factors such as: • production, processing and use of the same chemical by multiple entities; • multiple uses of the chemical leading to actual or potential exposures; • multiple routes of exposure (direct, indirect) to a chemical; • continuous or periodic release of or exposure to a chemical; and • exposure to multiple chemicals producing the same/similar effects and/or acting by the same/similar mechanism(s) Biomonitoring/environmental monitoring/health tracking: The ultimate arbiter of the value of exposure assessment is the extent to which its findings comport with reality. It is relatively rare for extensive data from actual environmental and biomonitoring to be available, and rarer still for health tracking statistics to be available that can be linked to particular exposures. Nonetheless, exposure assessment policies should ensure that such data are examined and incorporated where available, and should encourage the development of and public access to such data. Susceptible subpopulations: In addition to variation over time and space, exposure to a chemical or the effects arising from such exposure may differ among particular subsets of human or ecological populations. This variation may be due any number of factors, such as inherent differences in the subpopulations themselves (e.g., children's respiratory rates are higher than those of adults), differences with respect to proximity to, or reliance on activities associated with, particular sources of exposure (e.g., occupational exposure, dependence on a diet high in fish or groundwater as a drinking water source), or differences in sensitivity to a substance (e.g., sensitization, genetic susceptibilities). (Less understood at present are the analogous differences in ecological subpopulations.) Policies need to account for such variations and ensure protection of the most susceptible and sensitive sectors of potential exposed populations.

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	The Dose –Response Principle is Key to a Science-Based Program The Dose –Response Principle is Key to a Science-Based Program To protect public health and the environment, Cal-EPA needs to assure that the approaches under consideration within California are science-based and follow the dose-response principle. The principle of dose response underlies the scientific practice of pharmacology, and is the foundation of clinical therapeutics. However this principle, which is used to determine appropriate dosages and regimens for administration of therapeutic chemicals (pharmaceuticals), is also integral to the mechanisms through which chemicals of all kinds (pharmaceuticals as well as industrial chemicals) produce the unwanted effects, also known as toxicity. The dose-response principle stipulates that there is a direct relationship between the amount of exposure to a chemical and the level of response, regardless of the response being evaluated. Therefore dose-response is a principle that underpins both the science of pharmacology (therapeutic response) and toxicology (unwanted response). Most importantly, and often overlooked by scientists without pharmacology and/or toxicology backgrounds, is that there is a dose level below which no response occurs. Although there are some who suggest that any degree of exposure to a chemical affords unreasonable risk, this assertion is without scientific basis and in fact is just plain wrong. In fact, such assertions border on irresponsibility. In any science-based program dealing with chemical exposure, consideration of toxicity must be accompanied by an evaluation of the circumstances of exposure (the dose). Illustration of Dose-Response Principle The principles of dose-response are easily illustrated. Let's consider a chemical for which it has been proven that: 1) repeated chronic exposure to high doses of the chemical causes cancer in humans; 2) acute exposure to high doses of the chemical over a short period of time causes neurotoxicity in humans; and 3) exposing women to sufficient doses during pregnancy causes a developmental syndrome characterized by mental retardation and birth defects. Now, let's ask the question: Should this substance be considered "toxic to humans at any exposure level? Also: Would this substance be considered to pose a threat for "causing cancer or developmental toxicity" to humans at any level of exposure, no matter how minute? Should this substance be 'banned"? If we know that this chemical is present commonly in food at a concentration of about 5000 ppm, would exposure to this chemical pose a concern for inducing cancer or neurotoxicity? We may also want to ask about concern for cancer or neurotoxicity when foods containing the chemical are consumed by school aged children day in and day out. Would that pose an "unacceptable hazard or risk"? Would there be a risk of developmental toxicity in fetuses exposed to this chemical in the womb when their mothers ingest 30 grams of a food containing this chemical, one to three times a day, and the chemical is present at concentration of from 3000 to 5000 ppm? If a hazard-based approach, where any exposure would be considered unacceptable, is used to answer these questions, it is likely that one would answer "yes" to all of the questions above. But, using the science-based principles of toxicology and dose-response, the answer will be no. Why? Because knowledge about the toxicity of a substance at high doses, under specific conditions of exposure, is insufficient, by itself, to determine what the potential health risks will be to humans under other conditions of exposure. Dose-response principles dictate that if exposure is maintained below a "threshold" concentration in a tissue that is the target for toxicity, no toxic effects will be manifested. This principle applies to all chemicals, both natural and synthetic. In this case, the "threshold" concentration is that dose that is necessary for toxicity to occur. Illustration Revealed So what is the chemical being referred to above? It is ethanol. Certainly abuse of alcoholic beverages chronically (high, repeated exposures over years) can cause cancer, and clearly drinking alcohol during pregnancy places the developing fetus at risk of fetal alcohol syndrome. Yet, there is no risk of developing cancer or birth defects from eating two slices of bread a day, day in and day out, even though the ethanol content in bread has been shown to range from 400 to 10,000 ppm (Logan and Distefano 1998) . Nor is there a risk of developing ethanol-induced cancer or birth defects from ingesting fruits or fruit juices, even though fruits commonly contain ethanol at concentrations ranging from 60 to 900 ppm while fruit juice (e.g., apple juice) can contain up to 5000 ppm ethanol.
F-TD-253	The Dose-Response Principle –the Scientific Basis for Chemical Management

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	Clearly, it is not the chemical per se that poses the risk, it is the chemical within the context of dose, where the magnitude, frequency and duration of exposure, as well as the lifestage and susceptibility of the exposed individual, determine whether the chemical poses a potential risk to human health. In the case of human drugs used to treat disease, to see efficacy, a critical concentration of the drug at the target site is needed. The same principle applies to toxicity -- effects at high doses will not be realized at lower doses if the concentration falls below the target site threshold level. If the dose-response paradigm is rejected, then for therapeutic agents “cures" would be predicted to be triggered by any dose of a therapeutic agent. However, evidence-based medical practice rejects such homoeopathic beliefs. Similarly, by analogy, hazard-only based chemical regulatory approaches should be considered as belonging in the realm of “homeopathy” rather than evidence-based toxicology and epidemiology. It is only the consideration of toxicity in combination with dose-response and the level of exposure that provides the scientific basis for risk-based chemical management approaches. Laura M. Plunkettt, Ph.D., DABT Integrative Biostrategies LLC
F-TD-254	Very informative. Surely dose/response considerations should be key to any government actions. If such risk factors are not evaluated, then it is easy for the total effect of government action to result in a less healthy instead of a more healthy California and world. When unnecessary costs and limitations are imposed, rewources are squandered. These resources are then unavailable for something that would make a big health difference. The ethanol example would work with salt and many other substances.
F-TD-255	Director Environmental Sustainability Programs Ecolab Inc. supports science and risk-based chemical management policies that balance the 'triple bottom line' of sustainability: protection of the environment, assurance of product safety and promotion of innovation in the marketplace. Ecolab encourages the members of the California ‘green’ committees in the following specifics: • Understand both the burdens and benefits of new regulatory proposals. • Find a way to successfully manage both toxicity and exposure (i.e., risk) while providing the solutions California needs. • Utilize risk assessment methods that integrate knowledge regarding potential hazards of chemicals with an understanding of their uses and exposures. • Look for product stewardship and risk management programs that establish mechanisms to assure exposures remain in the safe region for typical uses and foreseeable misuses; and • Enact laws and regulations that: • are science-based, • balance potential risks with benefits, • factor in existing scientific knowledge as well as reasonable uncertainties, and • consider the degree of risk to people and the environment." We encourage California to study the availability of data now, particularly the availability of both hazard and exposure data, so that risk determinations can drive decision making. Please coordinate information needs with other governments and other sources of information. Do not reinvent the wheel. Ecolab is in the process of evaluating products/services to evaluate the 'greenness' and 'sustainability' of our products. One of the companies we have evaluated is Chemical Compliance Systems, Inc. (CCS) which specializes in ecological, health and safety compliance, chemical security, and hazardous material management services. CCS has a database containing 220,000 chemicals and more than 75,000,000 data elements comprising 43 key environmental metrics. I first became aware of CCS on June 28, 2007 when I heard Dr. George R. Thompson, President & CEO, giving a presentation called “Web-based Databases That Facilitate Chemical, Product and Process “Green” Assessments and Automated “Green” Cleaning Product

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	Development or Acquisition Assessments" at the 2007 Green Chemistry & Engineering Conference, Washington DC (www.GCandE.org) For products we submitted to them, they organized the results in three categories Ecology, Human Health and Safety in their default product 'report card' which weighs constituent chemicals and and their percentages in the formulation. They evaluated and produced 'report cards' on both concentrates and ready-to-use solutions on a number of our products, showing the sensitivity of their approach. The following procedure was used to produce each report card. For each metric, the chemical that is least sustainable/green is given a score zero and the most sustainabile/green is assigned 100. The scores in between are normalized so that each chemical (all 220,000) has a quantitative normalized score. They also have a Cross-Reference Dictionary & Regulatory Lists. The Chemical Cross Reference Dictionary contains 550,000 records of purified CAS numbers and their associated synonyms. This file facilitates accurate and complete materials management data searches and product substitution research. The Regulatory List of Lists file is comprised of over 650 international, federal, state and local regulated chemical lists and their associated data, as well as numerous CCS compiled lists (e.g., incompatible chemicals, hazard classes, etc.). CCS' modules compare a single chemical inventory file against these lists and generate a multitude of regulatory reports utilized by logistics, environmental/safety/ health, and chemical security professionals, as well as first responders. I strongly recommend California evaluate CCS's capabilities for application as part of California's Green Chemistry Initiative. I believe California's efforts will benefit from use of CCS's capabilities.
F-TD-256	Risk-Based Evaluation – the One Approach that Makes Sense Chemistry has enabled the development of countless products that consumers use each and every day, and consumers want to understand what impact these products may have on the environment and on their health. Industry shares this desire, and continues to strive to develop, produce and market products that are both beneficial and safe for people and the environment. Given the complex and multifaceted technical, societal and policy elements that are inherent in the design, manufacture, use and disposal of these products, one must consider a number of factors to effectively assure their safety. Approaches to safety that are performance based and flexible will provide the greatest benefits and allow the development of innovative approaches within the context of California's Green Chemistry Initiative. Industry works to minimize exposure of workers and the public to all chemicals that could be considered hazardous as used, and we pay particular attention to chemicals considered to be hazardous to humans or the environment. At the same time, industry uses chemicals that are least hazardous, and thus require the least expense in worker and public safeguards, consistent with the production of effective and economically accessible products. The two halves of risk--hazard and exposure--are always part of our planning and never far from our minds. Approaches that utilize risk-based evaluations of chemicals to determine efficacy and safety should serve as the foundation for decision making within programs that flow from the California Green Chemistry Initiative. While the toxicity of a substance is an important consideration in a risk based evaluation, the potential for toxicity must be considered in the context of exposure--including exposure level, route, duration and timing. Every substance can produce toxicity under certain exposure conditions. Even common-place substances usually thought of as benign, such as water and table salt, can cause death when ingested at too high a dose over short periods of time. Conversely, even the most toxic substances pose virtually no risk when releases are controlled and exposures are minimized to levels below which, given an adequate margin of safety afforded by risk assessment techniques, the doses will not elicit adverse effects. For example, arsine gas is used to make microcontroller and microprocessor chips, and although arsine gas is highly toxic when inhaled, its "presence" in semiconductor chips in products used in every day life--computers, calculators, appliance microprocessors--poses no health hazards or risks from in-home normal and customary uses. So the question is not just, "How do we control toxic substances?", but also how do we successfully manage both toxicity and exposure--risk--while providing the solutions society needs? The answers to these questions are best provided through:

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	1) Risk assessment methods that integrate knowledge regarding potential hazards of chemicals with an understanding of their uses and exposures; 2) Product stewardship and risk management programs that establish mechanisms to assure exposures remain in the safe region for typical uses and foreseeable misuses; and 3) Laws and regulations that: • are science-based, • balance potential risks with benefits, • factor in existing scientific knowledge as well as reasonable uncertainties, and • consider the degree of risk to people and the environment.
F-TD-257	Quantitative Assessments of “Green” Munitions and Chemicals of Concern For many years, the Department of Defense (DOD has made a concerted effort to reduce the potential impact of munition constituent and other chemicals on human health and the environment. In 2000, the U.S. Army Defense Ammunition Center (DAC) began working with Chemical Compliance Systems, Inc. (CCS) to use CSS’s extensive centralized Relational Chemical and Product Databases as the basis for a series of integrated, web-based modules within what has become the Munitions Analytical Compliance Suite (MACS). (CCS’s centralized databases included over 650 regulatory lists.) MACS includes eight modules. In a few months, the 9th and 10th automated modules the Emissions Risk Assessment and Human Health Risk Assessment–will be added. The most comprehensive of the MACS modules is the “Green” Munitions Analytical Compliance System (G-MACS). CCS developed G-MACS for DAC and PEO Ammunition Office in 2003. DAC and CCS co-own G-MACS, which has been available to 13 military munitions demilitarization facilities and two munitions management offices from coast to coast since its development. Military munitions design engineers can use the G-MACS’s 43 quantitative ecological, health and safety criteria (Endpoint Criteria) to eliminate or reduce the use of hazardous munitions constituents to create a theoretical munition composition that substitutes alternative components, parts or chemicals, and calculates the “green” grade for the total, component, or part composition in 5 to 20 seconds. G-MACS can also quickly identify which munition constituents have an impact on any of 112 state, federal or international regulations. This electronic design capability greatly reduces the labor and time required to design a “greener” munition. G-MACS also has application to other munitions activities (e.g., acquisition handling, demilitarization). Using a munition’s National Stock Number (NSN), G-MACS can calculate a munition’s overall “green” grade, its ecological, health and safety scores, and the 43 Endpoint Criteria scores within five to 10 seconds. Because all scores are normalized on a scale from 0 (worst) to 100 (best), comparisons of the “greenness” of two (or more) munitions is easy and quantitative. The evaluator can view individual scores, from worst to best, as a means to determine those constituents that need to be replaced to improve the “green” grade. When G-MACS is combined with CCS’s proprietary “Green” Process Analytical Compliance System (G-PACS) the four stages of a product life cycle (i.e., design; manufacture; stockpile management [e.g., handling, transportation, storage]; and disposal) can be evaluated. G-PACS uses the same 43 Endpoint Criteria as G-MACS, but analyzes the chemicals used in each step of the manufacturing process, or wastestream, rather than the constituents used in a munition. The MACS Chemicals of Concern (MACS-COC) module combines the objective and quantitative 43 Endpoint Criteria with quantitative Regulatory Impact and Inventory On-Hand Criteria to calculate a ranked Level of Concern listing for any facility’s inventory. This prioritized list can be beneficial in decision making, particularly in regard to inventory management, pollution prevention, and cleanup. I strongly recommend California evaluate CCS’s capabilities for application as part of California’s Green Chemistry Initiative. I believe California’s efforts will benefit from use of CCS’s capabilities. CCS’s web-based capabilities, their innovative approach, and their willingness to develop new or modified, integrated capabilities has proven beneficial to the Army’s efforts to both be good stewards of the environment and to implement its sustainability

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	program. Although I have not used them, I am aware of CCS's non-munitions capabilities, and believe that they would prove to provide tools of value to the civilian community and decision makers.
F-TD-258	Addressing the Data Gaps Is more data always better when it comes to understanding chemical safety? In many cases, the answer is yes, but when making this determination, it is important to understand the difference between a "data gap" and a "data need." WHAT DATA IS NEEDED? The U.S. EPA has clearly distinguished "data gaps" from "data needs" in the past. Data gaps are areas that could benefit from additional data, additional analyses, or clearer presentation, while "data needs" are data gaps requiring additional work before the potential risks can be adequately characterized – an important distinction to keep in mind. As was discussed at OEHHA's October 1 – 2 workshop on "Practical Decision-Making Tools," there are many models, tools, and guidance on structure-activity relationships to provide California with a tremendous amount of knowledge about chemicals without performing direct testing. The Canadian chemical prioritization under its Environmental Protection Act (CEPA) discussed at length in the workshop made extensive use of such modeling. The oft-touted EU REACH system initially proposed broad new testing mandates, but in its final version, the regulation backed away from that in deference to concerns over animal welfare. Sound scientific decision-making does not require the blunt approach of mindless box checking that only serves to require unnecessary data and animal testing, and burdens already strained public and private resources. Simply requiring unnecessary testing would only serve to put California seriously out-of-step with scientific consensus in the U.S., Europe, and the 30+ member countries of the Organization for Economic Co-operation and Development (OECD). WHAT CAN CALIFORNIA DO? 1. California should begin its assessment of information needs by first leveraging the information that already exists on chemicals. This includes accessing the information publicly available on High Production Volume (HPV) chemicals. Through the groundbreaking HPV Chemical Challenge Program, the OECD ICCA HPV program, and industry-led extensions of that work in the US, the chemical industry has already made and continues to make more information publicly available on more chemicals than any other voluntary or regulatory program globally. HPV chemicals in this program represent more than 95 percent of the U.S. market for commercial chemicals by volume. The information provided covers 17 endpoints internationally agreed by the OECD member countries as sufficient to initially assess chemical hazards including physical/chemical properties, environmental fate, ecotoxicity, and hazards to human health. Although this database is still being populated, there is a wealth of data and a solid platform from which the state of California can prioritize chemicals of interest, and evaluate further information needs. 2. Additionally, the HPV hazard data will be soon be supplemented with the information required by EPA's Inventory Update Rule. Specifically, in 2006 chemical manufacturers and importers of chemicals with site-specific annual production of 25,000 pounds or more were required to submit the following information for chemicals manufactured or imported in calendar year 2005: • Basic company and facility site information • Chemical identify information • Specific chemical production volume • Chemical site limited status • Number of workers reasonably likely to be exposed to the chemical substance at the site of manufacture or import (in prescribed ranges); • Physical form(s) of the chemical substance as it leaves the submitter's possession, along with the associated percent production volume; and • Maximum concentration of the chemical substance as it leaves the submitter's possession (in prescribed ranges).

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	In addition, manufacturers and importers of chemicals with site-specific annual productions of 300,000 pounds or more were also required to provide the following production and use information: • Application - North American Industrial Classification System ("NAICS") codes that best describe the industrial activities conducted by the sites that use or process the substance; • Industrial functions of the chemical substances; • Approximate number of processing and use sites; • Estimated number of workers reasonably likely to be exposed to each chemical substance at all sites at which the chemical is used or processed; • Commercial and consumer uses of reportable chemical substances o An indication of whether the commercial/consumer products are intended for use by children; o Maximum concentration of the reportable chemical substance in each commercial and consumer product category; and • Estimated percentages of the submitter's production volume in each industrial function category and commercial and consumer product category. A compilation of the IUR information will be made publicly available by EPA sometime by the end of this year, and will provide the core of basic chemical "mapping" data discussed in recent Green Chemistry dialogues. 3. California should also work now to understand how it can leverage the regional chemical cooperation program recently announced by Canada, Mexico and the United States under the Security and Prosperity Partnership (SPP). The SPP program will leverage the information Canada has produced under its Chemical Management Program, and the related CEPA priority-setting. In addition, the U.S. has committed that by 2012 it will assess and initiate any action necessary on more than 9,000 existing chemicals produced in the U.S. This will include both HPV chemicals and Moderate Production Volume (MPV) chemicals. WHERE CAN CALIFORNIA GET THIS DATA? Identified below are websites where California can obtain a significant amount of information on chemicals that already exists. The HPV Challenge data is available at: • http://www.epa.gov/hpv/pubs/hpvrstp.htm A more user-friendly version of the above referenced database is being built, and should be complete later in 2007. An initial version of that database is available now at: • http://www.epa.gov/hpvis/metadata.html. Recently, the chemical industry announced that it is extending its work on HPV chemicals - calling it the Extended HPV Program or EHPV. The EHPV Program broadens the original initiative by calling on companies to provide health and environmental information on 573 chemicals that have become HPV since the initiation of the Challenge Program, and increases the scope of information requested for all sponsored HPV chemicals by asking companies to provide use and exposure information. Information from this program will be submitted to the EPA over the next four years. Additional information is being generated under the Voluntary Children's Chemical Evaluation Program (VCCEP), in which USEPA evaluates both hazard and exposure information submitted by companies which have volunteered to determine potential effects on children's health. This information is publicly available at: • http://www.epa.gov/chemrtk/vccep/index.htm Beyond the databases for these voluntary programs, there are numerous other publicly available government databases. The Toxic Substances Control Act Test Submission database, TSCATS, is a central system for the collection, maintenance, and dissemination of information on unpublished technical reports submitted by industry to EPA under TSCA. Studies on over 8,000 chemicals are categorized into three broad subject areas (health effects, environmental effects, and environmental fate). Searches can be conducted using these subject areas as well as indexing terms.

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	• http://www.syrres.com/eSc/tscats_info.htm EPA and its Office of Research and Development maintain an electronic database called the Integrated Risk Information System (IRIS) and it contains descriptive and quantitative information on human health effects that may result from exposure to various chemicals in the environment. IRIS was initially developed for EPA staff in response to a growing demand for consistent information on chemical substances for use in risk assessments, decision-making and regulatory activities. Information in IRIS is intended for those without extensive training in toxicology, but with some knowledge of health sciences. The heart of the IRIS system is its collection of computer files covering individual chemicals. • http://www.epa.gov/iris/ The European Chemical Substance Information System (ESIS) is an electronic system that provides information on both new and existing substances in the EU. It includes proposed classification and labeling for 3,300 chemicals, information and data for roughly 2,500 EU HPV chemicals and final risk assessment reports for chemicals with completed assessments. • http://ecb.jrc.it/ESIS/ The EU's REACH legislation will eventually make available hazard data on all chemicals in the European market, as well as use-specific chemical risk assessments for chemicals on the European market above a specific threshold. Data will be publicly available, fully searchable, and formatted in software known as IUCLID. The International Council of Chemical Associations has committed to submit data and assessments for 1,000 global HPV chemicals to the 30 developed nations of the OECD for government assessment. To date, 667 chemicals have been assessed under the OECD program and work is continuing. OECD assessments are published as soon as they are completed on the OECD website. The data included in those assessments are also available, via the United Nations Environment Program (UNEP). • http://cs3-hq.oecd.org/scripts/hpv/ • http://www.chem.unep.ch/irptc/sids/OECDSIDS/sidspub.html The EXICHEM database is a pointer system on current, planned and completed activities on existing chemicals in OECD member countries and other relevant bodies. It was created to provide information for the OECD member countries on "who is doing what with which chemicals", (e.g. information gathering, testing, evaluation), in order to assist countries that are identifying opportunities for co-operation. • http://webdomino1.oecd.org/ehs/exichem.nsf The International Program on Chemical Safety (IPCS - a joint program of UNEP, ILO and WHO) developed INCHEM - a freely available collection of internationally peer-reviewed documents about chemicals and chemical safety. It was initiated in 2003 in response to priorities established by the Intergovernmental Forum on Chemical Safety (IFCS) and provides convenient worldwide full-text electronic access to chemical safety-related documents provided by intergovernmental organizations. All documents referenced by INCHEM contain hazard information and the site can be queried by key-words and free text. INCHEM contains Environmental Health Criteria documents, and cancer assessments by the International Agency for Research on Cancer. • http://www.inchem.org/
F-TD-259	Innovation and Regulation Some of the suggestions posted in the Conversation with California appear to recommend that the State adopt a regulatory framework that would somehow coerce or command companies to innovate and develop "green" products or processes. The underlying assumptions seem to be that (1) the current system somehow stymies innovation and (2) forced regulation is the only way to bring about innovation. Unfortunately, neither of these assumptions are supported by the facts.

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	Let's look at the current U.S. chemical regulatory system and opportunities to bring new, better chemicals to market (a surrogate for measuring innovation). A comparison of the US system against the pre-REACH European system found that opportunities for the innovation were stifled for the European companies, not the US companies. European firms showed a lower economic performance, lower R&D productivity, lower patent productivity, lower number of polymer patents, and lower numbers of new chemical notifications (Fleisher, Manfred, Sabine Kelm, Deborah Palm. Regulation and Innovation in the Chemical Industry. Social Science Research Center Berlin. October 2000). Our current system allows companies to use the sophisticated techniques developed by EPA to assess potential risks for chemicals and incorporate the findings into future business decisions. Thus, far from being a barrier to innovation, the U.S. regulatory system confers some important benefits in the breadth and speed of technological progress. What about the second assumption that we need to regulate to force innovation? If "green" chemistry is to work, there must be inter-disciplinary collaboration among a variety of experts in chemistry, toxicology and environmental science that work in business, government and academia. No government can dictate precisely how this process for innovation and collaboration should occur. It will be unique for each circumstance. A one-size-fits-all regulatory framework will not only fail to bring about new innovation; it could, in fact, stifle ongoing innovative processes. In addition, stricter management controls (including bans) of existing chemicals provide no guarantee of "greener" outcomes, although this has been implied by others. Green chemistry explicitly identifies materials or processes that reduce health and environmental impact while maintaining or improving cost-effective performance. A regulatory action taken against an existing chemical may or may not be supported by a careful analysis of the health and environmental impact of substitute products or processes; and those substitutes may or may not provide cost-effective performance to meet the specific societal need. Unless such an analysis occurs, it is not clear that regulatory action improves health and environmental protection. The reality is many chemical companies are already addressing green chemistry objectives through their ongoing product stewardship work. Product stewardship is the practice of making health, safety and environmental protection an integral part of the full life cycle of chemical products. It includes evaluations of chemical products and their uses to help assure that those products deliver their intended benefits to society while protecting public health and the environment. As part of Responsible Care®, members of the American Chemistry Council employ a rigorous management system that is certified by third-party auditors. In addition to numerous other elements, those auditors verify that our companies have systems to manage risk associated with chemical products and that those systems include management of product development, transport, use and disposal in a safe and secure manner. Companies are also audited on their programs to protect the environment and conserve programs, as well as processes to dialogue with stakeholders about the organization's impact on human health and the environment. ACC member companies have a track record of bringing new, innovative products to market that address new societal needs, including health and environmental protection. In addition, shifting market expectations and liability regimes are already at work in instituting the increased attention to health and environmental effects. The market is already leading the way -- the risk of a government "meat-ax" could stifle that innovation in its tracks. ACC agrees that government can and should encourage the collaborations that can produce "green" chemistry, through mechanisms such as the sharing of expertise, financial support for research, information exchange and public education. In fact, a variety of federal agencies (including EPA and DOE), the private sector, professional associations such as the American Chemical Society, Non-Governmental Organization (NGO) groups and universities are currently working together to encourage green chemistry strategies. The government can and has provided support for green chemistry outside the framework of TSCA. Those efforts can, of course, be enhanced further to improve U.S. leadership in the field. If the state of California truly wants to lead in green chemistry, it needs to be focused on encouraging innovations through incentives. The economic drag of yet more rules, regulations and restrictions will not foster the creation of new products or, more importantly, their development and diffusion across the economy.

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F-TD-260	Quantitative Web-based "Green" Munitions Analyses . The United States Army Defense Ammunition Center (DAC) has partnered with Chemical Compliance Systems, Inc. (CCS) to develop munition analytical compliance capabilities for the past eight years. Along with other DOD organizations, in 2003, DAC contracted CCS to develop a tool that would assist the Army in efforts to assess munitions from a “green” perspective. What came out of this was a Web-based tool known as the “Green” Munitions Analytical Compliance System, or G-MACS. Since no green criteria had previously been established for munitions, or any other product, the development of G-MACS by CCS with 43 ecological health and safety “green” criteria made a giant step forward in helping our design and manufacturing installations with an automated capability to assess the “greenness” of munition constituents early in the life cycle. The “green” scoring criteria in G-MACS was programmed to be flexible and dynamic enough to be modified as needed to support any environmental factors and/or guidelines on “greenness” that might be developed. G-MACS is unique in that it can, in combination with the CCS “Green” Process Analytical Compliance System (G-PACS), be used to “score” a munition for “greenness” throughout the life cycle (cradle to cradle). G-MACS, along with other CCS systems such as their "Green" Product Compliance Analytical System (GP-CAS), and "Green" Process Analytical Compliance System (G-PACS), could be utilized to provide a complete life cycle “green” product measuring tool that not only covers munition constituents but also, paints, pharmaceuticals, cleaning products, pure chemicals, etc. After a number of years of working with CCS and knowing the tools that they developed such as MACS and G-MACS, DAC is confident that the State of California could benefit by utilizing CCS and their GP-CAS, G-PACS and G-MACS Web-based tools.
F-TD-261	Green Chemistry & Product Stewardship The California Green Chemistry Initiative is defined by DTSC as an effort to stimulate a “transformation in the design of products and processes.” Interestingly, DTSC’s leading recommendation for bloggers (“…Consider public health and the environmental effects of chemicals during the process of designing products and industrial processes…”) could have been lifted directly from the American Chemistry Council’s Responsible Care® product stewardship program – a program which has been in place since 1991, more than 15 years before California’s initiative. All members of the American Chemistry Council, which represents the leading companies engaged in the business of chemistry, participate in Responsible Care® as a requirement of membership in ACC. “Green chemistry” is product stewardship done right. It is the practice of making health, safety and environmental protection an integral part of the full life cycle of chemical products, including design and manufacture. Under Responsible Care®, this includes evaluations of chemical products and their uses to help assure that those products deliver their intended benefits to society while protecting public health and the environment. Responsible Care® requires our members to employ rigorous management systems that are certified by third-party auditors. In addition to numerous other elements, those auditors certify that our companies have systems to manage risk associated with chemical products and that those systems include management of product development, transport, use and disposal in a safe and secure manner. Companies are also audited on their programs to protect the environment and conserve programs, as well as processes to dialogue with stakeholders about the organization’s impact on human health and the environment. Companies’ performance under Responsible Care® is publicly shared with the public through a first-of-its-kind website: americanchemistry/responsiblecare.com. Reducing hazardous materials in products and processes is also simply good business sense. Hazardous materials cost companies money in additional storage, transportation and disposal fees, as well as additional cost for protecting their work force through engineering controls and personal protective equipment. DTSC and the public can obtain more information on what the chemical industry has been doing in the Responsible Care® program from http://www.responsiblecaretoolkit.com.

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	It's critical that DTSC's recommendations to CalEPA in the Green Chemistry Initiative recognize the value and role of industry stewardship programs, and create incentives for others to take similar steps. This is particularly true through the entire value chain, up to and including end users of chemicals and the products made from chemistry.
F-TD-262	Info on federal legislation on Green Chemistry from Chemistry and Engineering News, 9/17 HOUSE SUPPORTS GREEN CHEMISTRY POLICY: Bill aims to eliminate hazardous effects ofchemical manufacturing THE HOUSEapproved legislation by voice vote on Sept. 4 that would establisb a federal interagency program and boost government funding for research into environmentally friendly alternatives to many traditional chemical products and manufacturing processes. "Preventing pollution and hazardous waste from the start ofa design process is far preferable to cleaning up that pollution and waste at a later date," says Rep. Phil Gingrey (R-Ga.), chiefsponsor ofthe Green Chemistry Research&Development Act of2007 (H.R. 2850). Thelegislation establishes a program that promotes and coordinates green chemistry R&D acti\'ities v.ithin four federal science agencies. It authorizes a total of $165 million in funding for R&D grants over the next three fiscal years, split among NSF, EPA, the ='lational Institute ofStandards Be Technology, and the Department ofEnergy. The interagency program would support grantS to VIRUS MAY BE CAUSE OF HONEYBEE LOSS ENTOMOLOGY: Chemical stressors mavweaken bees' immunity, J researchers suggest J BEEKEEPERShave buzzed \"ith speculation about why c.s. honeybee colonies declined by an average of30% last year. Kow, researchers in academia, government, and industry report that a virus may be responsible for what has become known

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	as colony collapse disorder (CCD). The researchers underscore that they do not know the extent to which other suessors, including pesticide exposure, may be involved (Science, DOI: 10.1126/science.u46498). What's clear to scientists is that more research is needed to make a definitive link. "The work is a major breakthrough, but it's not a slam dunk," says ~Iay R. Berenbaum, a professor ofentomology at the UniversityofIllinois, Urbana-Champaign. "But it certainly illustrates how complex this whole situation is." For the study, epidemiologist W. Ian Lipkin at Columbia University and colleagues collected bees from healthy and CCO-stricken hives in the U.S., as well as healthy bees from Australia. The research team evaluated the samples collected over three years \\'ith a rapid genome-sequencing technique called pyrosequencing. individual researchers, university/industry partnerships, R&D and technology transfer at federallaboratories, and the education and training ofstudents in green chemistry and chemical engineering. The House passed similar legislation in 2004and again ,in 2006, butboth measures died when the Senate failed to act. "1 hope the third time ""in truly be the chann for thiS bill because the SOOnerweenact greenchemistry legislation, the sooner companies across America can utilize this. innovative development," Gingreysays. The initiative has received endorsement from the chemical, phannaceutical, and biotechnology industries, as well as the American Chemical Society. "Green chemist!)' is the ultimate proof that environmental and economic benefits in chemistry can be optimized simultaneously," ACS President Catherine T. Hunt says. "The technologies that spinout ofthis novel research are the seeds that can sustain small-business ventures and green corporate practices. "From reducing and impro\'ing pharmaceutical processes to reinventing the home and construction business to overcoming our climate and energy challenges,

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	green chemistry is proving that economics and environment are not mutually-exclusive," Hunt adds. There is no companion Senate legislation yet, but an aide to Rep. Gingrey says Sen. Olympia J. Snowe (RMaine) has expressed an interest in sponsoring a green chemistrymeasure.-GLENN HESS The results revealed genetic sequences that suggest the presence ofa virus; upon further examination, the researchers found that the sequences are most closely related to those ofIsraeli acute paralysis virus (IAPV), first desclibed in Israel in 2004- Bees in Israel infected with this virus had a shivering ",:ing condition and died near the hive. In the U.S.,nowever, bees have simply disappeared and are presumed dead. "At this point, we do not have a cause-and-effect relationship v:ith L<\PVand CCO," says coauthor Jeffery S. Pettis, research leader ofthe C.5. Department ofAgriculture'S Bee Research Laboratory. Parasites such as the varroa mite are knO\~iIl to suppress bees' immune systems. The authors suggest that a variation in the virus strain, coinfection with another virus, poor nutrition, or interaction "'ith pesticides may also explain the symptomatic differences. Chemical pesticides could act as a potential trigger for the \iral infection, and preliminary data from other studies show that some classes ofpesticides may lead to the amplification of specific viruses, says lead author Diana L. Cox-Foster, an entomologist at Pennsylvania State University. -RACHEL PETKEWICH -

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	Gingrey Hunt Parasitic van-oa mites (one visible on top ofbee) can make honeybees more susceph"ble to infectious agents, including vinlses. WWW.CEN- IINE.ORG 9 SEPTEMBER 10.2007
F-TD-263	ACC's Perspectives on California's Green Chemistry Initiative The business of American chemistry is built on fundamental science. As a result, the members of the American Chemistry Council (ACC) support science and risk based chemical management policies that simultaneously protect health and the environment, assure product safety and promote innovation in the marketplace. Our industry has always relied upon innovation in its development of products and processes to meet customer needs and expectations, address new regulatory requirements, and to fulfill voluntary commitments to programs that go beyond the law. It's important to note that "Green Chemistry" is a way of doing business was never intended to be applied as a government mandate through regulation or legislation. Indeed, the American Chemical Society's Green Chemistry Institute states: "Green Chemistry differs from previous approaches to many environmental issues. Rather than using regulatory restrictions, it unleashes the creativity and innovation of our scientists and engineers in designing and discovering the next generation of chemicals and materials so that they provide increased performance and increased value while meeting all goals to protect and enhance human health and the environment." So how should California approach green chemistry? We think there are a number of threshold issues DTSC must be prepared to address in making recommendations on the basis of this initiative: 1. Make a baseline assessment of chemical information that is already available to the State. In ACC's view, there is a lot of information already publicly available on chemicals in commerce, and a lot more coming on line, from other States, the federal government, foreign governments, intergovernmental organizations, and even non-governmental organizations (including industry). DTSC should be studying the availability of data now, particularly the availability of both hazard and exposure data, so that risk determinations can drive decision making. It simply makes sense for California to coordinate on information needs with other governments and other sources of information – why reinvent the wheel? More importantly, DTSC doesn't have to wait until the end of its Green Chemistry Initiative to get the ball rolling on this important element. 2. Reiterate the commitment that the Green Chemistry Initiative will be governed by science. Many entries in the "Conversation with California" appear to be based on an underlying assumption that the current design of products and manufacturing processes is not adequately protective of health and the environment, and recommend that DTSC suggest hazard-based approaches to decision making. That's not good policy. As DTSC acknowledged in the launch of the Initiative, science should govern the process. Americans (and Californians) are living longer, healthier, and safer lives than ever before, and significant improvements have been made in public health and the environment. An extensive legal and regulatory framework, coupled with myriad voluntary programs, initiatives and innovations, has led to those advances in health and the environment. We hope that the Green Chemistry Initiative will examine the basis for the assumptions about the adequacy of current protective measures as policy options are identified. 3. Commit to understand both the burdens and benefits of new regulatory proposals. One University of California report on chemical regulation in California noted that businesses in California labor under a "labyrinth" of rules enforced by a number of agencies. Interestingly, many of the entries in the

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	"Conversation with California" argue that even more regulation is necessary! Some have referred to Europe's new REACH regulation as the solution – taking the interesting position that a regulatory program that is not yet even operating is now a benchmark for chemical regulation. 4. Acknowledge that engineering is a part of "green chemistry." ACC member companies are leaders in green chemistry and green engineering in their operations and have been honored for their efforts. Modifications in process technology have significant potential to minimize possible adverse health or environmental effects of chemical substances. Many of the entries in the "Conversation with California" appear to focus largely on promoting product substitution – the simplistic substitution of one hazardous chemical for a less hazardous alternative – without regard to the consequences of such an approach, and without recognizing the important role that process improvements can have. It's time DTSC made clear in this dialogue that engineering is every bit as important as product improvements. ACC and its member companies believe that the Conversation with California should address a number of the complex, specific issues that are implicated by the Initiative. In the weeks ahead, we intend to address issues like the role of product stewardship, the role of regulation in promoting innovation, how California might stimulate "green chemistry" and "green engineering", and the four broad categories on which DTSC has invited specific comment. Mike Walls Managing Director, Regulatory and Technical Affairs American Chemistry Council
F-TD-264	Quantitative Green Ranking for All Chemicals A database has been created with over 220,000 chemicals (all listed to date) and all cross reference names with filters for all state and federal regulatory lists. Each chemical has assigned the 33 federal EPA Environmentally Preferred Characteristics (EPP) and additional credible Characteristics given by regulatory agences CAL EPA, other key USA states and key countries totaling 41 key environmental performance characteristics (e.g. LD 50, excess lifetime cancer risk, flammability, health hazardard indicies etc). These characteristics may be organized into three categories Ecology, Human Health and Safety. This database, updated annually, contains over 75,000,000 elements to rank products as a function of the chemicals and chemical percentages. For each environmental characteristic, the chemical that is least compatable with living systems is given a score zero and the most compatable the score one hundred. The scores in between are normalized so that each chemical (all 220,000) has a quantitative normalized score. The navy tested eight adhesives meeting MIL-SPEC by providing the chemicals that make up the products. The chemicals were tranmitted via the on-station web site database of products Hazardous Material Management System (HMMS) to Chemical Compliance System's (CCS; www.chemply.com) web site. A report of all 41 Environmental Characteristics was automatically generated, and with equal weights as the default mode, a normalized score for Ecology, Human Health and Safety and an overall Environmental Score (Green Rank Score to make the best decision for the environment). This tool may be used for face cream, road paint, military aircraft munitions or paint, any product with a list of chemicals and percentage created a true quantitative score. This tool may be utilized by acedemia, government, industry, householders, military etc to formulate-design and or determine the best products compatable with the ecology, human health and safety. The vision is that the state of California purchases the tool for the USA to be utilized for no cost by all so that the environmental may improve rapidly. This would become the biggest pollution prevention project ever and the most cost effective to reduce pollution through source reduction. The federal EPA may also participate. With this tool in place via a web site sponsered by CAL EPA and or FED EPA, the products most compatible with the ecology, human health and safety may be chosen by the consumer. Also, formulations by acedemia, the govenment, industry etc may be optimized for environmental compatability. The user simply imputs the chemical makeup of a product and the web site generates a complete report of the EPA EPP

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	chacteristics (and others from the key state and countries if desired) and a normalized score for the ecology, human health and safety and a total environmental score (green rank). This would be easy to put the information into a green label. Dr. George Thompson, PHD in Chemical Engineering developed this tool taking over 25 years for the DOD through a company www.chemply.com. The rest of the nation should benefit from this significant work.
F-TD-265	Require Legislation Require Legislation.
F-TD-266	As a resident of Mar Vista, west Los Angeles, my neighborhood is bombarded by people living near Santa Monica Airport who complain of the health hazards of jet fumes emenating from Adjacent Santa Monica Airport. There has beeen a lot of political agitation buyt no onbe seems yto realizer that thisd is a chemical engineering problem. What is needed is a point of sale jet fuel additive (ASTM 1655) that mitigates soot and fumes during jet aircraft ground operations. Odeally, any jet aircraft departing KSMO should be tolpped off with a fuel addditive that inhibits soot and fumes. Any suggerstions?
F-TD-267	Legislative Changes I have conducted research on safer alternatives for the last 30 years. Over the last 17 years, my organization, the Institute for Research and Technical Assistance (IRTA), has identified, tested, developed and demonstrated safer alternatives in a range of different applications and industries. Over that period, IRTA has assisted hundreds of facilities in California in adopting alternatives. IRTA has worked on alternatives in dry cleaning, repair and maintenance cleaning, handwipe cleaning, batch loaded cold cleaning, electronics cleaning, vapor degreasing, printing cleanup, paint stripping, coatings and adhesives. In some cases, whole industries have adopted alternatives developed and tested by IRTA. Over the course of this work, I have learned much about how the system works and have become aware that, in order to ensure that safer alternatives are used, legislative changes are required. First, California needs a California Toxic Substances Control Act (CAL TSCA). CAL TSCA would require all new chemicals sold into California to be tested for toxicity before they are marketed. A set of toxicity tests that would be required would be developed by a consensus group of toxicologists with input from DTSC and the public. The manufacturers or distributors would have to conduct these toxicity tests at their own expense. CAL TSCA would also establish a set of toxicity tests that would be required for existing chemicals, chemicals that are already being used and marketed in California. In a few cases, the toxicity test information would already be available; in other cases, the tests would have to be performed. When the toxicity test data were provided by the manufacturers or suppliers, DTSC, with the help of the Office of Environmental Health Hazard Assessment (OEHHA), would evaluate the results and decide whether the chemical could be marketed (new chemicals) or whether the chemical would have to be removed from the market (existing chemicals). The criteria for deciding on this up or down vote would be predetermined by the group of toxicologists who designed the tests and DTSC with public input. Many chemicals that have toxicity problems have come on the market in the last 10 years. These chemicals are used extensively and exposure of workers and community members is high. An example is n-propyl bromide (NPB). NPB is a reproductive toxin in animals and has also caused nerve damage. It is currently undergoing testing for carcinogenicity. When the chemical was first marketed, EPA did not require toxicity testing for the substance under Federal TSCA. The chemical has been listed on California's Proposition 65 but is not on the state toxics list. Cal/OSHA and Federal OSHA have not established worker exposure levels for the chemical. NPB is used in vapor degreasing. The dry cleaning industry is considering using it as a dry cleaning solvent and there is nothing that would prevent this. Once chemicals like NPB are on the market, there is no mechanism for preventing their use in dispersive applications. Adopting a CAL TSCA would allow the state to deal with chemicals like NPB. Second, OEHHA has the responsibility of determining whether chemicals pose an unacceptable risk and that agency has few resources. OEHHA's budget should be expanded substantially. Dry cleaners in the state have been using a dry cleaning solvent called D5 for several years and D5 has

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	caused cancer in laboratory animals. OEHHA has been evaluating toxicity test results to determine whether D5 is a threat but has not completed their analysis. In the meantime, no regulatory agency can regulate D5 and the dry cleaning industry is using it extensively. Giving OEHHA more resources could speed the evaluation process and give high priority to the new work the agency would be called upon to do under CAL TSCA. Third, the California Air Resources Board (CARB) is limited in their regulatory authority and their authority should be expanded. CARB regulates consumer products but is forbidden from regulating away a whole product type. In other words, if a low-VOC or low toxicity nonaerosol product is available and could substitute for a higher VOC more toxic aerosol product, CARB cannot regulate the VOC content or toxicity of the aerosol product on that basis. CARB can set a lower VOC limit or ban certain toxics in the aerosol product if there are other aerosol products with lower VOC content or no toxics. Aerosol products are inherently not green. They lead to a very large waste stream and they rely on propellants that are often VOCs or greenhouse gases. As an example, consider antiperspirants and deoderants. Roll on products have very low or no VOC content. In contrast, aerosol products have a higher VOC content and contain propellants that may be greenhouse gases or VOCs. Expanding CARB's authority would permit the agency to establish VOC and toxics limits based on the nonaerosol products. This would allow the state to forbid the use of aerosol products in cases where there are greener products. It would also allow CARB to forbid the use of certain toxics as determined under CAL TSCA as a threat. The three legislative suggestions described here would make it far easier to restrict the use of certain materials that cause problems for health and the environment. The strategy would provide an incentive for manufacturers and suppliers to find and market greener products. This would result in better protection of the health of consumers and workers and of the environment in California.
F-TD-268	Pharmaceuticals and Personal Care Products (PPCPs) Add PPCPs to your Green Chemistry Initiative. Legislative and regulatory action with respect to PPCPs can have large significant benficial effects. With new analytical processes, the ubiquitous nature of PPCPs have been confirmed ((USGS study in 1999-2000). PPCPs are harmful to ecological systems at very low concentrations, causing feminization in fish (from estrogen in oral contraceptives) and delayed matamorphosis in amphibians (from anti-depressants). These observed effects are dramatic in themselves and ominous indicators of large uncontrolled threats to ecosystems. Effects on humans and long term effects on both humans and ecosystems have not been fully investigated. Some ideas: Mandatory take-back programs for pharmaceuticals, have been successful in Australia, where every pharmacy is required to take bck unused or outdated phramaceuticals. A voluntary take back program was recently very successful in the Bay Area. The Bay Area Pollution Prevention Group (BAPPG) in partnership with Walgreens collected 3,500 pounds of phraceuticals. PPCPs remain in soil and waste treatment effluent. Because the waste streams are continuous, this results in a pseudo-persistence of these contaminatns. Contaminated sludge is commonly applied to land. Ozonation (in waste treatment plants) is successful in degrading many PPCPs without toxic daughter products. Legislation to make ozonation mandatory would provide significant immediate benefits to ecosystems. Legislation should include a grant program to allow rapid upgrade of facilities and regular inspection/monitoring of both sludge and efflent. Partner with personal care product companies and distributors to identify and reduce harmful ingredients. Consider banning certain chemicals for use in California. Partner with European entities who have been working on this problem. Educate the public about risks in shampoo etc. Create legislation to include PPCPs

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F-TD-269	Lord Professor of Chemistry Regulate toxics out of products—stimulate Green Chemistry to find replacements where necessary. • To regulate, emulate REACH and expand it in a CA leadership way based on understanding that comes from toxicity experts and especially EDC researchers. • In encouraging GC R&D, adhere to the Anastas/Warner principles inside projects and the Collins bookcase to prioritize projects for funding. • Develop and enact legally binding tests for EDCs, ASAP. • Make it easier to make money through GC—a key governmental role.
F-TD-270	Worker health impacts should be part of cost-benefit decisions In addition to environmental and consumer impacts, potential adverse effects on worker health should be assessed and taken into consideration when evaluating product toxicity. This includes workers who manufacture the products as well as those who use it. Prevetning the marketing of products with potential adverse impacts is an essential public health function.
F-TD-271	Avoid one size fits all approaches We all share an interest in promoting a balanced approach to this subject, meaning one that can advance health and safety without stifling economic growth. It is essential that any scheme takes into account both high volume chemicals and the nature of the uses (i.e. uses that create few pathways for exposure vs. ones that more easily enter the environment or come into contact with humans). Some industries, such as the semiconductor industry, rely upon specialty chemicals to enable key processes, but the chemicals are used in relatively small volumes. In addition, given the trend twoards globalization, most technology companies are interested in producing products that can be sold and used anywhere in the world. That factor strongly suggests that California should conform its green chemistry scheme to other parts of the world so that local companies are not forced to understand and comply with California-only regulations.
F-TD-272	Senior Toxicologist, Office of Environmental Health Hazard Assessment Cal/EPA should consider the best practices identified in the April 2007 report entitled "Not that Innocent" A comparative analysis of Canadian, European Union, and United States Policies on Industrial Chemicals" by Richard Denison."
F-TD-273	California should certainly lead in this field. We are a California company that offer economically viable tools to do just this…

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F-TA-1	American Chemical Society Response Cradle to Cradle: Through product design and industrial innovation, produce products that reduce the use of harmful chemicals, thus generating fewer emissions and less waste. How do you think California should move to a Cradle to Cradle framework? California needs to carefully review and identify with stakeholders the current significant barriers that impede investment in, and adoption of, sustainable technologies. Although the long-term economic benefits of sustainable technologies, such as reduced regulatory and waste disposal costs, can be significant, businesses can be placed at a near-term competitive disadvantage because of potentially prohibitive, up-front costs. Regulations need to be revised to allow flexibility for the superior environmental performance obtained when clean technologies are employed. To effectively address this dilemma, ACS believes that governments should provide incentives for the implementation of sustainable technologies, as explained further by our answer to the green chemistry question.
F-TA-2	Use of Existing Web-Based Tools to Certify "Green" Cleaning Products Industrial cleaning product constituent chemicals have a wide spectrum of potential effects on human health and the environment. Manufacturer employee, product user, and cleaned building resident exposures potentially encompass both acute and chronic health risks. Selected products and processes also manifest safety risks (e.g., fire, explosion, incompatibilities). Constituents may additionally pollute air, water and soil. Everyone gains when historic industrial and household cleaners are cost effectively replaced with “green” products and manufacturing processes that have passed quantitative, objective, and comprehensive assessments. Customization of the Chemical Compliance Systems, Inc. (CCS) “Green” Process Compliance Analytical System (G-PACS) and their “Green” Product Compliance Analytical System (GP-CAS) enables the Chlorine Free Products Association (CFPA) to utilize the “Green” Cleaning Product Process Analytical Compliance System (GCP-PACS) in conjunction with the third party accountability services of our Sustainable Manufacturing Initiative (SMI) on-site audits. Those facilities that complete the SMI with GCP-PACS are then offered access to the on-line, automated “Green” Cleaning Product Compliance Analytical System (GCP-CAS) to provide a complete, comprehensive, cleaning product assessment within 5-10 seconds. Both systems utilize over 40 ecological, health and safety criteria for each chemical constituent. The process, or product, is quantitatively rated on a scale of 0 (worst green) to 100 (best green) for easy manufacturing, or acquisition, assessment against pass/fail criteria, or comparison of competitor products. Compromising product hazards and offending constituents are also quantitatively identified. Both GCP-PACS and GCP-CAS include alternative constitutent databases in their process/product Design modes that greatly streamline selection of less hazardous constituents to replace more harmful ingredients. This latter feature greatly facilitates “green” cleaning product and process research and development by rapidly calculating product, or process, “green” ratings as alternative constituents are theoretically inserted for compromising ingredients. Cleaning product or process constitutent impacts on over 100 state, federal, international and other third party regulations are simultaneously assessed. GCP-CAS and GCP-PACS represent the first standardized, Web-based analytical compliance capabilities for quantitatively certifying the “greenness” of industrial cleaning products and processes by an independent third party. CFPA recommends that California consider these CCS capabilities as options for achieving the objectives of the California Green Chemistry Initiative.

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F-TA-3	Practical Issues for Identification and Management of Common Consumer Items by Public Agencies Public agencies purchase a wide range of promotional items in the same commercial marketplace that other consumers use, but as tax-supported entities, they are expected to practice a higher standard of safety for any items they make available to the public. The green chemistry initiative should deal with practical problems such as: 1. Standards: Even pre- and post-production testing for Prop 65 compliance has proven inadequate to assure that items meet these standards, possibly due to variability in product composition, types of tests used or other, unknown factors. There are no clear voluntary or mandatory standards or methods for testing of most materials for most chemicals for most consumer items; the standard Material Safety Data Form provides occupational safety information but no clear information about the chemical content of the finished consumer product; few manufacturers provide independent verification of test results; and there appear to be few penalties and little self-policing of the voluntary standards that are in place. These system failures need to be addressed. 2. Indemnity: Once distributed, items found with contamination above reportable levels may immediately be classified as hazardous waste, thereby preventing the use of timely, efficient, and least costly means to recover and dispose of the contaminated items. If current law is prohibitive or unclear, then time periods should be established in statute/regulation within which agencies may recall/recover items. Alternatively, a "hold harmless" testing system should be established to enable agencies to test and recover items w/o fear of punitive regulatory action. 3. Responsible Purchasing: Purchasing guidelines or specifications, together with information and technical assistance, should be provided for public agencies to use with potential vendors so as to encourage and incent "clean" manufacturing practices. A public registry for companies with "clean" manufacturing, monitoring, disclosure, and business practices should be created; alternatively, a public source of information about recalls, litigation/regulatory action, and other concerns (as might be found in media reports) should be established to encourage informed purchasing. Laboratories capable of doing specialized testing should be certified, and their fees should be publicly available. Registration through C-MASS or other such mechanism should be considered. 4. Science as Driver: There is a growing science base about the public health impact of many chemicals, making the establishment of guidelines or standards a moving target. Proactive, science-driven processes free of commercial concerns and reporting/monitoring systems for both the public and for business purposes are needed as a foundation for reviewing and updating the evidence that is available to inform the development and updating of such public health standards. New legislative authority and funding may be needed. This resources could be obtained through fees rather than general tax funds. 5. Cost: To provide the greatest return for each taxpayer dollar, government purchasers shop for low price, often through volume purchasing and value-driven sourcing. It is critical that standards for "clean" consumer goods take into account economically feasible manufacturing methods and consider both domestic and imported items and components. Again, it may be appropriate to have interested vendors qualify through C-MASS process. 6. Infrastructure: The public health and environmental health infrastructures are not now well prepared, equipped, staffed or funded to support these expanded responsibilities and new functions. There needs to be a phased-in approach based on both health and strategic priorities. 7. Responsible Leadership: There needs to be a way for public agencies to share information, such as for model contract provisions, laws, regulations, ordinances and so forth, so that the best possible decisions are made. Efforts should be coordinated with federal agencies having relevant jurisdiction such as FDA, CDC, EPA, USDA, and the CPSC; the state may want to consider establishing similar relationships with counterpart agencies at the state and local levels.

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F-TA-4	The California Bed Clothing Flammability Standard and Green Chemistry One immediate challenge for the Green Chemistry Initiative is Technical Bulletin 604 (TB 604) to regulate the flammability of filled bed clothing including comforters, mattress pads, and pillows. This regulation, being implemented by the California Bureau of Home Furnishings and Thermal Insulation, is likely to lead to the introduction of large amounts of fire retardant chemicals and materials into California's homes and environment. Health and environmental questions such as those listed below should be answered for all stages of the lifecycle of these products: manufacture, use in consumers' homes, and end of life disposal. Although no specific materials are required to meet TB604, it is expected to be met by fiber mixtures containing inherently fire resistant materials and/or added fire retardant chemicals. Some of the these fibers, (modacryllic, polyvinylidene chloride, and polyvinyl chloride) consist of polymers that are composed of monomers that are known to be mutagens/carcinogens and/or can cause neurological, developmental or reproductive impacts in animals.[1],[2], [3]. In addition TB604 would also impose flammability requirements on foam used in bedding materials, such as mattress pads and pillows. The TB604 foam test is rigorous and, if met by adding FR chemicals to foam, would require significant amounts - much more than currently used to meet the furniture foam requirements included in TB117. A U.S. Environmental Protection Agency study of fire retardants shows areas of significant toxicological and environmental concerns as well as large data gaps for safety information for all of these chemicals. [4] The fire retardant chemicals currently used in foam in California include tris (1, 3-dichloro-2-propyl) phosphate (TDCP), which is a known mutagen and carcinogen. A CPSC analysis predicted up to 300 excess cases of cancer per million when humans are exposed to TDCP from furniture. Another primary fire retardant used in foam is a proprietary mixture called Firemaster 550 containing brominated fire retardants for which little toxicological information is available and a phospahate which is known to be highly ecotoxic. . Before TB604 is implemented, the following questions and considerations should be addressed: 1) What are the environmental impacts of the manufacture, use and disposal of products which are polymerized from toxic monomers or contain toxic or potentially toxic fire retardant chemicals? 2) What are the health impacts of using these fibers and materials in bedding? What is the level of human exposure to the toxic or potentially toxic fire retardant chemicals added to foam and fabrics? Are there residual monomers present in the inherently flame resistant fibers? Exposures for fetuses, young children and pregnant women (the most vulnerable populations to endocrine disruption and potential adverse health outcomes) as well as the number of hours people spend in bed in intimate contact with bed clothing should be considered. 3) Will the inherently flame resistant fibers break down to the toxic monomers in landfills? In that case, will the legislature need to add these bedding products to the list of products banned from the landfill under the Universal Waste Ban, which went into effect in February 2006? If so, will government managed and ratepayer financed local government programs be responsible for their safe disposal or will manufacturers be required to take these products back at the end of their useful life? 4) Do the flame retardant chemicals that would be used to meet the standard persist, accumulate and/or be potentially toxic in hundreds. Other fire retardant chemicals are rapidly accumulating in humans, wildlife, and the environment. U.S. women have some of the highest levels of fire retardants in their breast milk in the world. Many studies completed underway postulate that a relationship exists between previously used fire retardant chemicals such as PBDEs and birth defects, hyperactivity, reduced fertility and sperm counts and other neurological and reproductive conditions. Will similar chemicals be used to meet your standard? 5) Have studies been conducted on the fate and transport of fire retardant chemicals and materials as following their use in furniture and other consumer goods? Fire retardants such as PBDEs and PCBs have been found in remote areas including the Arctic Circle, with the highest levels found in killer whales. The lifecycle of products containing fire retardant chemicals must be considered including occupational exposure during manufacture, chemical exposure during use, and end of life disposal when products are combusted, land-filled, composted, littered, or recycled.

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	6) When polyvinylidene chloride, polyvinyl chloride, or materials treated with brominated or chlorinated fire retardant chemicals burn, highly toxic dioxins and furans are believed to be produced. If there will be incineration of these bedding materials, an analysis of the health and environmental impacts of this disposal method should be done. 7) Will plasticizers be used to make polyvinylidene chloride, polyvinyl chloride, and other polymers in the inherently flame resistant materials soft and flexible? Phthalates are sometimes used for this purpose. They are known endocrine disruptors and just have been banned from use in children's items in California. 8) Estimates from New York State suggest that fire-safe cigarettes could lead to 50 to percent reduction in fire deaths The CPSC estimated that the current mattress flammability standard would reduce bedding fire deaths by 69 to 78 percent. With the requirement for fire-safe cigarettes in California beginning January 1, 2007, and a stringent standard for mattresses already in place, has the estimated fire death reduction associated with the proposed bed clothing standard been reevaluated? Has this significantly reduced fire death and injury risk led to a reconsideration of the need for potentially toxic fire retardant chemicals in consumer products? 9) The Green Chemistry Initiative calls for the design of products and processes that reduce or eliminate the use and generation of hazardous substances at all stages of the life of a product, ranging from the manufacture of a product all the way until end-of-life disposal. Implementing a new bedding standard that results in the increased use and generation of hazardous substances appears to contradict the premise of the California Green Chemistry Initiative. [1] IARC (1999). IARC Monographs on the Evaluation of Carcinogenic Risks to Humans. Volume 71. Re-evaluation of some organic chemicals, hydrazine and hydrogen peroxide (Part One). IARC, Lyon. pp. 43-108. [2] U.S. EPA (2000). Toxicological Review of Vinyl Chloride (CAS No. 75-01-4). In support of summary information on the Integrated Risk Information System (IRIS). May 2000. EPA/635R-00/004. U.S. Environmental Protection Agency, Washington, D.C. Available at: http://www.epa.gov/iris/toxreviews/1001-tr.pdf [3] U.S. EPA (2002). Toxicological Review of 1,1-Dichloroethylene (CAS No. 75-35-4). In support of summary information on the Integrated Risk Information System (IRIS). June 2002. U.S. Environmental Protection Agency, Washington, D.C. Available at: http://www.epa.gov/IRIS/toxreviews/0039-tr.pdf [4] U.S. EPA (2005). Furniture Flame Retardancy Partnership: Environmental Profiles of Chemical Flame-Retardant Alternatives for Low-Density Polyurethane Foam. September, 2005. EPA 742-R-05-002A, U.S. Environmental Protection Agency, Washington, D.C. Available at: http://www.epa.gov/dfe/pubs/flameret/ffr-alt.htm

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F-TA-5	Education and the Environment Initiative November 16, 2007 Maureen Gorsen Director Department of Toxics Substances Control PO Box 806 Sacramento CA 95812-0806 Dear Ms. Gorsen- On behalf of my environmental organization Heal the Bay, and the public-private partnership of the Education and the Environment Initiative, I express strong support for the Green Chemistry Initiative. Clearly, the current structure by which we regulate chemicals in California is not sustainable. Given that California has serious pollution, ecosystem degradation, and natural resource scarcity concerns, it is imperative that the state develop a more cradle-to-cradle approach. The Department of Toxics Substances Control's (DTSC's) leadership is essential to create such a new policy and regulatory framework. Green Chemistry will better enable California to protect people, and the environment, as well as economically keep pace with changes worldwide, and here at home. Educate about the environment is fundamentally critical to any such new Green Chemistry policy and attendant programs. Education is necessary in order to scientifically inform such a policy, practically and efficiently implement it, and also to disseminate information about it to future generations. Luckily, California is currently poised to lead the nation in environmental literacy: the Education and the Environment Initiative (EEI) is a landmark environmental education law that requires the development and implementation of multi-disciplinary environmental education curricula in all disciplines (science, history/social science, English/language arts, and mathematics) for all K-12 grade students in state public schools. The EEI was co-authored by environmental organization Heal the Bay and signed into law in 2003 by former California Governor Gray Davis. In 2005, Governor Schwarzenegger allocated state funds over two years for environmental education curricula development under the EEI. A national model, the EEI will ultimately allow six million California school children each year to have the information they need to make informed decisions about protecting their health and our precious natural resources. As currently being developed, the EEI will necessarily include information that touches on green chemistry specifically. For example, EEI statutory mandates specifically call for the EEI curricula to address topic areas such as "toxics and hazardous waste," "public health and the environment," "pollution prevention," and "environmental sustainability." Obviously, there is significant overlap between the educational mandate of the EEI and the subject matter and goals of any state Green Chemistry Policy. We therefore encourage DTSC to make sure there is full integration between the EEI curricula development and its implementation, and the Green Chemistry policy and program development (including, but not, limited to K-12, post-secondary, and vocational educational efforts associated with Green Chemistry.) To date, DTSC has been very supportive of the EEI effort, and we gratefully applaud their leadership in this regard. We hope that as the Green Chemistry policy unfolds, that DTSC will continue to closely coordinate with the EEI and share Green Chemistry educational content, potential outreach opportunities, and other resources. Together, we can help children learn about environmental issues and make informed decisions about their individual impact on the environment. Sincerely, Leslie Tamminen Legislative Director/EEI Director Heal the Bay

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F-TA-6	Comments - California Green Chemistry Initiative Thank you for soliciting input from California residents concerning the Green Chemistry Initiative. I am currently writing a book-length narrative about environmental illness (including one fictional character based on Dr. John Balmes, who was extremely helpful to me when I first became chemically sensitive), and I would love to contribute my insights to your project. The REACH program currently underway in the E. U. would be a wonderful model for California. In addition to this, however, we need to zero in on those toxins to which the general public is being heavily exposed on a daily basis. At the top of this list is secondhand cigarette smoke. Twenty-one years ago, Surgeon General C. Everett Koop concluded that secondhand smoke causes disease. Twenty years later, Surgeon General Richard Carmona called secondhand smoke an alarming public health threat, "a serious health hazard at any level" One and a half years ago, the State of California's Air Resources Board defined secondhand smoke as "toxic." So what are we waiting for? Who are we afraid of? …more on behalf of Trudy Fisher
F-TA-7	CalARVC's Comments The California Association of RV Parks and Campgrounds (CalARVC) requests that the Department of Toxic Substance Control prohibit the import, sale, or use of certain RV toilet additives as part of the California Green Chemistry Initiative. Many of these products are detrimental to onsite septic systems and often cause systems to fail and pollute surrounding soil and groundwater. CalARVC, which is comprised mainly of hundreds of small "mom and pop" RV parks and campgrounds from all over the state, has been seeking a solution for this problem to several years. CalARVC believes the best solution is to ban the sale and use of deleterious products that contain formaldehyde or similar biocides. Most of the toilet additive products sold and used in California contain formaldehyde or a derivative of formaldehyde. These products help dissolve toilet paper and bio-solids and are used by RV owners to prevent odors and blockages in their toilet systems. However, the chemicals in these products that help dissolve toilet paper and bio-solids also kill natural biological organisms used in many onsite wastewater systems. Many onsite wastewater treatment systems use natural organism to breakdown bio-solids and toilet paper. Thus, when RV holding tanks containing certain RV toilet additives are dumped into an onsite wastewater system, which is a common everyday occurrence at RV parks, the chemicals designed to eliminate odors and dissolve toilet waste also kill off the natural organisms causing the onsite septic systems to fail....more on behalf of California Association of RV Parks and Campgrounds
F-TA-8	Johnson & Johnson - Additional Comments On behalf of Johnson & Johnson and its family of companies, I appreciate the opportunity to provide additional comments on the California Green Chemistry Initiative. Johnson & Johnson has identified a number of key policy points regarding green chemistry that we believe are important guidelines that will lead to the overall success of California's Green Chemistry Initiative. Johnson & Johnson recommends specific policy points should be structured around the following policy goals and objectives: on behalf of Johnson & Johnson

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F-TA-9	Policy Elements proposed by the Silicon Valley Leadership Group Green Chemistry in California – Initial Policy Elements Proposed by the Silicon Valley Leadership Group (These comments have been posted to all four discussion forums in the same form, due to overlap in topics.) The Silicon Valley Leadership Group advocates a comprehensive, integrated approach to expanding Green Chemistry in California. By highlighting leaders in the corporate environmental practices and encouraging those who are further behind, we can all move ahead. We envision Green Chemistry as an interactive, evolving partnership with industry, government and consumers working together to protect human health and promote a cleaner, safer environment. Leadership Group members involved in crafting these initial suggestions include those from the electronics, biotechnology, pharmaceutical, chemical manufacturing, and supporting sectors. For more information about the Leadership Group please visit www.svlg.net. The Leadership Group proposes the following policy elements to further Green Chemistry in California: 1. Strengthen the recognition and pursuit of Green Chemistry processes and products by establishing clear criteria and voluntary certification based on comprehensive lifecycle considerations. Equally important, consumers need to be educated about responsible choices and practices. 2. Explore models other than, or building upon, the current Materials Safety Data Sheet (MSDS) system to provide needed chemical hazard data throughout the supply chain. 3. Establish a Green Chemistry Coordination Council to collect and promote the sharing of information, highlight businesses with green practices, provide assistance to businesses lacking resources, and educate consumers. 4. Prioritize chemicals for screening, testing and appropriate restrictions. We suggest building upon the model of Canada's analysis and prioritization as well as the Proposition 65 review process conducted by OEHHA. Chemicals of high concern should be allowed for targeted, low-exposure uses as determined in an open process by DTSC. 5. Greater investment in pollution prevention in the short term as well as extension of the current CA Pollution Prevention model to downstream chemical users as an element of the long term Green Chemistry strategy. 6. Continue the Conversation with California to sustain progress in Green Chemistry. The dialogue between DTSC and stakeholders has been very helpful and will result in more well-developed, effective policy. IN MORE DETAIL: 1) Issue: Our market economy and the innovations that it engenders, environmental and otherwise, are driven by the relationship between industry and consumers. In order for industry to offer products that are environmentally-sound, and for consumers to recognize them, clear and stakeholder-driven criteria are necessary. Proposal: The Leadership Group proposes we strengthen the recognition and pursuit of Green Chemistry processes and products by establishing clear criteria and voluntary certification based on comprehensive lifecycle considerations. Equally important, consumers need to be educated about responsible choices and practices. While the focus of the Initiative has been on chemical safety, green chemistry in the broader sense should incorporate an accounting of embedded energy, C02 impact, water usage, packaging, recyclability and so forth. Industry on the whole is already moving toward a greater consideration of these factors in our practices. The difficulty of quantifying and ascribing relative importance to these factors points to the need for commonly-held practices or industry standards. A voluntary certification program for green chemistry processes and products will clarify goals for industry members while empowering consumers with the information they need to make informed choices. As green chemistry practices evolve, according to the green chemistry principles we are so well aware of, so should the criteria - we should build flexibility into the system. It is important to note that a voluntary system is more pragmatic than

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	standards at this point, given the innovative and often resource intensive approaches that will be required, the longer timeline necessary for industry transformation, and the need for consumers to have choices. As with organic food, not every consumer wants the environmentally-sensitive approach, if it costs more. The International Standards Organization (ISO) 14001 process certification and ACC's Responsible Care Management Practices are good examples to build upon. It is also important to note that potential green chemistry certification should be a recognition of process in addition to the product. As many experts in the DTSC Symposia have remarked, we are not only trying to improve products, but the entire system that goes into making that product. And we should realize that perfection will not be immediate, but evolve over time. In order to motivate voluntary certification some type of incentive, especially market mechanism such as rebate, tax incentive, or fee refund, should be explored. We understand very well that the consumer wants environmental accountability. As consumers gain in accountability, though, so should they gain in responsibility. This is in no way a proposal to allow industry to abdicate its responsibility for the safer use of chemicals, but rather to acknowledge that in a market-based society, corporate and consumer responsibility must closely intertwine to be successful. Beyond making informed purchases, we can best protect the environment when consumers understand Green Chemistry applies to them as well. How they collectively handle chemical products has an enormous effect (for example, nail polish remover can be easily poured down a household sink which would not be allowed in the workplace). The Green Chemistry Coordination Council described in the third point below could assist in consumer education. 2) Issue: The MSDS provides insufficient data on chemical hazards to those downstream in the supply chain. Proposal: The Leadership Group proposes the DTSC explore models other than, or building upon, the current Materials Safety Data Sheet (MSDS) system to provide needed chemical hazard data throughout the supply chain. Our members often find the data included on the Material Safety Data Sheet (MSDS) to be insufficient for determining chemical hazards. Many times important information is addressed in a superficial, boiler-plate fashion or missing altogether. The same raw material from different suppliers may have divergent information. This is in part due to some government regulations requiring that an MSDS be obtained directly from the manufacturer. While we recognize that confidential business information needs to be protected, best possible data on hazard and ecological effects should be made readily available to the supply chain and other stakeholders. In order to meet customer information requirements on chemicals in products, some electronics manufacturers currently must request additional information from upstream suppliers. Instead of doing this on a case by case basis, and in some cases taking the costly approach of reverse-engineering products to determine content, it would be more cost-effective to make raw materials hazard information available further upstream. One approach that could facilitate the sharing of information could be to use the existing MSDS system as a vehicle. More uniform information availability, through approaches such as the ANSI standard for a 16-section MSDS or the IPC 1752 could be an improvement. However, since the MSDS was originally intended to provide more immediate emergency response and use information, it might be best to explore other options such as an MSDS addendum, focused on hazard data. As both REACH and industry efforts such as the Global Product Stewardship initiative make available this data over a 4-10 year timeframe, it is important to recognize that generating this hazard data will take time. A voluntary certification process, with recognition for particularly thorough MSDS's, could also improve the quality of information while allowing chemicals manufacturers to differentiate their products. The Global Harmonization System for the Classification and Labeling of Chemicals (GHS) should be considered, as well. Any model chosen should include the appropriate ecological as well as toxicological information. We also recommend that early stage R&D chemicals be exempted due to their limited use and limited exposures. Worker exposure issues involving recognized hazards (mostly in small/medium enterprises) during the Conversation with California suggests that incorporating MSDS information into real-life practices may be an issue, aside from content. Technical Assistance for those less familiar with critical MSDS information is included as part of the Green Chemistry Coordination Council described below.

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	3) Issue: Some companies and industries have already made much progress in achieving the aims of Green Chemistry while others lag behind. Green Chemistry involves myriad innovations and the collection and processing of much information. We do not have an adequate way of sharing Green Chemistry practices nor have we made the investment to encourage and reward green efforts. Proposal: The Leadership Group proposes the establishment of a Green Chemistry Coordination Council to collect and promote the sharing of information, highlight businesses with green practices, provide assistance to businesses lacking resources, and educate consumers. The information presented by the speakers, panelists, and stakeholders during the past year of effort on this Initiative has been incredibly thorough, enlightening, and inspiring for all stakeholders. We suggest the DTSC catalog and make easily available information regarding best practice screening processes, green chemical design, collaborative efforts such as the ACS Green Chemistry Institute, and international efforts such as the Global Harmonization System. All stakeholders still have a lot to learn in this dynamic area, and everyone stands to gain from continued information sharing. DTSC's leadership in this area should be continued by establishing it as a central clearinghouse of information for the state and beyond. Many medium and small companies are lacking in appropriate knowledge and resources, and will need assistance in taking advantage of Green Chemistry practices. Providing incentives for the sharing of data and best practices will help all companies. We further suggest building upon and making readily available the information provided by existing efforts: ACS Green Chemistry Institute, Cleangredients, U.S. EPA's Design for Environment Program, Performance Track, the chemical industry's HPV testing program, eChemPortal, EPEAT, and DTSC Technical Resource Center. 4) Issue: California has limited resources to evaluate chemicals for restriction. Chemical safety is a measure of exposure as well as toxicity. While we need to carefully assess and restrict the use of chemicals of concern, complete bans fail to allow for appropriate and beneficial uses. Proposal: The Leadership Group proposes the DTSC prioritize chemicals for screening, testing and appropriate restrictions. We suggest building upon the model of Canada's analysis and prioritization as well as the Proposition 65 review process conducted by OEHHA. Chemicals of high concern should be allowed for targeted, low-exposure uses as determined in an open process by DTSC. The DTSC, together with other relevant State agencies, needs to establish clear and consistent science-based protocols for screening and testing. These should include determination of endpoints of concern and modes of action, where scientific and methodological questions are sufficiently advanced to enable consistently sound science-based judgments of potential risk. The use of a transparent and rigorous process to evaluate risk factors as indicated by toxicological, epidemiological, and exposure data will allow us to compare the relative importance and safety of chemicals as well as determine whether any restrictions or substitutions are appropriate. A scientific panel of experts with a range of theoretical and applied chemicals experience can best establish and oversee a process acceptable to all stakeholders. The Proposition 65 review process may offer a starting point for development of a thorough, scientific process to meet these broader needs. Government entities around the world have been or are in the process of revamping their chemicals use policies. Although the DTSC will need to analyze the individual needs of our state through such means as chemical mapping, we should coordinate with the chemicals policies of other countries to minimize confusion, cost and competitive impacts. Starting with the thorough screening done by Canada's Environmental Policy Act (CEPA) would allow us to build upon their scientific knowledge base and mitigate the burden of data gathering. Any proposed restrictions or mandates should be targeted and include careful evaluation of alternatives. This targeted approach will allow us to concentrate our resources where most needed. Furthermore, any mandates should be harmonized with systems in other countries as much as possible. While we wish it were not necessary to use chemicals determined by such scientific protocols to be of high concern, many times they are needed to promote human health or advance ground-breaking research. This is the uncomfortable irony with which we will have to live until we find better alternatives. In the meantime, targeted use of these chemicals under highly controlled and low-exposure scenarios should be allowed by DTSC, after an open, scientifically based stakeholder process. In the absence of safer alternatives, which should be technically feasible, improve

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	health/safety/environmental profile, be of comparable or superior performance, cost-effective, and be capable of persistence, banning should be avoided. In that case, resources should be devoted to R&D or incentives should be provided to develop cost-effective alternatives. Our goal should be a marketplace where informed decision making at both the manufacturing and consumer levels is consistently delivering changes/substitutions that advance our collective interests along the dimensions outlined above. We recommend that novel R&D chemicals, used in relatively tiny amounts in highly controlled settings, be excluded from any consideration of a restriction or mandate. There are rarely, if ever, exposures outside of the laboratory. Government oversight of these chemicals would not be cost-effective and would be counterproductive to the aims of Green Chemistry. Flexibility in this type of research chemical use promotes the innovation of safer chemicals and processes. Both CEPA and REACH exempt these chemical uses. Exemptions should also be allowed for select pilot demonstrations and testing. 5) Issue: It will take a significant amount of time for industry and consumers to move to Greener Chemistry and we need to address pollution concerns in the meantime. Existing efforts at pollution prevention in the state utilize a collaborative model that has proven effective, but has been limited by its modest resource commitment and its narrow manufacturing focus. Proposal: The Leadership Group proposes greater investment in pollution prevention in the short term as well as extension of the current CA Pollution Prevention model to downstream chemical users as an element of the long term Green Chemistry strategy. Pollution prevention programs and policies such as SB 14 have been promoted for quite some time, yet they never receive anywhere near adequate funding and attention. We need to increase our investment in pollution prevention assistance, especially for medium and small businesses that either lack the resources or motivation to tackle the problem on their own. Since pollution prevention has led to demonstrated improvements and optimization of chemical processes, it is a critical, complementary approach to Green Chemistry's goals of better chemical design. The model of collaboration between companies, the DTSC and third party experts (in the case of the SB 14 program, from the University of California), may also offer a model applicable to a broader Green Chemistry strategy. The impressive accomplishments of the Institute for Research and Technical Assistance in enabling development of substitutes for problem solvents in various applications suggest that such targeted 3rd party collaboration may pay dividends in products/product use as well as in manufacturing. This suggests the possibility of 1) taking chemicals of top priority concern, 2) identifying the specific applications or industry uses posing the greatest risk from those chemicals, and 3) applying a collaborative process of agency, industry and third-party experts to identify or develop viable alternatives that can maintain efficacy, but reduce risk in those targeted applications. 6) Issue: The stakeholder process for developing Green Chemistry has provided much more comprehensive progress than could have been achieved otherwise. Proposal: The Leadership Group proposes we continue the Conversation with California to sustain Green Chemistry progress. The dialogue between DTSC and stakeholders has been very helpful and will result in more well-developed, effective policy. We commend the DTSC for encouraging creativity in finding safer alternatives and providing opportunities for open-ended discussion. There remains, though, a very real need for extensive further discussion by the stakeholders in this Green Chemistry Initiative. We hope that the inclusive nature of this process is not at an end. There are so many pieces to Green Chemistry and as the focus narrows to various subtopics, meaningful stakeholder participation will be essential. We have all built personal relationships and broadened our understanding of the various points of view. It would be a shame to toss this hard-won experience aside.

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F-TA-10	Green Chemistry Initiative The Western States Petroleum Association (WSPA) is pleased to offer the following comments on policy options being considered in the context of Cal-EPA's Green Chemistry Initiative. Many of the comments submitted to DTSC to date and debated in public forums refer to the need for California to supplement the requirements of the Federal Toxic Substances Control Act (TSCA). Prior to immediately moving in this direction, WSPA believes that DTSC must evaluate what regulations and information are currently available and whether these tools are being appropriately implemented and applied prior to developing new programs. Indeed, we expect this analysis is already underway, pursuant to the mandate to conduct a "baseline assessment" of existing programs and information described in the April 20 memorandum from Cal-EPA Secretary Linda Adams announcing the Green Chemistry Initiative. We further expect that this analysis will be presented to Initiative stakeholders for review and comment along with the policy options that flow from it, to ensure that all relevant information has been considered, including information obtained from national and international programs. We are optimistic that this approach will lead to meaningful improvements in existing state programs. on behalf of Western States Petroleum Association
F-TA-11	Concerned About Safety of Products I am a resident of OJai, California, and am concerned about the safety of many of the products we use from toxic chemicals in them - mostly food, but also pharmaceuticals, cleaners, etc. I have learned about the Green Chemistry Initiative which provides an opportunity to protect California by acting to restrict or eliminate especially dangerous substances and by mandating safer alternatives. This is a wonderful idea and I heartily endorse it. However, I really encourage you to ensure that in addition to incentive programs, the Initiative implements protective regulations, including restrictions and bans of chemicals for which the weight of evidence demonstrates a severe hazard to human health and/or the environment. Many thanks for considering this suggestion. on behalf of Walter M. McClelland
F-TA-12	California Green Chemistry Initiative - Comments I am in support of the Green Chemistry Initiative to restrict or eliminate dangerous substances in California. We are being exposed to far too many chemicals in our daily environment and many of us are getting sick. It is especially necessary to get them out of commercial cleaning products that are used everywhere, from stores to doctor's offices and even hospitals! We need some strict regulation on use of harmful chemicals that in many cases can simply be replaced by less or non toxic ones. This is a critical situation which requires regulations to test chemicals and ban those shown to be a hazard to our health and well being. Please reply too: Diane Brodd on behalf of Diane Brodd

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F-TA-13	Comments on the California Green Chemistry Initiative I would like to add my support of the Green Chemistry Initiative to restrict or eliminate dangerous substances in California I would like to see this initiative include the problem of chemicals being used in our daily lives that have not been tested for neurotoxicity in children. I urge you to include restrictions and bans on chemicals that demonstrate a hazard to our health and/or environment. This is a critical situation that requires immediate attention by not only providing incentive programs but requiring restrictions and bans on those chemicals that are potentially dangerous. Please reply too: Linda Blackwell on behalf of Linda Blackwell
F-TA-14	CSPA Summary Comments on the California Green Chemistry Initiative Dear Director Gorsen: The Consumer Specialty Products Association (CSPA) has appreciated your continual efforts to include us in the discussions and stakeholder input on the Department of Toxic Substances Control (DTSC) California Green Chemistry Initiative. We also appreciate this opportunity to provide supplemental comments in addition to the information that we have provided on the “Conversation with California” website. CSPA is a national nonprofit trade association that represents more than 260 companies engaged in the formulation, manufacture, distribution and sale of consumer, institutional and commercial products. CSPA member companies manufacture and market a wide range of products, including: cleaning products, disinfectants and sanitizers, candles and air care products, household pesticide products, automotive products used to clean and maintain vehicles, and polishes and floor maintenance products. CSPA members are committed to manufacturing and marketing safe products which are protective of human health and the environment while providing essential benefits to consumers. CSPA and our members support the broad goals of the Green Chemistry Initiative and look forward to working with DTSC and other stakeholders in the state to help spur green chemical innovation and ensure that products are safe. I. Background CSPA member products improve the quality of human life and are necessary to protect the public health against dangerous diseases, infestation, and unsanitary conditions. CSPA members are committed to providing products that are thoroughly evaluated for human and environmental safety and go through rigorous safety-based assessments before they are brought to market. CSPA members are also committed to clear and meaningful labeling on consumer products, i.e., label instructions are written to ensure that consumers use products in accordance with label instructions. Finally, CSPA members are committed to the development of green products that are safe for human health and the environment. In addition, CSPA members routinely apply green chemistry and green engineering principles in their operations and have been honored with awards for their efforts. The consumer products industry develops products that meet or exceed safety requirements of all state and federal agencies in the United States and Canada charged with regulating those products, including the California Department of Pesticide Regulation, the California Air resources Board, and other state agencies, U.S. Consumer Product Safety Commission (CPSC), the U.S. Environmental Protection Agency (EPA), the Occupational Safety and Health Administration (OSHA), the U.S. Food and Drug Administration (FDA), Health Canada, and Environment Canada. While we support the California Green Chemistry Initiative and believe there is much that can be done to address and spur the development of green chemical technology, CSPA believes that regulation of our members’ products under current federal and state regulatory authorities provides safety and protection to consumers. Below is a short summary of the various regulatory authorities that ensure the safety of consumer products and their ingredients. While it is not an exhaustive list of the regulatory requirements these products undergo, it illustrates the extensive oversight that already

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	surrounds the manufacturing and marketing of consumer specialty products. II. Toxic Substances Control Act (TSCA) The Toxic Substances Control Act (TSCA) gives EPA the authority to regulate chemicals produced or imported into the United States. EPA repeatedly screens these chemicals and can require reporting, testing or a complete ban of those that may pose an environmental or human-health hazard. Any person intending to manufacture or import a chemical substance first must determine whether the substance is listed on the TSCA Inventory. If it is not listed, the prospective manufacturer or importer must satisfy premanufacturing notice (PMN) requirements before commencing production or importation of the substance. In filing a PMN, the manufacturer or importer must give their identity, specific chemical identity, product volume, use, exposures (worker, user and consumer), and environmental fate. Additionally, any test data relating to environmental or health effects of manufacturing, processing, distributing, using, or disposing of the new chemical substance must also be submitted. The PMN must be filed at least 90 days prior to the commencement of commercial production or importation of a new chemical substance. EPA's review of a PMN consists of seven major stages designed to ensure that EPA examines all aspects of a new chemical, including its physical and chemical properties, potential toxicity, exposure of workers, users and consumers, and economic benefits. EPA has the authority to prevent, delay, or limit manufacture after the initial PMN review period ends. EPA can issue an administrative order regulating a new chemical substance if the Agency finds that there is insufficient information to reasonably evaluate the risk and either the chemical may present an unreasonable risk to health or the environment or it will be produced in substantial quantities with the result that either substantial quantities will enter the environment or there will be substantial or significant human exposure to the substance. While EPA does not require a designated set of toxicity testing to be included in the PMN submissions, it has identified several categories of chemicals and the concerns areas where it has required such tests. Under these requirements a company must provide information addressing these risk concerns or face restrictions based on default assumptions. EPA has broad authority to regulate the existing chemicals in commerce as well. If a chemical presents unreasonable risks to health or the environment, EPA must initiate a rule-making to regulate the chemical. As of 2007, EPA has issued over 1300 Significant New Use Rules, which restrict the manufacture, import, or processing of a substance . EPA can prohibit or limit the manufacture, processing, distribution, commercial use or disposal of the chemical; prohibit or limit the use of the chemical in a concentration above a specified level; require adequate warnings and instructions with respect to the chemical's use, distribution in commerce or disposal; require record-keeping; prohibit or regulate disposal of the chemical; and require notification to the purchasers or the general public about the risks involved and to replace or repurchase a chemical substance or mixture if requested. EPA also has the authority under TSCA to require manufacturers of substances to develop safety and environmental data. III. Consumer Product Safety Act (CPSA) The Consumer Product Safety Act (CPSA) provides that when the Consumer Products Safety Commission (CPSC) finds an unreasonable risk of injury associated with a consumer product it can develop a standard to reduce or eliminate the risk. The CPSA also provides the authority to ban a product if there is no feasible standard, and it gives CPSC authority to pursue recalls for products that present a substantial product hazard. The CPSC is authorized to set safety standards as to consumer product performance, composition, contents, design, construction, finish, packaging and labeling. In general, the manufacturer of a consumer product subject to regulation must issue a certificate announcing compliance with the applicable standards, and must label the product with the date and place of manufacture, the identity of the manufacturer, a certification of compliance with any applicable rule, and a brief description of such rule. Manufacturers are required to immediately notify the CPSC if it obtains information which reasonably supports the conclusion that a product: (1) fails to comply with a consumer product safety standard or banning regulation or a voluntary consumer product safety standard upon which the CPSC has relied upon; (2) contains a defect which could create a substantial product hazard described in the CPSA; or (3) creates an unreasonable risk of serious injury or death.

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	In the last ten years, CPSC obtained 472 voluntary recalls involving 110 million product units. During this time, CPSC obtained 1031 corrective actions (including recalls and other actions to keep unsafe products from consumers). IV. Federal Hazardous Substances Act (FHSA) The Federal Hazardous Substances Act (FHSA) requires labeling of hazardous substances sold to households. It prohibits the sale or introduction into interstate commerce any product which does not comply with the regulations. FHSA regulations provide specific guidelines to determine potential risks specific to the entire formulation and package. Product risk assessments are the basis for label decisions and precautionary label text to protect consumers and children. At a minimum, labels must include hazard signal word, affirmative statement of hazards, the name of each component that contributes to the hazard, and precautionary measures to be taken to avoid risk, required or appropriate instruction for first aid treatment, handling instructions, storage instructions, and "Keep out of reach of children." V. Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) The Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) provides the basis for regulation, sale, distribution and use of pesticides in the U.S. FIFRA authorizes EPA to review and register pesticides for the specified use which a registrant applies for. Before registering a new pesticide or new use for a registered pesticide, EPA must first ensure that the pesticide, when used according to label directions, can be used with a reasonable certainty of no harm to human health and without posing unreasonable risks to the environment. To make such determinations, EPA requires more than 100 different scientific studies and tests for active ingredients. In fact, EPA has banned and severely restricted 64 pesticides in the United States. When EPA registers a pesticide, it approves the product's label, which includes (among other things) directions for use, hazard warnings, and precautions. It is a violation of FIFRA for any person to use a pesticide in a manner inconsistent with its EPA-approved labeling. EPA also has the authority to suspend or cancel the registration of a pesticide if subsequent information shows that continued use would pose unreasonable risks to health or the environment. EPA may decide to remove a pesticide from the market based on information from a variety of sources: new studies conducted by the registrant, the Government, or a third party; incident information submitted by a registrant; or results of the EPA's periodic review of pesticides and tolerances. EPA is currently completing a review of those pesticides registered before November 1984 to ensure that they meet current scientific and regulatory standards. This process, called reregistration, considers the human health and ecological effects of pesticides and results in actions to reduce risks that are of concern. Concurrently, EPA has begun a registration review process for those products registered subsequent to 1984 and for those pesticides that were review under the reregistration process previously. These ongoing review processes assure the continual reexamination of the safety and environmental profile of pesticides. EPA and the states enforce FIFRA primarily through stop sale, use, and removal orders, civil penalties, or a combination of the two. Unlawful acts under FIFRA include: selling an unregistered or misbranded pesticide; selling a pesticide whose composition differs from the one described in the pesticide's registration application, violating EPA's labeling requirements, failing to file annual production reports, and violating FIFRA's export requirements. VI. Recommendations for Product Stewardship & Safety-based Assessments As stated in our November 6 "Conversation with California" entry, CSPA supports company performed safety-based assessments of consumer products prior to the marketing of a product, that take into consideration all of the phases of a product's life-cycle. CSPA also supports appropriate use-restrictions for chemical ingredients when scientific safety-based assessments indicate that they cannot be used safely in a consumer product or use application. CSPA and our members believe that every responsible company should be performing these types of safety-based assessments and supports initiatives that recognize companies for these types of procedures. In fact, CSPA has demonstrated our industry's commitment to manufacturing and marketing safe products which are protective of human health and the environment while providing essential benefits to consumers, when we initiated our Product Care program in 2001.

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	CSPA's Product Care program is a stewardship program for the consumer and institutional specialty products industry where participating companies have agreed to go beyond government regulations in emphasizing health, safety and environmental concerns by carefully designing products, purchasing raw material and packaging, operating safe manufacturing facilities, promoting safe storage and distribution, providing useful product information, answering consumers questions and anticipating product disposal needs. CSPA believes that these types of product stewardship programs should be considered as frameworks for programs developed under the Green Chemistry Initiative. Product Care provides a framework for companies to identify and commit to stewardship principles, share ideas and information and benchmark better performance. Participating companies have pledged to develop management principles for each of seven areas in a product's life cycle from development in a research facility through product use and disposal. Through this program Companies Must Commit to Evaluate: 1. Product Design 2. Raw Material, Package and Service Supply 3. Manufacture and Production Site Management 4. Product Storage and Distribution 5. In-market Support, Incident Evaluation and Follow-up 6. Consumer Education and Outreach 7. Product Disposal Stewardship did not begin when CSPA's Product Care program was initiated in 2001. Responsible companies have long followed policies promoting safe products that provide important health benefits while not adversely affecting the environment. CSPA believes it is vital that these types of product stewardship programs and companies that participate in these programs be recognized and fostered through any program developed under the Green Chemistry Initiative. In particular, CSPA believes that DTSC and California can leverage and recognize programs like Product Care as a way of encouraging companies to establish robust procedures to ensure product safety and environmental safety. VII. Recommendations for Chemical Data Development Initiatives Chemical data development efforts should build on existing statutory and regulatory structures, voluntary initiatives, and data development efforts. CSPA does not support California-specific data development requirements and pre-market approval process for chemicals or consumer products. However, CSPA supports collaboration by DTSC and California in ongoing work by other government agencies to assess chemicals and consumer products. Specifically, California and DTSC could leverage efforts by Health and Environment Canada in addressing priority chemicals in the Chemicals Management Plan. DTSC and California could collaborate with these agencies on their high priority list and avoid needless duplication of current data development and prioritization efforts. DTSC and California could also participate in the effort launched in August during the Security and Prosperity Partnership (SPP) with under the Montebello Agreement involving trilateral cooperation among the governments of Canada, the United States and Mexico to share chemical information and safety assessments. In addition if DTSC and California move forward with efforts to establish chemical priorities the process should be collaborative and should include scientific experts in toxicity and exposure, chemical manufacturers, consumer product manufacturers, and nongovernmental organizations. CSPA believes inclusion of manufacturers of the chemicals and consumer products could provide toxicity and exposure/use data to determine whether the uses of "priority chemicals" are safe or should be restricted. As referenced above, CSPA does not support pre-market approval of chemicals or consumer products, because this would be an incredibly burdensome and expensive process for the State of California and would unnecessarily slow down the development of products. For example, the Department of Pesticide Regulation registers approximately 12,000 pesticide products sold in the State and in 2005-06 it cost the agency over $17.5 million to review and approve these products . To require pre-market approval for the hundreds of thousands of chemicals and consumer products in

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	commerce would be cost-prohibitive. VIII. Support for Appropriate Ingredient Disclosure Throughout Green Chemistry discussions and in recent market research consumers and others have expressed a desire to know what ingredients are in the products they use in their everyday life. These consumers are interested in having this knowledge in order to make informed product choices. It may appear that product ingredient information may not be readily available to consumers; however, our members willingly provide information to meet consumer needs. While some organizations have expressed concerns about ingredients in consumer products, much of this information is inaccurate. This is primarily due to the reliance on outdated resources that are dependant on old technologies or on assumptions made by sources that are not well versed in specific product chemistries. CSPA and our members support an appropriate approach to providing accurate information to consumers through ingredient communication. Our industry stands behind the safety of our products and the appropriate use of chemical ingredients in those products. We would like to work with DTSC and the State of California to implement a means of ingredient communication that would provide consumers with the information they can use to make informed decisions regarding the products they use in their homes. IX. Essential Principles for Green Chemistry Initiatives As any Green Chemistry program moves forward, CSPA believes, that in order for the effort to be credible and have a positive impact it must be structured in a way that includes all stakeholders and provides a sound scientific basis for the program. Specifically, Green Chemistry should ensure the safety of chemicals and consumer products through the use of sound science in the decision-making process. Additionally, green chemistry programs should be designed to ensure that products remain technologically and commercially feasible to produce; and that product efficacy, performance, and usability are not compromised or undermined. As such, Green Chemistry must foster innovation and not limit the development of new chemistry technologies. X. Support for Initiatives to Spur Green Innovation Stimulating green chemical innovation has been a core concept of the Green Chemistry Initiative, and discussion of this topic has shown the promise that new technologies have for improving the standard of life in California and reducing environmental impacts. CSPA supports collaborative efforts to encourage public and private partnerships with the goal of developing “greener” products and “environmentally responsible” ingredients rather than mandatory and voluntary state labeling programs that endorse green products or programs that stipulate a single third-party certification of green products. CSPA supports initiatives that provide incentives for companies that innovate and develop technologically and commercially feasible products using green chemistry. CSPA also supports recognition for companies that develop sustainable business operations, processes, and/or products. We also believe there are unique opportunities in California for research that identifies areas for the use of green chemistry in consumer products. Essential elements to ensuring that these technologies become widespread are implementing State policies that are designed to overcome barriers to commercial application of green chemistry research and development efforts. XI. Conclusion Once again, CSPA has appreciated DTSC’s efforts to include all stakeholders in the discussions during the California Green Chemistry Initiative. CSPA believes that the Green Chemistry Initiative holds incredible promise for helping spur green innovation in California. We also believe that the Initiative can leverage ongoing chemical data development initiatives in setting chemical priorities. Further, CSPA believes that DTSC should recognize and encourage the current product stewardship procedures and safety-based assessments that companies perform prior to marketing a consumer product. CSPA would also look forward to working with DTSC and the State of California on an appropriate ingredient information system to help inform consumers when making their purchasing decisions. CSPA looks forward to continuing to work with DTSC through the Green Chemistry Initiative, as recommendations are developed, and CSPA hopes that

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	our continued participation in this discussion will provide meaningful help to the endeavor. Please feel free to contact me directly at (202) 833-7328, or CSPA's in-state representation, Laurie Nelson at (916) 446-1111 if you have any questions about these comments. Respectfully Submitted, Andrew R Hackman Manager, State Affairs Programs
F-TA-15	High Production Volume (HPV) Challenge Program: A Landmark Program Making More Health and Environmental Data Publicly Available Than Ever Before During the course of the conversation with California, the High Production Volume (HPV) program has been the subject of discussion and criticism. The HPV program is a voluntary initiative that was launched as a cooperative effort among EPA, the chemical industry, and Environmental Defense in 1998. Through this effort, more than 300 companies and consortia volunteered to provide safety information on chemicals, which collectively represent nearly 95 percent of U.S. chemical production by volume. It has made more health and environmental data publicly available faster than any other regulatory or voluntary initiative before it. This significant contribution has been widely recognized as an important and successful program by EPA, state and foreign governments, public health officials and professional science organizations. By most measures, the HPV Program rates a solid A. Some have unfairly criticized the chemical industry and EPA's performance in this unprecedented program. However, more often than not, these criticisms are predicated on faulty analyses, and overly simplistic reviews of the program. For example, some critics want to look at raw numbers alone as a measure of the program's success or failure, without examining any underlying circumstances that might shed light on or explain the numbers more completely. ACC acknowledges that not all HPV Challenge submissions are complete and that the program did not meet its targeted end date, but industry commitments are strong and continue to be met. Sponsors have completed initial submissions for 97% of those chemicals sponsored in the U.S. Challenge component of the program. This includes submitting to EPA studies on more than 11,000 health endpoints. The HPV Challenge Program was unprecedented. Prior to the HPV program, no one had experience with an ambitious plan that sought to make a fairly significant amount of screening-level hazard information on some 2,200 chemicals publicly available in a relatively short 6- or 7-year period. Examples of common problems encountered by sponsoring manufacturers that slowed work progress in the HPV Program are: insufficient technology for analytical method development; delays when preparing testing methodologies for substances that are difficult to test; guidance documents do not necessarily define all the requirements of a study, requiring sponsors to fine tune the guidance; and learning curves in the early stages of the program had to be overcome. In fact, manufacturers volunteering in the HPV program made commitments to use their best efforts to complete work by target deadlines. Comparing Speed of US HPV Submissions with Those Sponsored in the OECD Program Compares Apples to Oranges While it is true that a sponsor may fulfill a commitment either by submission to EPA in the U.S. component of the Challenge Program, or by submission to the OECD SIDS international program, comparing the completion rate between the two is not a fair one. In the OECD program, sponsors obtain a country sponsor to which a dossier and SIDS Initial Assessment Report (SIAR) are submitted for review and acceptance. Once the member country is in agreement with the content of the SIAR, the SIAR is then submitted to the OECD for review and comment by other member countries. Therefore, the sponsor country's review, comment, and agreement with the SIAR are imperative before a submission is deemed complete under the terms of the HPV Challenge Framework. This frequently involves a significant amount of discussion concerning data questions and data interpretation. In operational

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	terms, this makes for a far lengthier process than is the case for those submissions to the U.S. EPA. Consequently, comparing the speed with which submissions are made in the two components of the Challenge Program results in a skewed interpretation of the submission rate. TSCA Is Strong and Robust Critics of the HPV program often maintain that the Toxic Substances Control Act (TSCA) is burdensome and blames it for the fact that EPA has not issued more test rules covering 243 HPV orphan chemicals, although these critics fail to offer any actual evidence to support this assertion. In fact, the requirements under TSCA are quite reasonable and not burdensome to meet. And, in point of fact, EPA plans to issue several section 4 test rules between the end of 2007 and 2009 on most, if not all, HPV orphan chemicals. Alternatives to Direct Testing Are Appropriate Some criticize the quality of HPV submissions based on their reliance on alternatives to direct testing, i.e., unpublished data; application of estimation methods; and category approaches. This criticism is unfounded. First, the fact that a study is not published does not mean that it is unreliable or less accurate than one that is published. Many scientific journals will not publish negative (finding that something did not happen)—studies having a bias for positive (something did happen) outcomes. The majority of the data and relevant studies were in company files and had not been published because TSCA does not require the submission of data that fails to show an adverse effect, and most companies generally were not inclined to share expensive test results with their competitors. Second, the use of estimation methods and category approaches was explicitly encouraged by EPA in the HPV Challenge Program. (See October 14, 1999, letter to HPV sponsors from EPA Deputy Assistant Administrator Susan Wayland). A quick review of the HPV guidance on EPA's and OECD's websites makes clear that these alternatives are appropriate when developing screening-level hazard information to complete the SIDS data sets, recognizing the significant animal welfare issues involved. Unfortunately, some choose to ignore the sensitive animal welfare issues presented in testing programs, which were a principal reason for the use of alternative approaches to testing under the HPV Program. All HPV Data Submitted Was Publicly Available, Readily Retrievable, and Usable From the Very Beginning of the Program Some critics claim that the HPV Program failed to have continuous, real-time access to program status and results on the Internet. However, every commitment, every robust summary, every test plan, every piece of data submitted was publicly available and readily accessible on EPA's website from the very beginning of the program's existence. http://www.epa.gov/hpv/
F-TA-16	Perspective of Affected Industries on California Green Chemistry Initiative The below listed organizations appreciate the opportunity to provide comments on the California Environmental Protection Agency's (CalEPA) Green Chemistry Initiative. Our organizations represent many of California's and the nation's leading industries and employers. We fully support science and risk based chemicals management policies which protect health and the environment while assuring product safety and efficacy and promoting innovation in the marketplace in California. Chemistry is at the foundation of a wide range of industries. The science of chemistry helps to make the lives of Californians and others throughout the world safer, healthier, and more productive. Chemistry goes into modern materials used to make insulation, weatherization equipment, firefighting and other emergency response equipment, lightweight vehicle parts, coatings, lubricants, and energy-efficient appliances. Just a few of the many industries that use chemical or chemical-derived products include farming, new residential construction, emergency response services, plastic bottle manufacturing, electronics and high-technology, consumer products manufacturing, upholstered furniture manufacturing, dry cleaning services, building services and health care. We support the statement of CalEPA Secretary Linda Adams that this "…strategy, and the policy it champions, must have at its core and be governed by sound science." Advancements in science make possible product innovations that meet consumer needs, while increasing knowledge about the safety of chemical products and protecting the environment. A science-based assessment that evaluates human health and environmental considerations, performance, and cost and feasibility must include an examination of traditional and alternative technologies, materials and processes.

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	Incentive-based approaches can allow companies to more easily and effectively share this knowledge, best management practices, and opportunities. Our industries and employees appreciate California's leadership in undertaking a comprehensive, scientific and risk based approach to this complex issue. Adhesive and Sealant Council American Chemistry Council AeA (American Electronics Association) American Sportfishing Association Association of Woodworking and Furnishings Suppliers California Chamber of Commerce California Circuits Association California Manufacturers and Technology Association California Paint Council Chemical Industry Council of California Consumer Specialty Products Association Flavor and Extract Manufacturers Association Fragrance Materials Association Grocery Manufacturers Association Independent Lubricant Manufacturers Association International Association of Color Manufacturers International Sleep Products Association IPC – The Association Connecting Electronics Industries National Association of Home Builders National Paint and Coatings Association NFIB – California Soap and Detergent Association Society of American Florists U.S. Chamber of Commerce
F-TA-17	Use of existing data and tools to implement the Green Chemistry Initiative DTSC should look at the procurement and / or contractual use of existing data and software tools to implement the Green Chemistry Initiatives for the short-term and long-term program needs. Previous posts have indicated various available existing chemical data systems and tools, including Chemical Compliance Systems, the Canadian efforts, and the European REACH program. Use of these types of tools could facilitate implementation of voluntary and/or regulatory programs in the near future as a beginning effort and establishment of a foundation, to be built upon in future developments, meeting the Green Chemistry initiative goals and objectives. One example of a potential use of existing tools is the establishment of a product "green" certification program which would allow consumers to readily identify green products. This type of program is already available via use of Chemical Compliance Systems data tools that can provide an automated "Green" assessment of chemical products which can be readily tailored for use in California. The use of such existing programs can provide efficiency through the avoidance of "re-inventing the wheel" and expanding on proven technologies and / or approaches.

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	Through the procurement and / or contractual use of existing data and software tools, DTSC should establish programs and/or partnerships by which these types of tools and data can be made available to other stakeholders (such as product manufactures, business and private consumers, other government agencies, etc.) on a free or lower-cost basis for the purpose of meeting or promoting the Green Chemistry Initiative goals and objectives.
F-TA-18	Feedback from Albemarle Corporation Toxics by Accident The basic classification of a given material can be addressed as described in the toxic by design section, but the important difference here is that the hazard presented by a material is not associated with the primary chemical, but with by products that are not integral to the materials function. In such a circumstance the opportunity for risk reduction by means of by product elimination should form an important element of ongoing risk reduction strategy. Where risks are unacceptable this has to be a part of the risk management program to bring risk within acceptable levels. Where risk levels are deemed acceptable, continued improvement can still be driven by procurement incentives.
F-TA-19	GMA's Perspective on a Framework for Green Chemistry The Grocery Manufacturers Association (GMA) represents the world's leading food, beverage and consumer products companies. The association promotes sound public policy, champions initiatives that increase productivity and growth and helps to protect the safety and security of consumer packaged goods through scientific excellence. The GMA board of directors is comprised of chief executive officers from the Association's member companies. The $2.1 trillion consumer packaged goods industry employs 14 million workers and contributes over $1 trillion in added value to the nation's economy. GMA appreciates the opportunity to participate in a dialogue on California's Green Chemistry Initiative with California's Environmental Protection Agency (CalEPA) and other interested parties. Our membership includes leading consumer products companies that produce safe consumer products that are protective of human health and the environment while improving the quality of life and protecting the public health against dangerous diseases, infestation, and unsanitary conditions. Green chemistry is sustainable innovation. It is built upon a foundation of companies using hazard and exposure analysis to address safety prior to marketing. It is about moving toward products with improved environmental quality that also improve performance and consumer value to better meet all consumer needs. It uses analytic tools such as life cycle assessment to guide real product improvement and to protect against burden shifting or regrettable substitution with unintended adverse consequences, such as occurred with MTBE. Background Our members are committed to thoroughly evaluating their products for human and environmental safety through rigorous safety-based assessments before they are marketed. Our members provide clear and meaningful labeling on consumer products to ensure that consumers use products in accordance with label instructions. Our members routinely apply green chemistry and green engineering principles in their operations and have been honored with awards for their efforts. The consumer products industry develops products that meet or exceed the safety requirements of all state and federal agencies in the United States and Canada charged with regulating those products, including the California Department of Pesticide Regulation, the California Air Resources Board, other state agencies, the U.S. Consumer Product Safety Commission, the U.S. Environmental Protection Agency, the U.S. Occupational Safety and Health Administration, the U.S. Food and Drug Administration, Health Canada, and Environment Canada. GMA supports initiatives that continue to foster innovation and encourage universities, educational institutions, and industry to partner in developing effective "greener" ingredients that reduce environmental impact. We support company performed safety-based assessments of consumer products prior to the marketing of a product, considering all phases of the lifecycle of a product. Any chemicals management program must be based on sound scientific risk assessment to protect public health and the environment, and we support appropriate use-restrictions for chemical ingredients when those scientific safety-based assessments indicate they cannot be used safely in consumer product or use application. We support initiatives by companies,

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	government and interested parties to promote consumer awareness of the importance of reading and following label instructions for safe product use, storage and disposal. We applaud collaborative efforts to encourage public and private partnerships, with a goal of developing greener products and environmentally responsible ingredients based on life cycle considerations, rather than mandatory and voluntary state labeling programs that endorse green products or programs that stipulate a single third-party certification of green products or numerical ranking. We encourage research that shows opportunities for the use of green chemistry in consumer products, as well as policies designed to overcome barriers to commercial application of green chemistry research and development efforts. We support initiatives that create incentives for innovative companies that develop greener products that are technologically and commercially feasible, and we encourage recognition for companies that develop sustainable business operations, processes and/or products. General Principles We believe that the Green Chemistry Initiative should ensure the safety of consumer products through the use of sound science in the decision-making process. It must foster innovation and encourage the development of new chemistry technologies. The Initiative should be designed to promote products that are technologically and commercially feasible to produce without compromising product efficacy, performance and usability. It should build on existing statutory and regulatory structures, voluntary initiatives and data development efforts. Finally, CalEPA should seek guidance from all stakeholder interests. Key Elements for the Green Chemistry Initiative We respectfully submit that the framework for the Green Chemistry Initiative should include the following elements: (1) A Systematic, Collaborative Process to Address Priority Chemicals: We support California's initiative to move beyond a chemical-by-chemical approach and build a more systematic, scientific and collaborative process to address priority chemicals. As Governor Schwarzenegger recently stated: "I strongly believe there needs to be a systematic way to address these types of concerns where California's scientists can work together with experts throughout the world to evaluate the health effects of chemicals, assess the risks they pose, and ensure that the safety of possible alternatives receives the same consideration." It is eminently sensible for California's collaborative effort to proceed in tandem with ongoing work by other government agencies assessing chemicals. The Canadian Government announced their Chemicals Management Plan on December 9, 2006. Numerous substances that have been in commerce for more than 20 years were assessed against rigorous scientific criteria. As a result of that process, Health and Environment Canada are now addressing priority chemicals as part of the Industry Challenge Program within the Chemicals Management Plan. Since Canada is undertaking this proactive approach for existing substances against the most modern science, we respectfully suggest that CalEPA collaborate with the Canadian government not only on the priority list of chemicals but the program in general. In our opinion, this collaboration would avoid needless duplication, inefficiencies and burdens, as well as take advantage of credible, high-quality scientific work already completed. This will help the government of California to meet its goals in a faster, more cost-effective way. Working with the Canadians and the Plan undoubtedly would foster greater results for the regulatory cooperation agreement for chemicals announced by the President and the leaders of Canada and Mexico this past summer. As part of the agreement signed in Montebello, the three countries agreed to share data, information and safety assessments so that all North Americans would have continued access to safe and effective products with improved sustainability and environmental quality profiles. With California's expertise at the table, collaborating with the agencies involved could accelerate the benefits of this effort across the North American region. As indicated in Governor Schwarzenegger's comment, it is important that California proceed with a science-based approach that focuses on key information, including toxicity and exposure of chemicals and possible alternatives, so that sound safety decisions can be made in the context of

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	scientific risk assessment. This process must be the tool for focusing resources and attention on a limited number of chemicals that are important to evaluate. The process should be collaborative and should include scientific experts in toxicity and exposure from academia, chemical manufacturers, product formulators, and nongovernmental organizations. The manufacturers of the chemicals and consumer products could provide toxicity and exposure/use data to determine whether the uses of “priority chemicals” are safe or should be restricted. (2) Ingredient Communication: Some consumers have expressed a desire to know what ingredients are in the products they use in their everyday life. These consumers are interested in having this knowledge in order to make informed product choices. We support providing accurate information to consumers through ingredient communication. Manufacturers of essentially every name-brand product have programs to respond to the information requests and needs of consumers. For example, we actively work with consumers who call our toll-free numbers or send emails. We are always looking for better ways to communicate. Some third party assessments and information available on the Internet or through literature searches can be inaccurate due to the reliance on sources or on assumptions that may not be as current as the information provided by the manufacturers or industry groups representing the products. Industry has the obligation and continues to improve the methods it uses to communicate product information to consumers, especially in its efforts to ensure the safe and appropriate use of the products. We would like to work with California to implement a means of ingredient communication that would provide consumers with the information they can use to make even better informed decisions regarding the products they use in their homes. (3) Product Safety Assessments: Our members are committed to thoroughly evaluating their products for human and environmental safety through rigorous safety-based assessments before they are marketed. We support the continual improvement of safety assessments and methodologies including conducting life cycle assessments to help understand the health and environmental footprint of products and possible alternatives through their lifecycle. Our members have staff that includes experts in toxicology and environmental science to work on these assessments. CalEPA could work with scientific experts to examine best practices and to develop a toolkit for safety assessment programs and for safety assessments. Companies also could make a description of their safety assessment process available on the Internet. This could help provide context for product ingredient communication. In addition to product safety assessments, companies could adopt programs to ensure the safety of raw materials and packaging, operations, storage and distribution, and the use and disposal of products. (4) Supporting Innovation: The Green Chemistry report argues that there is a need to close the “technology gap” through market-based incentives to support green chemistry. This could include funding for university research grants, scholarships, and similar programs, as well as awards for innovation, tax credits, low-interest loans, and other incentives. These positive incentives should be open to all companies that are innovators and sell products in California -- not simply be limited to companies located in California. * * * * * Chemicals are useful and essential ingredients for many products that protect public health and improve the quality of our lives. We appreciate the importance of a scientific approach based on an evaluation of hazard and exposure information to determine the safety of these products that improve the well-being of the public.

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F-TA-20	Bayer MaterialScience's Comments on California Green Chemistry Initiative At Bayer MaterialScience we share society's values of developing, producing and putting into the marketplace products that are both beneficial and safe for humans and the environment. We respect and support the objectives of Responsible Care® along with sustainable development as a commitment for management and as a responsibility shared by each employee. We at Bayer continue to address green chemistry objectives through innovation and product stewardship. Innovation is essential to driving green chemistry and sustainability in markets such as automotive, green building and alternative energy. Products and their uses are evaluated to help assure intended benefits to society while also protecting public health and the environment. We follow the American Chemistry Council's Responsible Care® program, with a management system that is certified by third-party auditors. We integrate knowledge of potential hazards of chemicals with an understanding of potential use and exposure in our risk management programs. We appreciate the California Green Chemistry Initiative's request for comments on the program and support an approach that addresses the following points: • Look at the chemical information that is already available to California. • Make it clear that the Green Chemistry Initiative process will be governed by a risk-based science approach. • Support an understanding of both the benefits and the burdens of new regulatory proposals. • Consider process technology as part of a green chemistry program. Look at the chemical information that is already available to California: We believe that California should consider existing data and information already available to California and the public before making judgments on additional chemical specific data and information needs. There are existing programs such as the High Production Volume (HPV) Challenge Program and the Extended HPV Program, which have provided valuable toxicology and exposure information that is publicly available. Hazard information from such sources can be used in light of exposure scenarios to evaluate potential risk and ensure appropriate risk management. In addition, the information from the recent evaluation and categorization of chemicals on the Canadian Domestic Substance List (DSL), Canada, should be considered by California. Make it clear that the Green Chemistry Initiative process will be governed by science with a risk-based approach: We believe that the Green Chemistry Initiative must be based on sound science with a risk-based and weight-of-evidence based approach. Objective and reproducible scientific methodologies are the keystones upon which regulatory policy should be based. Everything can be toxic at some level; the key is to minimize potential risks (risk = hazard x exposure). The Green Chemistry Initiative should be based on the principles of risk. That is, minimizing the use of toxics in light of the exposure scenarios, along with considerations of efficiency and economics. Support an understanding of both the burdens and the benefits of new regulatory proposals: To most efficiently use resources, we believe that consideration should be given to existing chemical management systems. Many existing regulatory and voluntary programs promote innovation and advances in chemical technology, govern areas of product life-cyle, and also promote pollution prevention and research into the use of less hazardous substances. We believe that the Toxic Substance Control Act (TSCA) is a comprehensive chemical management statute. Criticisms of the TSCA to protect human health and the environment often overlook the real need for resources to properly administer the statute. Without the proper staffing and financial resources, any regulatory program will have limited effectiveness. Innovation is critical to green chemistry. Rather than imposing regulatory burdens, innovation through green chemistry can be promoted with positive incentives and partnerships. Green Chemistry should be encouraged through the sharing of expertise, financial support for research, information exchange, and public education. Incentives could be offered for companies to pursue and foster Green Chemistry and Green Engineering. Consider process technology as part of a green chemistry program:

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	Green chemistry is an important consideration in efforts that lead to sustainable development, but it is only part of a potential solution. In a broader sense, green chemistry programs should include process technology considerations as alternative chemistry is being evaluated. This technology can have a significant impact on minimizing potential adverse health or environmental effects of a chemical substance. Process technology can reduce both human and environmental exposures to chemicals, for example, through enclosed systems, recycling of by-products, and controlling potential environmental releases. Use of these process technologies can eliminate the need for substitution of critical raw materials. In conclusion, we believe that a green chemistry initiative must be based on sound science, be risk-based, leverage validated existing health and environmental information, and consider engineering and processing technology. We feel that innovation and partnership with industry should be encouraged. Industry should be brought in as a critical stakeholder in this Initiative as it develops. On behalf of Bayer MaterialScience LLC
F-TA-21	Comments from Rohm and Haas Company The overall question of toxics in products has to be viewed against our understanding of what dose response curves look like at low dose. Current assumptions of multi-stage linear extrapolation from high dose toxicological testing may be causing undue concern and mis-direction of public health resources. California should support work to better understand what is happening at low dose and thereby more reasonable setting of quantitative risk guidelines to which products can be designed.
F-TA-22	P&G's Recommendations for Advancing California's Green Chemistry Initiative Procter & Gamble Suggestions The California Green Chemistry Initiative holds a lot of promise for expanding the principles of Green Chemistry, accelerating innovation and creating important health, environmental, social and economic benefits. Through the Conversation with California—workshops, symposia and Blog contributions—it's clear that there is broad interest and excitement about moving the state forward, both in improving protections for the environment and the health of Californians, and in creating a more sustainable future. P&G supports the State's objectives. Here are some ideas that California can consider to advance GCI. Priority Chemicals—California should establish a program to identify, assess and manage priority chemicals based on an evaluation of hazard and potential for exposure - Move quickly by leveraging priorities identified in the Canadian Chemical Management Plan. Create a collaborative effort between California and Canada to accelerate progress in both geographies. - Include a means for adding and deleting priority chemicals based on unique California circumstances. - Leverage the recently assembled U.S. Inventory Update report to provide initial volume, use and exposure information. Identify uses and user industries for the high priority chemicals that raise the greatest concern. Expect producers of priority chemicals and manufacturers with high concern uses to provide hazard and exposure information on those chemicals/uses to the program. - Provide the agency with authority and a due process to establish restrictions for uses of priority chemicals that have unacceptable risks. - Facilitate informed substitution in moving to alternatives for restricted uses of priority chemicals - Organize this overall effort in a collaborative approach involving chemical producers, targeted users/industries, the agency and appropriate academic and other 3rd party experts. - Engage with US EPA and the recently announced Canada-US-Mexico Montebello Agreement to avoid duplication and expedite action on priority chemicals in California and throughout North America. Product Safety Management Systems—California should expect and encourage manufacturers of consumer and commercial products sold in California

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	to employ comprehensive product safety management systems that include: - Assessments to ensure the safety of products prior to marketing; - Rigorous control of production from raw material specifications, to formulation management, to process and quality control; - Safe operations that protect the health and environment of employees and the surrounding community; - Compliance with all applicable product safety, labeling and regulatory requirements including transportation, waste management and product disposal; - Constant vigilance in post market surveillance with rapid response to identified concerns; - Innovation that improves product performance, value and environmental quality based on life-cycle considerations; - Transparency in communicating information about safety management systems and products; and, - Ongoing evaluation and improvement of systems performance. Animal Welfare—In pursuing the objective of the Green Chemistry Initiative to expand toxicology information on chemicals, California should encourage the use of alternatives to animal testing and require testing only as a last resort. - The agency and UC university system could work with other experts to provide assistance on alternative screening methodologies that can be utilized to provide adequate toxicology information for recommendations and decisions about priority chemical uses. Transparency—California should take the lead in expanding the amount and ease of accessing Information on chemicals and product safety. - Expect and encourage manufacturers of consumer products to communicate information about the ingredients in products, either on the package or on the internet at the manufacturer's discretion and with appropriate provisions for protection of Confidential Business Information. - Expect and encourage chemical and product manufacturers to update their MSDS's to the new 16-section ANSI standard and to reflect the latest hazard information from voluntary (e.g. HPV) and regulatory (e.g. Canada CMP) programs. - Encourage companies in important value chain sectors to work together to identify "beyond MSDS" information needs both upstream and downstream and to establish processes for communication to meet those needs. - Leverage California's capability and interest to assemble a chemical information system on hazard, use and exposure from global sources. Stimulate Green Chemistry Innovation—California should prime the pump to initiate early and significant advancements in Green Chemistry and to recognize and reward success. - Provide economic incentives for business innovation in green chemistry. - Provide economic support and incentives for innovation at California's University system: scholarships, research funds, technology licenses, etc. - Focus the above programs on development and commercialization of alternatives for restricted priority chemicals, including for small business application and on innovations that create breakthroughs in performance, value and environmental quality. - Develop a registry in which all stakeholders can document Green Chemistry successes - Develop an extension service through the UC university system to expand reapplication of successes across the potential user community. - Establish an Annual Green Chemistry Recognition program for new chemicals, products and processes and for advances in research, analytical and toxicological methods that best exemplify the objectives of GCI, - Continue the Conversation with California via ongoing workshops, symposia, and other communication approaches to maintain and build on the momentum established in the program to date. November 15, 2007 Contacts: Bill Greggs, greggs.wj@pg.com Pat Hayes, hayes.pl.1@pg.com

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	Green Chemistry Initiative Public Comments Fossil-fuel-based plastic use in our society continues to grow at an exponential rate, creating a plethora of environmental impacts for California, the oceans and, increasingly places like Lianjiao, China (see http://news.sky.com/skynews/video/videoplayer/0,,31200-greenbritain_china_p222,00.html). The State of California has one of the most impressive recycling mandates in the country but I am very concerned about where our recycling, especially our plastic, is going. Most consumers believe that their fossil-based plastic, once placed on the curbside for recycling has been taken care of in a way that renders any potential problems with plastic waste solved. Myself and my colleagues at Green Sangha have been working over the past 2.5 years educating the public regarding plastic waste issues including pollution in the ocean. The central Pacific Gyre contains a plastic waste mass that has been measured to be larger than the state of Texas. Because plastic does not biodegrade, plastic entering the oceans remain there unless it is deposited on a distant beach. Fossil fuel-based plastic has entered the marine food web at many trophic levels impacting countless marine species (birds, salps, marine mammals, etc…please see: http://www.algalita.org/pelagic_plastic_mov.html) Small bits of plastic in the central Pacific Gyre outweighs zooplankton at a ratio of 6:1 (six pound of plastic for every pound of plankton!), according to research published by the Algalita Marine Foundation. Of greatest concern for my organization and me right now is what is happening to our plastic waste once it leaves the US shores not as litter but as commerce. At the link, http://news.sky.com/skynews/video/videoplayer/0,,31200-greenbritain_china_p222,00.html please find some news footage shot by Sky News in the UK. This news story highlights the situation that Californians don't know about and never see. It is the story of the dark side of plastic downcycling that all policy makers need to see, we believe. This short news piece is of great importance regarding plastic policy here in California. The plastic industry continues to repeat the mantra that plastic is fine; we must continue to use it but we need to do a better job recycling. I'd like the Green Chemistry Initiative to first acknowledge that fossil plastic is downcyclable not recyclable. And that most of our fossil plastic waste is being shipped overseas and being handled under conditions that are harming water, air, public health and the land surrounding so-called recycling facilities. In the video workers are exposed to mountains of unsanitary plastic waste. They melt it down and/or burn it; smoke and ash fills the air. Untreated polluted water runs into local streams turning them dark grey; they too are littered with plastic and ash. Workers are subjected to toxic fumes and heavy metals where PVC is downcycled without any idea that their work is dangerous…. Needless to say, there are no health or environmental standards in places such as Lianjiao, China. Our continued embrace of plastic needs to be looked at with a cradle-to-cradle perspective, which requires a close look at what is happening overseas. The Green Chemistry Initiative is for California, but for the initiative to have integrity in cannot be part of exporting waste that is causing great harm overseas. We in California need to develop closed-loop safe and just ways of handling our waste. The current model of exporting plastic to countries such as China needs to be stopped if California is serious about its Green Chemistry Initiative. Andy Peri Green Sangha
F-TA-23	Further information provided: a link to the short online version of the video described above and some articles regarding waste exports to China.

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	on behalf of Andy Peri
F-TA-24	Green Chemistry and Beyond: Sustainability, Safety and Continual Improvement GREEN CHEMISTRY AND BEYOND: SUSTAINABILITY, SAFETY AND CONTINUAL IMPROVEMENT INTRODUCTION Earlier this year, California kicked off its Green Chemistry Initiative with the stated goal of taking a collaborative approach to significantly reduce the impact of toxic chemicals on public health and the environment. The Soap and Detergent Association provides the following comments on behalf of its members so that California may consider new ways to manage chemicals towards the continual improvement of public and environmental health. The Soap and Detergent Association (SDA) is the non-profit trade association representing manufacturers of household, industrial, and institutional cleaning products, their ingredients and finished packaging; oleochemical producers; and chemical distributors to the cleaning product industry (http://www.cleaning101.com/). SDA members produce more than 90 percent of the cleaning products marketed in the U.S. SDA members strive to meet the commitments of a sustainable industry: 1) advancement of social well-being, 2) advancement of human health and environmental quality, and 3) economic growth. Cleaning products have been an integral part of the dramatic advancements in public health and longevity, and the decline of communicable diseases throughout the world over the past two centuries. SDA and its members have been at the forefront of research on the environmental and human-health safety of their products for the past 50 years, and a culture of innovation and continuous improvement among its members has resulted in a robust industry that is a leading contributor to the public health across the country. SUSTAINABILITY Social Sustainability SDA members are committed to contributing to a better quality of life for our consumers, business partners, employees and the communities in which we operate, and to maintaining a high level of product stewardship throughout the chain of commerce. As such, we believe that decisions of preferability and substitution should be based on the comparative life cycle impacts of a chemical and its potential substitute. While a safety-based characterization scheme may focus on toxicity, persistence and bioaccumulation, there are a number of other parameters which are relevant to the sustainable use of a particular chemical in a formulation such as raw material sourcing and carbon footprint. All relevant aspects of sustainability should be taken into consideration for a potential substitution decision. Similarly, any plan to consider substitution of chemicals should require that the efficacy and benefits of that compound be considered as any diminution of efficacy may negatively impact public health and well-being through reduced hygiene and sanitation. Environmental Sustainability Cleaning products are chemical formulations, and generally each ingredient in a formulation will have some measurable toxicity. However, the use of cleaning products generally is well understood, leading to sound characterizations of exposures and risks. SDA members are committed to the enhancement of human health and quality of life through the responsible formulation, production and sale of cleaning products and ingredients, and their proper use. SDA members only market products that have been shown to be safe for humans and the environment, through careful consideration of the potential health and environmental effects, exposures and releases that will be associated with their production, transportation, use and disposal. In determining the safety of cleaning products, toxicity of ingredients to humans and wildlife is studied. Economic Sustainability The cleaning products industry is an important component of this nation's public health infrastructure and a contributor to the nation's economic well being. As such, it is important that the Green Chemistry Initiative not compromise this industry. SDA members are committed to innovating to improve products both in terms of performance and environmental impact. The Green Chemistry Initiative must ensure that product efficacy, performance, and usability are not undermined, and that the ability to innovate is not compromised. In fact, California is uniquely well positioned to foster innovation in

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	Green Chemistry and product formulation. With a strong educational system including world-class research university and a robust high technology sector, California has the means to lead the world in developing and commercializing alternatives to high priority chemicals of concern. The Green Chemistry Initiative should include a significant component related to research and development of alternatives for high priority chemicals which leverages California's intellectual resource. Through such efforts, California could facilitate the development and application of chemicals that will reduce negative impacts to the citizens of California. SUGGESTIONS FOR CALIFORNIA Confirming the Baseline Safety of Chemicals in Commerce In order to affect the impact of toxic chemicals on public health and the environment, the inherent hazards and potential for exposure should be integrated into a risk framework, and risks should be managed appropriately. Currently, there are several national and international programs designed to evaluate and manage the risks of chemicals. California should leverage existing efforts and customize results to meet their needs. For example, in Canada, Environment Canada completed a prioritization exercise of 23,000 chemicals on their Domestic Substances List (DSL) in 2006. Using information from Canadian industry, academic research and other countries' data, Government of Canada scientists worked with partners in applying a set of rigorous tools to the 23,000 chemical substances on the DSL. They were categorized to identify those that were: inherently toxic to humans or to the environment and that might be persistent and/or bioaccumulative, and substances to which people might have greatest potential for exposure. From this exercise there were over 4,000 chemical substances identified as needing further attention, and about 19,000 (over 80% of the total) were set aside as not needing further action based on their hazard and exposure profiles. Among the chemicals needing further attention, 500 were high priority, 2600 were medium priority and 1200 were low priority, and most of the low priority chemicals were eliminated from consideration. Additionally, about 150 of the high priority chemicals were determined to not be used in Canada and were restricted from further use without an evaluation. In the end, Canada has moved forward to consider about 350 high priority chemicals and 2700 medium priority chemicals. California could focus on the 500 high priority substances identified in Canada's program. To address unique circumstances that might exist in California, the State could have a process to add substances to the high priority list, as necessary, based on hazards, uses and exposures to workers and consumers in California. Once the high priority chemicals are identified, use and exposure should be considered to determine whether there are impacts on human health and/or the environment. The State could work in coordination with other North American initiatives (e.g., Canadian Domestic Substances List prioritization, EPA and OECD High Production Volume Chemical programs, Security and Prosperity Partnership (SPP) of North America Regulatory Cooperation Framework) in order to assess the risks of the highest priority chemicals. In undertaking such programs, SDA urges the State to proceed with any chemical assessments in a manner that would avoid unnecessary animal testing. In cases where real impacts exist, risk management strategies should be implemented in order to reduce those impacts, including use-specific restrictions where there are unacceptable risks. Continual Improvement of the Safety Profile of Chemicals in Commerce California can continually improve the safety profile of chemicals in commerce in the State by focusing on the high and medium priority chemicals in use, and using Green Chemistry and other tools to facilitate informed substitution with chemicals having an improved safety and life cycle profile. There are a number of opportunities for California to apply its resources towards traditional Green Chemistry activities. California could leverage the universities in the State and the high-tech business sector towards the development of alternative chemicals for those of the highest priority, and development of alternative manufacturing processes for those with high discharges of hazardous waste. For alternatives identified, there should be a separate Life Cycle Assessment by an outside party, or state-funded Center for Excellence in order to confirm that there is no loss in performance with the alternative, to avoid unintended consequences, and to assist in commercialization. The State also could develop a Cooperative Extension-type program to assist companies in Cradle-to-Cradle product design/formulation and assist in adoption of new alternative chemistries and processes. In order to facilitate informed substitution of high priority substances towards those with a more favorable environmental and human health profile, the

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	State could develop database of chemical alternatives that compares a number of sustainability parameters: performance, price, human health and environmental (e.g., toxicity, bioaccumulation, persistence) including carbon footprint and source sustainability. Additionally, the State could map the flow of chemicals in California using information drawn from existing sources such as EPA's Inventory Update Reporting (IUR), the data received by Canada during its data call-ins for high priority chemicals, and other contributions from the public. In order to assess the performance of these programs and measure the impact of these reforms, the State should monitor metrics that will assess releases of chemicals to the environment and exposure to humans. Increased Transparency and Access to Information on Chemicals in Commerce California could expand access to information on chemicals for consumers, businesses and regulators by leveraging its preeminence in data management and mining in order to organize the world's chemical data. For example, the dossiers for the EPA High Production Volume (HPV) Chemical Challenge program, and the related European program are often difficult to find and the data difficult to extract. By partnering with the information technology sector (e.g., Internet search firms), the State could expand access to chemical information, support its local industry and raise awareness of chemical safety information currently available. Additionally, California could expand product-specific chemical ingredient disclosure for consumer products which currently do not have that requirement. To increase transparency and improve the management of chemicals in the workplace, California should adopt the 16-section Material Safety Data Sheet (MSDS) described by ANSI Standard Z400.1-2004. Recognition and Rewarding Success As California's Green Chemistry Initiative unfolds, it will be important to recognize efforts and reward successes. The State could establish a registry for companies seeking to align their business practices with the Green Chemistry principles and acknowledge their intent. Similarly, the registry could accumulate examples of product development decisions and substitutions that have resulted in reduced waste produced and energy inputs. The registry could be the basis for recognition of successes in reducing impacts from chemical exposures similar to the Presidential Green Chemistry Challenge Award, but focusing on results achieved through implementation of a program or application of a new chemistry rather than development of a new technology. SUMMARY California's Green Chemistry Initiative should emphasize all three components of sustainability: the social benefits of chemicals and products, the economic contributions through innovation and improved performance, and the environmental and human safety. California can confirm the baseline safety of chemicals through a prioritization based on hazard and exposure, assessment of risk, and management of risks including use-specific restrictions where necessary. California can drive innovation, the benefits of products and the continual improvement of the safety profile of chemicals by leveraging the State's expertise, and applying resources to the application of Green Chemistry research and development. California can expand access to information on chemicals in order to improve decision-making by taking advantage of their data management industries to organize the world's chemical data, and by increasing the disclosure of chemical ingredients in consumer products. Once California has implemented its Green Chemistry Initiative, it should recognize the efforts of those industries seeking to apply the principles of Green Chemistry and provide recognition to those that have had notable success.
F-TA-25	The Green Chemistry Initiative Should Consider Voluntary Programs and the Concepts of Sustainable Chemistry Government has not been the sole repository of efforts to promote green chemistry. The Green Chemistry Institute (GCI) was incorporated in 1997 as a not-for-profit entity to promote and advance green chemistry. In January 2001, GCI joined the American Chemical Society (ACS) in an increased effort to address global issues at the intersection of chemistry and the environment. The twelve recognized principles of green chemistry are as follows: The Twelve Principles of Green Chemistry 1. It is better to prevent waste than to treat or clean up waste after it is formed. 2. Synthetic methods should be designed to maximize the incorporation of all materials used in the process into the final product.

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	3. Wherever practicable, synthetic methodologies should be designed to use and generate substances that possess little or no toxicity to human health and the environment. 4. Chemical products should be designed to preserve efficacy of function while reducing toxicity. 5. The use of auxiliary substances (e.g. solvents, separation agents, etc.) should be made unnecessary whenever possible and, innocuous when used. 6. Energy requirements should be recognized for their environmental and economic impacts and should be minimized. Synthetic methods should be conducted at ambient temperature and pressure. 7. A raw material feedstock should be renewable rather than depleting whenever technically and economically practical. 8. Unnecessary derivatization (blocking group, protection/deprotection, temporary modification of physical/chemical processes) should be avoided whenever possible. 9. Catalytic reagents (as selective as possible) are superior to stoichiometric reagents. 10. Chemical products should be designed so that at the end of their function they do not persist in the environment and break down into innocuous degradation products. 11. Analytical methodologies need to be further developed to allow for real-time in-process monitoring and control prior to the formation of hazardous substances. 12. Substances and the form of a substance used in a chemical process should be chosen so as to minimize the potential for chemical accidents, including releases, explosions, and fires. The terms sustainable chemistry and green chemistry/engineering may be viewed by some as interchangeable. Green chemistry is often defined by the twelve principles of green chemistry developed by Anastas and Warner (referenced above). Equally important to the chemical industry are the principles of Green Engineering developed by Anastas and Zimmerman, which highlight the need for processes developed under the principles to be economically feasible. Sustainable chemistry builds upon the principles of green chemistry and engineering by going a step further and integrating economic viability and social benefits. Sustainable chemistry focuses on the end application or service delivered comparing all of the potential options (materials and processes) across the full life-cycle, and not just the process to make a particular chemical substance as with green chemistry and engineering. This requires a much longer term view (decades) than is common today. Also, those products which meet important needs of society are clearly more beneficial from a sustainable chemistry perspective. For example, using plastic to provide water pipe that delivers safe drinking water is more beneficial to society than providing hula hoops. Sustainable chemistry is not only about maximizing efficiency, minimizing risk, and reducing environmental impact, analogous to green chemistry and engineering, it's also about ensuring social benefit and economic viability for the applications and services delivered across the full life cycle of those products. Sustainable chemistry is not an endpoint, but a journey of continuous improvement, that can bring tremendous benefits to society if done well. These voluntary programs should be reviewed to see if some of the mechanisms they employ might have a place in the Green Chemistry Initiative. Clearly voluntary efforts are underway to advance both Green Chemistry and/or Sustainable Chemistry. DTSC may be able to replicate some of the valuable lessons learned in these programs, including adoption of incentives that best motivate greater use of Green and Sustainable Chemistry.
F-TA-26	Making the California Green Chemistry Initiative Workable The California Green Chemistry Initiative (GCI) is an innovative mechanism with the potential to influence the design of products in ways that reduce the use of harmful chemicals and generate less waste and pollution. The objective to create partnerships between industry, the public, and government agencies to bring about this change represents an interesting social experiment. The success of such partnerships will surely rest upon the ability to simultaneously meet the competing needs of all stakeholders. Chemical Compliance Systems, Inc. (CCS) believes we have unique resources that can effectively assist California result in successfully establishing GCI partnerships.

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	CCS has compiled the largest and most accurate relational hazardous chemical/product and regulatory databases in the world over the past 22 years. These unique databases have been derived from over 1,000 sources and are currently comprised of approximately 75,000,000 data elements for 210,000 chemicals, 350,000 products and munitions, and 650 local, state, federal, international and nongovernmental organization regulations. These databases are maintained current, expanded on a daily basis, and are constructed to facilitate utilization of discrete elements in a wide spectrum of analytical compliance systems. CCS has currently developed 13 nonmunition and 10 munition Web-based analytical compliance software modules that utilize different elements from these databases and could immediately be implemented, or easily be customized, to support GCI requirements/needs. In addition, CCS has developed eight detailed concepts that will apply to more broadly defined GCI considerations. CCS has been working to “green” products and the environment for nearly 10 years. We currently have four separate, but equivalent, Web-based “green” analytical compliance systems for chemicals, products, processes and munitions. Each of these four modules utilizes the same 43 specific ecological, health and safety criteria to quantitatively evaluate the “greenness” of a chemical, product, process (including wastestreams), or munition. Each of these systems also includes alternative product/process constituent chemical data tables to facilitate the selection of a less harmful ingredient. In combination, the “green” product/munition and process modules provide a complete life cycle (i.e., “cradle to cradle”) analytical capability. Each has product design and evaluation capabilities that enable chemists/engineers to design “greener” products/processes upfront, and acquisition, regulatory and ecological/health/safety professionals to assess, or compare, the “greenness” of the overall product/process (wastestream) to the level of detail they require. Each of these modules also simultaneously identifies the regulatory impact of the overall product/process, parts or components, or individual constituents. These tools will enable California regulatory agencies to partner with industry and the public to establish objective and quantitative “green” standards, or performance measures, for products and processes that can be incrementally increased over time and apply fairly to both small and large companies. The utilization of harmful chemicals will be reduced and less waste and pollution will be generated. The “green” standard will be a known, level playing field for industry, and the result will be greater protection for workers, the public, and for the environment. These “green” capabilities have also been incorporated into a Web-based Chemicals of Concern module that can quantitatively rank the concerns for a chemical/product inventory at a facility, thereby focusing alternative chemical acquisition, or research, on the worst offenders first, effectively accelerating pollution prevention. CCS regulatory compliance capabilities draw upon our List of Lists data that currently includes 650 state, federal, international, and nongovernmental organization lists and associated data. Our Web-based compliance capabilities are available as standalone modules, or incorporated into other analytical tools (as described above). Compliance assessments can be applied to facility inventories, products/processes, waste classification, and/or CERCLA/RCRA site remediation. CCS is scheduled to develop a new, Web-based Health Risk Assessment module for the U.S. Army that will utilize our existing, Web-based Conceptual Site Model, and simplify RCRA Subpart X and CAA Title V Permit applications. Finally, CCS has conceptualized a Chemical Homeland Security System (C-HoSS) that will utilize existing facility chemical/product inventories to quantitatively rank resident chemical hazards, security risks and mortality risks by location at the facility. These three reports quickly prioritize inventory concerns. Entry of container accessibility constraints (i.e., storage conditions that control access) for chemicals of greatest concern enables C-HoSS to rank container vulnerabilities and identify accessibility requirements to nullify all vulnerabilities. C-HoSS concern levels are made proportional to the Homeland Security Advisory System daily risk levels. C-HoSS addresses all four levels in an effective security program (i.e., vulnerability assessment, corrective strategy, third party verification, and management system incorporation). C-HoSS will be a good tool for effectively eliminating terroristic chemical vulnerabilities at a facility. In addition, C-HoSS could have direct utility for preparation of California permit-required Security and Emergency Response Plans. Implementation of C-HoSS across the entire State of California can be accomplished “free,” utilizing a state grant for “equipment” from the Department of Homeland Security. CCS hereby offers to provide a remote demonstration of our existing Web-based capabilities and detailed concepts, at no charge, to any parties interested in their potential utilization in support of the California GCI, to achieve corporate “green” objectives, or to utilize in “green” product acquisition.

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F-TA-27	Measuring the Greeness of Products My name is George Kopcsak. I am the former Deputy for Munitions in the Office of the Secretary of Defense. During that time efforts were initiated to accelerate the demilitarization (DEMIL) of approximately 1 million tons of old, outdated, unstable and/or incompatible munitions in our nation's stockpile. Initially this was accomplished through open burn and open detonation techniques. More recently there has been much focus on more environmentally friendly means to destroy munitions or to recycle the components. Some of this work is done within the state of California. Within the past decade a small business organization, Chemical Compliance Systems (CCS), has developed a metric to determine the environmental impact when differing DEMIL techniques are utilized. This metric is called the Green Munitions Analytical Compliance System (G-MACS) and was sponsored and initially funded by the US Army. I'm happy to say that this tool now exists on the web. Since this tool evaluates the ecological, health and safety risks associated with munitions by breaking each down to the chemical level I have learned that the tool can also be used by munitions designers and producers to evaluate the environmental impact of specific chemicals used to make the devices. The designer now has a tool to change specific components within a munition design and determine its positive impact on the "Greeness" of the design. The idea can now be carried forward to look at designing munitions to ease the environmental impact of its anticipated DEMIL 20 years down the road. Since CCS has focused on munitions at the chemical level they have been able to broaden their "compliance system" tools looking at any and all products being designed, produced, or destroyed as long as the chemical composition is known. This looks like a good fit with the California Green Chemistry Initiative. I believe that you should seriously consider its use. As a final note, the web-based CCS tools (G-MACS, GP-CAS, and G-MACS) appear to have the capacity to look at chemical compatibility issues related to their close proximity with a product design. This may well become important when one considers the environmental impact of munition/product aging or temperature cycling. Please give these tools a look.
F-TA-28	Dow Chemical's Comments on Chemical Management Systems The Dow Chemical Company (Dow) appreciates the opportunity to provide additional comments on a recent discussion initiated by the California Environmental Protection Agency on chemicals management policy. As a company providing products and services in over 175 countries, we comply with a broad range of chemical management policies and programs. Dow supports a consistent, coordinated regulatory environment for products at global, national and regional levels to complement industry voluntary efforts and to ensure a level playing field. Where new regulations are required, they should be based on established scientific risk assessment and risk management principles – predictable, flexible and capable of responsibly addressing society's economic, environmental and safety requirements. We recognize that regulatory systems will inevitably vary by country since they must work effectively within the broader statutory and regulatory framework for each country. Nevertheless, we generally support broad regional programs that provide the greatest consistency and uniformity for the industry as a whole. As a result, Dow is not an advocate for any particular program. Instead, we have developed a set of principles for effective chemical management programs. As governments select specific legislative or regulatory approaches to product safety or chemical control policies, we believe that certain principles should be adhered to, and we present them below. on behalf of Dow Chemical Company

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F-TA-29	BSEF's Chemical Policy Recommendations The Bromine Science and Environmental Forum (BSEF) is pleased to offer the following recommendations to the California Department of Toxic Substances Control (DTSC) for your consideration in developing and implementing the Cal-EPA Green Chemistry Initiative. Summary: The guiding principle for this proposal is that it relies on successful management of chemicals already in the marketplace according to their characteristics and actual uses, rather than simply banning substances. This focus recognizes the important difference between risk and hazard, i.e., that hazardous substances properly managed may not pose actual risks, and would create a system that is based on successful management of indentified risks, as opposed to establishing prohibitions based on potential hazard. on behalf of the Bromine Science and Environmental Forum (BSEF)
F-TA-30	Real risk There was a recent article in the Detroit Free Press which got the point of risk—hazard PLUS exposure—and then ignored it. It reported the release of a study by activists that indicated all (35) test subjects had certain chemicals in their body “though none at levels posing immediate health concerns”. The story later quotes an activist stating that “The point is not the levels….” Well of course it is. Everything is harmful at some dose level. Any new chemical regulatory program has to revolve around not only the ability to detect ever smaller levels of chemicals but at what level the presence of a chemical poses a real risk to health. Some of this information is known or will be known as more testing is done for other programs inside and outside the US. There may be gaps in the ongoing range of testing unique to California and perhaps the state could identify those gaps and establish a targeted risk assessment program to fill them. Setting some priorities based on real science—not political science—and then assessing real risks makes sense. If such risks are identified, there are a number of ways to manage those risks, ranging from employing green chemistry innovation to reduce chemical presence in and exposure from products, to green engineering to reduce exposure from manufacturing processes to, in extreme cases, outright restrictions on specified chemical use. Green chemistry innovation has an inherent role to play in reducing risk and improving products that enhance our quality of life. But the real risks must first be identified.
F-TA-31	Automated, Web-Based Assessment of “Green” Chemicals, Products and Processes for Procurement Rutgers University purchases thousands of chemicals and products for use in hundreds of buildings throughout our three campuses. We have implemented comprehensive acquisition processes to assure that the products we purchase are manufactured and distributed in compliance with all applicable laws and Rutgers standards. In the past six months, I have become aware of the Web-based “Green” Product Compliance Analytical System (GP-CAS) and the “Green” Process Analytical Compliance System (G-PACS) developed by Chemical Compliance Systems, Inc. (CCS). These two, quantitative, Web-based systems have been incorporated into a third party cleaning product certification program by the Chlorine Free Products Association (CFPA). Together, GP-CAS and G-PACS evaluate the entire life cycle of a product. Rutgers University is currently in discussions with CFPA and CCS about the possibility of incorporating these capabilities into our chemical and product acquisition processes. California may find these existing Web-based capabilities applicable to the objectives of your Green Chemistry Initiative. They certainly have the potential to achieve a voluntary product certification program that could increase the application of available chemical hazard information in a way that reduces labor and cost requirements for both the State and industry, while increasing the protection of the public and the environment.

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F-TA-32	Dow Chemical's Comments on Educational Programs The Dow Chemical Company (Dow) is pleased to provide the attached paper on the role educational programs could play in California's Green Chemistry Initiative (GCI). We have appreciated the open, collaborative environment utilized for this process and have taken advantage of opportunities to participate in a variety of ways. Attached is a brief paper on educational programs where Dow has been engaged with the objective of improving science education and understanding of sustainability. This is intended to catalyze DTSC's thinking about the role education can play and the types of programs to consider. Dow believes that education must play a key role in California's Green Chemistry Initiative for the effort to reach its full potential. on behalf of the Dow Chemical Company
F-TA-33	Understanding TSCA Sections 4 and 6 At several of the Green Chemistry Initiative stakeholder meetings held over the past few months, and in several entries in the "Conversation with California," the U.S. Federal Toxic Substances Control Act (TSCA) has come under attack. Some have suggested that the law provides no basis for California to assume that health and the environment have been protected from unwanted or unnecessary chemical exposures. In fact, some say that the U.S. Environmental Protection Agency (EPA) is unable to ban chemicals. California's Department of Toxic Substances Control (DTSC) is going to make recommendations on chemical regulatory matters as a result of the Green Chemistry Initiative. Some of those recommendations may include additional regulatory programs, actions that the legislature should consider, and some will likely be related to how the state drives a "green chemistry" approach through policy and the marketplace. As far as I know, no one is suggesting that California simply rely on the U.S. EPA and TSCA when it comes to chemical regulatory decisions. But it is important that Californians understand that the Toxic Substances Control Act provides an effective chemical management system, so that the state does not duplicate effort or waste scarce resources. Some of the misperceptions about TSCA involve EPA's testing authority under Section 4. Some claim that the law imposes too great a burden on the agency, making it difficult for EPA to justify issuing test rules. The truth is EPA only needs to meet a modest burden to support a test rule on a chemical. The law only requires EPA to show that a substance MAY present an unreasonable risk, or MAY reasonably be anticipated to enter the environment in substantial quantities, or that there is or MAY be significant or substantial human exposure. EPA has even said that when it considers whether a chemical "may present" a hazard, it does not require definitive scientific data, but of necessity looks to reasonable scientific assumptions, extrapolations, and interpolations. EPA has even stated that it only need to establish that exposure MAY arise because of activities associated with the manufacture, use, etc. of the chemical. Federal courts have ruled that EPA can rely on the mere POTENTIAL for human exposure in deciding whether a chemical "may present an unreasonable risk." Section 6 of TSCA gives EPA authority to regulate the manufacture, processing, distribution, use, or disposal of a chemical if the agency has a "reasonable basis" to believe the chemical "presents or will present an unreasonable risk to health or the environment." Section 6 identifies various regulatory options—from an outright ban to warning and labeling requirements—and provides that EPA may impose one or more of the listed requirements "to the extent necessary to protect adequately against such risk using the least burdensome requirement." That was Congress' way of telling the agency to take the most efficient regulatory approach consistent with the potential threat to health and the environment. When acting under Section 6, EPA must, among other elements, take into account the health and environmental effects of the substance, the magnitude of exposure, the benefits of the substance, the availability of substitutes, and the reasonably identifiable economic consequences of the proposed rule. Some say that EPA can't regulate effectively under Section 6 because of a federal court decision that overturned an EPA ban on certain asbestos-containing products. Critics like to say, "If EPA cannot ban asbestos, then what can it ban?" The truth is that EPA's failures in the asbestos regulation

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	were not deficiencies in the statute, they were failures in implementation. Simply put, EPA did not do what Congress told it to do. The fact is, EPA has used Section 6 rulemakings since the asbestos case was decided, albeit not very frequently, largely because TSCA provides multiple authorities for EPA to achieve its desired risk management results. TSCA critics want to suggest that these perceived failings in the federal statute should persuade California that the state must step in to correct these "deficiencies," by establishing its own chemical regulatory system, among other approaches. The fact is, TSCA is protective of public health and the environment. There may well be important opportunities to improve the timing, quality and transparency of EPA's chemical management decisions, and important opportunities to enhance the level of cooperation and coordination between the California and U.S. EPA. Which leads back to one of the fundamental questions that the Green Chemistry Initiative needs to grapple with—what is the problem that needs to be addressed?
F-TA-34	In claiming that TSCA Sections 4 and 6 work well and are easy for EPA to use, Mike Walls of the American Chemistry Council (ACC) omits or glosses over key aspects of what EPA must do to use these authorities. I address some of these below. But first consider that the real proof of the effectiveness of these provisions is, as they say, in the pudding: • Over the 30 years TSCA has been in effect, EPA has succeeded in issuing test rules or enforceable consent orders under Section 4 for fewer than 200 of the many tens of thousands of chemicals that have been in commerce over that same period. • Over that same period, EPA has succeeded in restricting only five chemicals (and then, only certain uses or occurrences of them) using its Section 6 authority: 1. PCBs (accomplished through an additional statutory mandate); 2. fully halogenated chlorofluoroalkanes used as propellants in aerosol spray containers (superseded by a ban under the Montreal Protocol); 3. the removal for disposal of certain wastes containing dioxin at a specific site in Arkansas; 4. asbestos, but limited to products no longer in commerce, because the initial rule was vacated by U.S. courts after legal challenge (see more below); and 5. hexavalent chromium-based water treatment chemicals for use in comfort cooling towers. Here's some of what Mike left out in his discussion of TSCA Section 4 test rules: To require testing of a chemical under Section 4, EPA must issue a rule using full notice-and-comment rulemaking. It can do so only if it makes a number of findings, not just one as Mike claimed. EPA must find, based on sufficient evidence, that: • the substance "may present an unreasonable risk," based on evidence of more than a theoretical risk of exposure, OR: • it is or will be produced in "substantial" quantities and either: o it is entering or may enter the environment in "substantial" quantities, or o there is or may be "significant or substantial" human exposure to the chemical, AND: • insufficient information exists to assess potential risk, AND: • testing is necessary to develop the needed data. Making the latter two findings is non-trivial; each requires substantial time and resources and is frequently the basis for challenges by industry (ACC members among them) during the comment period for a proposed rule, and sometimes via lawsuits brought against the Agency after a final rule is issued. EPA itself has noted that using its Section 4 authority is difficult and imposes substantial burdens, for a number of reasons. In practice, EPA says it

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	rarely has enough information to make the “may present an unreasonable risk” finding, and instead is usually forced to rely on making the exposure-based finding. But EPA reports that obtaining the requisite exposure information needed for rulemaking is particularly difficult. EPA also indicates that finalizing rules under Section 4 can take from 2 to 10 years and require the expenditure of substantial resources – resources that are in increasingly short supply as its budget has been declining. (EPA provided these comments to the Government Accountability Office, and they are discussed in GAO’s 2005 report, Options Exist to Improve EPA’s Ability to Assess Health Risks and Manage Its Chemical Review Program, pp. 25-26, at http://www.gao.gov/new.items/d05458.pdf, and GAO’s 1994 report, Toxic Substances Control Act: Legislative Changes Could Make the Act More Effective, pp. 45-47, available at archive.gao.gov/t2pbat2/152799.pdf.) Two examples: • EPA has succeeded in issuing one test rule covering only 16 of the more than 250 unsponsored chemicals under its voluntary HPV Challenge Program. That rule took more than 5 years to promulgate. Proposal of a second rule that will cover only about 40 more unsponsored HPV chemicals is already years late. EPA will not be able to require testing for many of these unsponsored chemicals because it cannot make the requisite findings. • In 1991, OSHA identified 658 chemicals for which it needed data on dermal (skin) absorption due to potential worker exposure, and requested that data be developed for them using a relatively inexpensive in vitro test. OSHA cannot itself require companies to test chemicals, and must instead request that EPA do so using its Section 4 authority, as it did in this case. Eight years later, EPA proposed a test rule covering 47 of these chemicals, because these were the only ones for which EPA could make the required Section 4 findings. This proposed rule was heavily challenged by industry, with the result being that the final rule covered only 34 chemicals and was not issued until 2004 – 13 years after identification by OSHA of many hundreds of chemicals for which it needed the data. As for TSCA Section 6, Mike’s rendition of the asbestos saga reflects what has become a fashionable storyline of late among some in the chemical industry: He essentially resorts to “blaming the victim” – in this case EPA – by claiming the agency simply didn’t do a good job. In fact, EPA spent over a decade and millions of dollars developing the Section 6 rule, in the process compiling a 45,000-page record, making it one of the most extensive and expensive rulemakings in EPA history. (For more balanced views of the history of Section 6, see, for example: Carnegie Commission on Science, Technology, and Government, Risk and the Environment: Improving Regulatory Decision Making, 1993, available online at www.carnegie.org/sub/pubs/science_tech/reg.txt; and Lisa Heinzerling, Testimony Before the Subcommittee on Environment and Hazardous Materials of the Committee on Energy and Commerce, U.S. House of Representatives, July 13, 2004, at www.law.georgetown.edu/faculty/Heinzerling/Testimony/POPs_Testimony_ July_2004.pdf.) This “blame the victim” argument also demonstrates considerable chutzpah on Mike’s part, since of course groups like ACC and its members stand at the ready to challenge any rule EPA does manage to propose or finalize. Here’s what EPA is required to assess and the findings it is required to make under TSCA Section 6 to control any chemical in commerce: It must first find that the chemical “presents or will present an unreasonable risk of injury to health or the environment.” To do so, EPA must evaluate not only health and environmental effects and exposure, but also the benefits of the chemical; the availability of substitutes; and the economic and social effects of the rule it proposes, including impacts on the economy, small businesses and innovation. EPA must prepare analyses of hazard and exposure, conduct a risk assessment, develop a substitution analysis for each use it proposes to restrict, and provide a full economic (cost-benefit) analysis. Then it must demonstrate that the proposed control is the least burdensome it could have proposed. Finally, it must demonstrate that no other statute could address the concern. EPA must also develop and finalize its regulation through full notice-and-comment rulemaking. Is it really any wonder EPA has given up trying?

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F-TA-35	Toxics In Products By Accident We know unwanted toxics can be present in products—we need look no further than recent attention on imported toys with lead-based paint. Short of erecting additional physical or regulatory barriers to the entry of products that may contain unwanted toxics—such as costly and burdensome testing regimes—what can California do in the context of Green Chemistry to prevent the accidental contamination of a product by a toxic? Unwanted toxics in a product can be the result of several factors. The unwanted toxic may exist in a raw material sourced well up the supply chain, it can arise from the manufacturing process, develop between the time of manufacture and the time of use (as in food spoilage or chemical reactions caused by light, heat, oxygen, or radiation), or it can result from an inappropriate product or raw material choice by a manufacturer or from intentional adulteration. The development and use of products standards and product-chain commitment to quality and purity can eliminate many of these concerns. While not every process needs the same level of quality, a material used directly in a consumer product may need to adhere to different standards than an intermediate or reactant in a process with many additional downstream process steps. California's Green Chemistry Initiative might well identify a few key product areas, and work with the affected industry sectors to either promote existing standards (and many such standards already exist) or develop new ones. Moreover, it is critical that there be an understanding of what is the unwanted toxic material? The chemical identity of an impurity can be a strong leg up in eliminating it. This argues for funding and improving research in new analytical methods for detection and quantification. If an impurity can be traced back to synthesis conditions, for example, adjusting the synthesis can help prevent the generation of some unwanted material in the first place. It's important to note, however, that virtually every synthesis requires an isolation step if the material is to be delivered as a pure product. Every chemical reaction generates some by-products, especially when analyzed at parts per billion or parts per trillion levels. To put this in perspective, one drop of water is 1 ppb of an Olympic-size swimming pool, and a part per trillion is a million times less than one part per million. It would be unrealistic to expect that end-of-pipeline purification methods could ever be eliminated, particularly as our ability to detect materials improves. Again, support for key process-related research could yield important new means to reduce the presence of unwanted toxics due to synthesis. Just as for toxics present in a product by design, the question of how much of a toxic is present by accident is relevant in determining what, if anything, can or should be done at the policy level. In short, dose matters, as does exposure. Receiving a dose of a chemical from a product depends not only on the identity and concentration of the chemical and the product, but on whether the toxic is chemically bound in or on the product. For example, polymers typically have such a large molecular weight, and are so tightly bound to other polymer units, that they are generally not biologically active or diffused. Inherent toxicity or other chemical properties is a necessary but insufficient measure of the risk associated with any material. It must be recognized that the product itself and its use pattern can be a determining factor as well. For example, a chemical contained in a hydraulic system versus one that is applied to the skin versus one eaten present dramatically different exposure scenarios. California might decide to focus its support for research and development on identifying particular risks, and risk reduction measures, in areas where exposure potential is particularly acute or poses special concerns (e.g., the workplace or potential exposures to children). By definition, an "accident" is an unintended result. And while unintended results cannot be eliminated, approaches to minimize the likelihood of their occurrence are possible without onerous regulatory constraints. California's Green Chemistry Initiative can help define toxics of particular concern and the risk parameters associated with them to set the bar for product performance, and can further help promote diligence on the part of the manufacturers and marketers to comply with appropriate product standards.

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F-TA-36	Thoughts on Fostering Product Stewardship The Consumer Specialty Product Association's (CSPA's) members are committed to manufacturing and marketing safe products which are protective of human health and the environment while providing essential benefits to consumers. To demonstrate this belief and practice, in 2001, CSPA initiated our Product Care program. CSPA's Product Care program is a stewardship program for the consumer and institutional specialty products industry where participating companies have agreed to go beyond government regulations in emphasizing health, safety and environmental concerns by carefully designing products, purchasing raw material and packaging, operating safe manufacturing facilities, promoting safe storage and distribution, providing useful product information, answering consumers questions and anticipating product disposal needs. CSPA believes that these types of product stewardship programs should be considered as frameworks for programs developed under the Green Chemistry Initiative. Product Care provides a framework for companies to identify and commit to stewardship principles, share ideas and information and benchmark better performance. Participating companies have pledged to develop management principles for each of seven areas in a product's life cycle from development in a research facility through product use and disposal. In doing so, Product Care participants commit to the following concepts: • We will strive to improve our efforts to protect and reach out to our employees, our customers, the community and the environment, as they are affected by our products and operations. • We will seek and value public comment regarding our products and operations. • We will provide information on safe and effective use of our products, as well as their health and environmental risks, to consumers and other affected stakeholders, encouraging them to partner with us in the appropriate use and disposal of our products. • We will, through CSPA, work with government and other stakeholders in the ongoing review and development of responsible laws, regulations and industry practices to help safeguard the home, workplace, community and environment. • We will promote our values to our contractors and other business partners. • We are committed to the sustainability of our environment and economy, and will work in partnership with governments and other stakeholders to encourage sustainability. 1. Product Design • We will independently seek to design products, packaging and labeling that are appropriate for the intended uses, and seek to minimize potential harm to our employees, customers, consumers and the environment. • We will have our products evaluated for health and safety in an effort to identify the consequences of potential exposures. 2. Raw Material, Package and Service Supply • We will have an internal process for our independent selection of raw material, package and service suppliers to promote our product stewardship objectives. • We, as suppliers, will share our expertise and information to assist our customers in using our materials and services safely and effectively in their operations. • We, as formulators, will make full use of the expertise and information of our suppliers to help us use their materials and services safely and effectively in our products and operations. 3. Manufacture and Production Site Management • We will have systems in place to identify potential risks to our workers, the community and the environment presented by our operations, and design prevention measures to manage, reduce or eliminate those risks. • We will have emergency response programs for our facilities. 4. Product Storage and Distribution

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	• We will establish and make available procedures for the handling, storage and distribution of our products to protect personnel, property and the environment. • We will have an emergency response plan to address the risks associated with our handling, storage and distribution. 5. In-market Support, Incident Evaluation and Follow-up • We will support dissemination of safety related product information regarding routine use of our products that is accurate, complete and in context to the inquiry or concern. • When product-related incidents occur, we will have systems in place to minimize adverse effects, assist our consumers/customers and provide needed information. • We will strive to influence product and label design as well as develop educational messages on safe and responsible product use based on information regarding unintended events and other types of exposures involving our products. 6. Consumer Education and Outreach • We will support public education programs that promote the safe and effective use of our products, and that help consumers put exposure and toxicity in proper context with hazard and risk. This can be done through programs of CSPA and the Alliance for Consumer Education (ACE). • We will provide appropriate training materials when necessary to assure the proper and safe use of our products that are intended for commercial, institutional or industrial consumers. • We will communicate appropriate environmental, health, safety and efficacy information, as well as warnings, to employees, distributors, and consumers, and ensure that labels, labeling, bulletins, material safety data sheets, and other appropriate product information, are designed to be accurate and not misleading. 7. Product Disposal • We will strive to make our products and packages compatible with typical municipal solid waste or sewage handling systems, encourage recycling of our products where recycling exists, and support other forms of waste minimization. • We will support programs of Integrated Waste Management (IWM) in communities, recognizing the distinct roles of manufacturers, retailers, governments, and consumers in the cost-effective management of waste. Stewardship did not begin when CSPA's Product Care program was initiated in 2001. Responsible companies have long followed policies promoting safe products that provide important health benefits while not adversely affecting the environment. CSPA believes it is vital that these types of product stewardship programs and companies that participate in these programs be recognized and fostered through any program developed under the Green Chemistry Initiative.
F-TA-37	Stimulating Green Chemistry "Green Chemistry" is an intellectual framework that aligns technology innovation with improvements in the health and environmental "footprint" of materials used in our society. It requires inter-disciplinary collaboration among a variety of experts in chemistry, toxicology, and environmental science that work in business, government, and academia. Government cannot, and should not, dictate by statute or regulation precisely how this process for innovation and collaboration should occur. Importantly, a "Green Chemistry" program, in and of itself, should not be picking "winning" or "losing" products. Instead, it should be removing barriers and creating objective tools to allow companies to create new products and enable consumers to recognize and choose them. According to a March 28, 2002, publication of the Organisation for Economic Co-operation and Development (OECD) (of which the United States is a member) entitled, "Need for Research and Development Programmes in Sustainable Chemistry" (available at http://www.oecd.org/dataoecd/9/55/2079870.pdf), "For government, sustainable chemistry is a non-regulatory way of making regulations work more effectively." OECD at 15.

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	Member companies of the American Chemistry Council (ACC) are leaders in Green Chemistry and Green Engineering in their operations and have been honored for their efforts (e.g., see http://www.epa.gov/greenchemistry/pubs/pgcc/past.html for a list of EPA Presidential Green Chemistry Challenge winners). Our members view both the American Chemical Society's (ACS) Green Chemistry Principles and the ACS Green Engineering Principles as useful approaches to resource efficiency, pollution prevention, and safety. These principles, however, were never intended to be applied as government mandates. In fact, prominently displayed on the home page of the Green Chemistry Institute is the statement: Green Chemistry differs from previous approaches to many environmental issues. Rather than using regulatory restrictions, it unleashes the creativity and innovation of our scientists and engineers in designing and discovering the next generation of chemicals and materials so that they provide increased performance and increased value while meeting all goals to protect and enhance human health and the environment. So, how can California encourage Green Chemistry rather than attempt to mandate it? Several actions may be taken to stimulate Green Chemistry in California and the United States broadly. For example, government can and should provide encouragement for Green Chemistry collaborations through the sharing of expertise, financial support for research, information exchange, and public education. In fact, a variety of federal agencies (including EPA and DOE), companies, professional associations such ACS, Non-Governmental Organizations (NGO), and universities are already working together to encourage Green Chemistry strategies. Additionally, government should consider offering incentives for companies to pursue and foster Green Chemistry and Green Engineering to help ensure these products/technologies can become economically viable and gain initial access to a competitive marketplace. These incentives might include tax incentives, low interest loans, awards, and marketing exposure. I. Education and Research/Development Industry is always working to drive down production costs. For specialties and fine chemicals, the synthetic chemists working in developing these materials have to know how to ask the Green Chemistry questions. This stands squarely in the realm of science education, especially in schools of chemistry. Not only do chemists and others involved in chemistry need to understand toxicology, but they also need to better understand the interaction between health and environmental protection, toxicology, and price. It is therefore essential that California support education in the methods and principles of Green Chemistry for all its state colleges and universities (and in its high schools and vocational schools, as appropriate). Anywhere that chemistry is taught, toxicology and Green Chemistry should also be taught. Additionally, California should encourage innovative research in Green Chemistry and Green Engineering. Research funding into new Green Chemistry methods is always welcomed by colleges, universities, and others, and should be an important part of any Green Chemistry program. According to the OECD (again referring to their March 2002 publication): Governments can promote sustainable chemistry R&D…by establish[ing] and fund[ing] programmes on sustainable chemistry R&D. … In addition, parts of industrial programmes are often supported by government funds. Governments, in general, can provide funds for basic and pre-competitive research. …Practically, governments can orient sustainable chemistry R&D programmes by adjusting the distribution of funds for fundamental and applied research or by commanding competitive and targeted funds depending on policies. OECD at 15. II. Incentives To further stimulate Green Chemistry and Green Engineering, California should consider the following incentives: (1) awards like EPA's Green Chemistry Challenge (see http://www.epa.gov/greenchemistry/pubs/pgcc/presgcc.html for more information); (2) tax incentives/subsidies/grants/low interest loans for research and development; and (3) marketing exposure for Green Chemistry processes and products. For example, when California purchases chemicals for state contracts, it could decide to pay a modest premium for a set period of time for new "green materials" that show promise. The goal of this subsidy would be to help a new material achieve greater economies of scale, but avoid locking in an

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	inefficient permanent subsidy. California could additionally make capital available to companies at preferential terms, whether via grant or lower interest loans, to encourage Green Chemistry and Green Engineering manufacturing process development. And California could also consider a marketing program (perhaps akin to the “California cows” and dairy ads currently on television) whereby the state would promote companies that are actively engaged in Green Chemistry and Green Engineering, and products that are the result of Green Chemistry and Green Engineering. The OECD suggests: [G]overnments can facilitate the consideration and application of sustainable chemistry R&D by supporting efforts which aim at educating and informing industry and the general public of the importance and benefits of sustainable chemistry. One possible role for government would be to identify incentives and disincentives for the promotion of sustainable chemistry and to use this information to modify or develop their policies accordingly. When appropriate, the use of incentives, such as a reduction in taxes or the use of subsidies, can be an effective way of supporting R&D by academia and industry in the field of sustainable chemistry. … It is essential that any sustainable chemistry technology or product be competitive in the marketplace, at least in the long term. However, some of those technologies, even if they are beneficial in the long term, will not be able to survive economically without incentives. Economic incentives, such as subsidies or tax reductions, could be effective in these cases. OECD at 15 and 17.
F-TA-38	A Modern Chemicals Policy For California CALIFORNIA MEDICAL ASSOCIATION A MODERN CHEMICALS POLICY FOR CALIFORNIA (2007) Introduced by: San Francisco Delegation Whereas, the state, national, and global scale of industrial chemical production is immense and is expected to grow four-fold by 2050, and the chemical industry is an important industry with wide contributions to health and human development; and Whereas, ever-expanding research confirms that many chemicals that are useful to society are also known to be hazardous to human biology and health, particularly in utero and in developing children; and Whereas, for new and existing medications, the Food and Drug Administration has long required pre-approval evaluation of safety as well as efficacy, and many industrial chemicals with known impacts on human biology are present in human bodies at levels similar to active doses of medications; and Whereas, numerous other nations including Canada and the European Union are adopting more proactive health-oriented chemicals policies, based upon scientific knowledge, assessment, and accepted public health principles; and Whereas, there are long-standing deficiencies in the federal regulation of industrial chemicals, most notably in the Toxic Substances Control Act (TSCA), as confirmed by the National Academy of Sciences and others, and the University of California documented in a 2006 report to the California Legislature that TSCA's deficiencies are important and can be remedied; and Whereas, these problems include the projected appearance of 600 new hazardous waste sites each month in the U.S. over the next 25 years; the appearance of hundreds of industrial chemicals in human tissues and fluids, including those of infants; and the development of chronic diseases caused by chemical exposures on the job among 23,000 California workers each year; and Whereas, the American Public Health Association's leadership has recently endorsed a policy titled "Calling on the U.S. Congress to restructure the Toxic Substances Control Act and implement a modern, comprehensive chemicals policy", to be considered for adoption at the annual APHA meeting in November; Therefore, be it Resolved: That the CMA calls upon the State of California and United States to implement a modern, comprehensive chemicals policy in line

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	with current scientific knowledge on human health, and which requires a full evaluation of the health impacts of both newly developed and existing industrial chemicals now in use; And be it further RESOLVED: That this matter be referred for national action (AMA). REFERENCES: http://www.healthandenvironment.org/science/papers on behalf of the California Medical Association
F-TA-39	How did it get there? When so-called toxics are found in products, a number of things are important to consider: 1. Will the material be reasonably expected to cause harm at the levels present in the article or extractable from the article? The inherent toxicity is only one measure of the potential to have impact, as exposure via “intended and non intended use” matters as well. 2. If the material is generally present but is not an intended constituent it is important to understand how the material got there and who is responsible for reducing its presence or impact. a. If that presence results from any part of the manufacturing process, the manufacturer at that step should exercise product stewardship to alter the production methods or materials to reduce the impact. b. The material could be an impurity carried through from an earlier step in the process that could be eliminated by the actions of a supplier to the manufacturer. c. The material could be present as a result of degradation over time, or as a direct result of use of the article. 3. There are other means by which an unintended product could appear in a final product—among them chemical or biological reactions for example, due to light or heat or intentional adulteration. The latter is a rare occurrence and not systematic; it requires legal intervention. The former may be systematic and could require different packaging or storage conditions, or even addition of other chemicals. Each analysis requires an understanding of the product, the process and the supply chain. These are all essential elements of product stewardship, a core value for responsible producers, and users of products.
F-TA-40	Check out This Tool that Will Work!!! Last week I attended the Western Regional Pollution Prevention conference in San Diego and had a chance to see a demo of a software tool that would be incredibly effective in addressing some of the concerns here. In fact I understate my excitement because it is so eye-popping to see to see the software in action, I can only hope to do it justice here. The software is very sophisticated but unlike other solutions I’ve seen, this one is actually very user friendly. It is the first real tool I’ve seen that can be used by industry experts, academia and the general public. Wow, let me say that again…the general public can actually use this tool it is that user friendly. The implications for Compliance Managers, Risk Assessment Departments and Purchasing agents are enormous. In addition to these individuals who must regularly make decisions that affect their organization, colleagues, and communities, there are also many in the medical profession, biotech, agriculture, ecologists and yes even economists (!) can plug in use this tool to get the results they need. Those of us posting here can dig into the inner workings of the software, because behind the easy-to-use interface is a complex, meticulous database that has been so well tested and refined that it is virtually bulletproof with respect to passing peer-based reviews. Dr. George Thompson has spent 25 years creating a chemical database of 75 million data elements for more than 210,000 chemicals, 350,000 products complied from over 1,000 sources. His software can generate a score that can accurately and effectively measure the toxicity levels in a given chemical recipe, process, or product and give specific information about the impact on Health, Safety and Ecology. Not only that, it is possible to cross reference information regarding the chemicals, CAS numbers, regulatory lists, (very exciting!) and can eliminate redundant data so that it’s easier for departments to work together and get things done faster.

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	There is much more detail that I can go into, however what's more important is that you, as you're reading this, get curious enough to check out Dr. Thompson's tool. It is worth the time to take a look, and even more than that, I would be thrilled to see the technology implemented as part of California's comprehensive solution. For this reason, I'm getting the word out on the other forums too. We need to be looking at this solution. There is no more time to wait. We must involve people at the business and community level. We must give people at the business and community level a tool that will work for them. Not just us. Check out www.chemply.com Read more about this man's work. It is phenomenal!!!!!!
F-TA-41	Thoughts About Substitution Contributions from chemistry bring many benefits to society, but there are chemicals which can pose risks to health or the environment in certain circumstances. Some argue that the most sensible approach to these chemicals is to replace them with substances considered less hazardous—a seemingly simple concept, but substitution is not always feasible and not always the right choice. American Chemistry Council (ACC) members, through Responsible Care®, regularly consider substitution as an option in their broader green engineering and process design efforts. When doing so, companies must closely examine the implications for the safety, functional performance, and cost of alternatives to avoid ineffective changes with unintended negative health and environmental impacts. A good cook knows that you cannot arbitrarily change ingredients in a recipe. Whole wheat, rye, all purpose, and pastry are just a few of the many different varieties of baking flour. Yet, bakers know that while all flour is similar, many cannot be substituted without creating a result nobody would want to eat. The same holds true for chemical processing. You cannot simply replace one chemical ingredient for another without impacting the final product. Therefore, significant problems would result if chemical substitution were mandated as the solution of first choice without careful consideration of potential consequences. This is very much the approach taken by an international group of experts to the Intergovernmental Forum on Chemical Safety (IFCS) earlier this year in talking about "informed substitution". (see the background elements of the IFCS paper available at http://www.who.int/ifcs/documents/forums/forum6/12_original_prop.doc) SUBSTITUTIONS MAY CHANGE THE NATURE OF THE PROBLEM RATHER THAN SOLVE IT Mandatory bans and forced substitutions often are not a complete solution because, as one issue is addressed, another set of concerns may arise. This is the difference between "informed substitution" and "regrettable substitution", with the goal of "informed substitution" being to avoid "regrettable substitution". For example, the health and convenience of our lives has been greatly enhanced by modern refrigeration. Refrigerators originally used ammonia, a toxic chemical, as a coolant. As scientific discoveries were made, chlorofluorocarbons (CFCs) replaced ammonia. While CFCs are practically non-toxic, they were later implicated in depleting the ozone layer and eventually banned. CFCs were then replaced with hydrochlorofluorocarbons (HFCs), which have no impact on the ozone layer, are non-flammable, have low toxicity, and high energy efficiencies. Scientists have now learned that HFCs could contribute to global warming if released into the air. Alternative coolants such as hydrocarbons and carbon dioxide have been considered, but both need to be carefully examined because of the potential for emissions and the possible dangers from higher operating pressures. In another example, consider the Peruvian government's decision to stop chlorinating drinking water. The result in 1991 was a five-year epidemic of cholera which spread to nineteen Latin American countries, causing more than one million illnesses and 12,000 deaths. After the outbreak, U.S. and international health officials criticized Peruvian water officials for not chlorinating the entire water supply. An official with the Pan American Health Organization (PAHO) blames the inadequate chlorination, at least in part, on concern over disinfection byproducts. In a 1997 article in the Journal of the

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	American Water Works Association, Horst Otterstetter states, “Rather than being abated by increased use of chlorination, the waterborne transmission of cholera was actually aided because of worries about chlorination byproducts.” Substituting one material for another is never as simple or straightforward as it might at first appear. SUBSTITUTIONS MAY RESULT IN UNINTENDED ADVERSE CONSEQUENCES Trading in a fuel-hungry SUV for a moped may address energy efficiency concerns, but it’s probably not a reasonable option for a mother of four. Like the moped, forced substitution, without full consideration of the potential impacts, is impractical and unwise. For example, some substitute chemicals require higher processing temperatures and greater pressure conditions in order to achieve the same result as the original chemical. Additionally, if the substitute chemical is not compatible with the processing equipment, it can cause break downs or failures. In some circumstances, the substitute is not as effective as the original chemical and more quantity must be used which results in larger amounts of waste materials and increased waste disposal management and risks. All of these factors can lead to increased safety concerns for the worker population, as well as increased energy consumption by the company. This unintended consequence of substitution was clearly demonstrated in Europe when energy companies decided that fuel derived from plants would be more environmentally friendly than fossil fuels. Those companies developed specialized generators for palm oil, which increased demand. To keep up with that demand, palm plantations cleared large tracts of land by draining and burning peat land, resulting in huge carbon emissions into the atmosphere. The production of the plant derived fuel had an unintended consequence of creating more harmful emissions than the fossil fuels they were intended to replace. SUBSTITUTION IS NOT THE ONLY VIABLE APPROACH TO CONTROL RISK The principle of risk reduction is and always has been part of the normal day-to-day operations for the business of chemistry. Industry’s ability to innovate allows us to respond to society’s evolving needs for better, safer products. Beyond substitution, the chemistry industry considers many other options to minimize potential hazards, such as operational management systems, engineering controls, modifications to the chemical product, and waste management innovations. The industry also provides specialized consumer training and works with communities to implement effective recycle/reuse programs. Through ACC’s Responsible Care® initiative, ACC member companies go above and beyond government rules and regulations to continuously improve their environmental, health, safety, and security (EHS&S) performance. ACC members employ a rigorous EHS&S management system that is certified by third-party auditors. Among numerous other elements, auditors verify that our companies have systems to manage risk associated with chemical products including management of product development, transport, use, and disposal in a safe and secure manner. Companies are also audited on their programs to protect the environment and to conserve resources, as well as their efforts to dialogue with community stakeholders about the organization’s impact on human health and the environment. Company performance under Responsible Care® is publicly shared through americanchemistry/responsiblecare.com. For more information on Responsible Care®, please visit http://www.responsiblecaretoolkit.com.

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F-TA-42	CHANGE's Perspective on a Successful Program We write to you today on behalf of CHANGE, Californians for a Healthy and Green Economy. Ours is a broad-based growing coalition of approximately 35 environmental and environmental justice groups, health organizations, labor advocates, community based groups, parent organizations, and others who are concerned with the impacts of toxic chemicals on human health and the environment, as well as the lack of a regulatory framework that seeks to prevent exposures to toxic chemicals. We thank you for your leadership initiating the Green Chemistry Initiative and would like to take this opportunity to join the Conversation with California by offering our perspective on what would make the program successful in addressing the critical human and environmental issues related to chemical use. on behalf of CHANGE
F-TA-43	Dow Chemical's Green Chemistry Thoughts The Dow Chemical Company (Dow) is pleased to provide the following comments on California's Green Chemistry Initiative (GCI). On June 29, 2007 Dow provided initial comments that represented our principles for sustainable chemistry at a corporate level. That letter spoke of Dow's accomplishments in sustainability, Dow's aggressive 2015 Sustainability Goals, and Dow's suggestions for framing California's GCI. We have engaged fully in the DTSC's process; Dow people have spoken at two of the three Green Chemistry Symposia and have participated in the workshops, including serving as break-out session facilitators. This current submission offers Dow's more-detailed thoughts in the specific areas of: § Life-Cycle Assessment § Eco-Labels § Consumer Choice § Environmentally-Preferred Purchasing § Incentives on behalf of the Dow Chemical Company
F-TA-44	Have EPA programs really closed the data gap? These comments respond to the American Chemistry Council's comments titled "Addressing the Data Gaps" posted on October 15, in particular those characterizing the types and amounts of information reported to EPA under: (1) the TSCA Inventory Update Rule (2) the US HPV Challenge Program and the industry's Extended HPV Program. (1) Information submitted to EPA under the TSCA Inventory Update Rule For certain chemicals in commerce, limited and infrequent reporting of production, use and exposure information by manufacturers has just been initiated under EPA's Inventory Update Rule (IUR). Such reporting is required only of chemical manufacturers (and in some cases, processors), but not of companies that use chemicals, whether directly or as ingredients in products. Beginning in 2006, manufacturers of non-exempt chemicals produced or imported in amounts of 25,000 pounds or more per year per site are required to report to EPA the information noted by ACC – to the extent it is "known or reasonably ascertainable." For chemicals manufactured in amounts of 300,000 pounds or more per year per site, the additional information on downstream processing and use noted by ACC must be reported – but only to the extent that it is "readily obtainable." Fewer than 10,000 chemicals are covered by the basic production information reporting requirements, and only a few thousand of these will be subject

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	to the more extensive reporting that extends to downstream processing and use information. Reporting is required only once every five years and then only for a single reporting year. Much of the information reported to EPA is designated confidential business information (CBI). Under TSCA, EPA is prohibited from divulging any CBI to the public or to other governments, including the State of California. (2) Information developed under the US HPV Challenge Program and the industry's Extended HPV Program. For more detail and documentation of my comments below, see my recent report, High Hopes, Low Marks: A Final Report Card on the High Production Volume Chemical Challenge, available online at www.environmentaldefense.org/hpvreportcard. The Challenge represents the only systematic effort by the US Environmental Protection Agency (EPA) to foster the development of and public access to basic hazard data on a relatively large number of chemicals in commerce. It should be acknowledged that the program is developing and making public basic hazard information for more chemicals in less time than any prior effort, and it represents the first significant step taken in the US toward closing the gap between what we know and what we should know about widely used chemicals. But the limitations of this voluntary program and the information it is providing need to be understood as well. Because the Challenge is voluntary, it side-steps the onerous findings EPA must make to exercise its authority under Section 4 of TSCA to compel hazard testing of chemicals. However, for the same reason, EPA also has limited recourse to ensure full participation by manufacturers or the timely submission and high quality of hazard data sets developed for HPV chemicals. The following statistics on the status of the HPV Challenge, which began in 1998, are current as of July 2007. MORE THAN 18 MONTHS AFTER THE ORIGINAL DEADLINE, THE HPV CHALLENGE IS FAR FROM COMPLETE • Two-and-a-half years after final data sets were due, fewer than half (47%) have been submitted. • 10% of eligible HPV chemicals were not volunteered for the Challenge by the companies that produce them; EPA has issued rules to compel testing for only 6% of these chemicals. THE QUALITY AND COMPLETENESS OF FINAL DATA SETS HAVE YET TO BE DETERMINED • The average quality of sponsors' initial submissions, while originally quite good, has declined over the course of the Challenge, especially in the past 18 months. The grade point average for initial industry submissions has declined from a solid B-plus in 2001 to a C-minus in 2006. • Of the final submissions examined so far by EPA, covering about 100 HPV chemicals, EPA has found that data gaps remain in about a third of them. THE HAZARD DATA SUBMITTED ARE SCREENING-LEVEL DATA ONLY • Hazard data being collected under the Challenge are limited to a subset of the Screening Information Data Set (SIDS), developed under the auspices of the OECD. • The SIDS data are generally acknowledged to be insufficient to provide the basis for a full hazard assessment, let alone a risk assessment, for a chemical. It relies primarily on testing of acute or subchronic toxicity, for example, and its ecological endpoints only include toxicity to aquatic organisms. THE PROGRAM FOCUS IS LIMITED TO HAZARD DATA • By design, the Challenge did not call for submission of use and exposure information, although some sponsors did submit some such information. • As a result, the program will provide little if any reliable, comprehensive information about the use of and exposure to HPV chemicals. EPA HAS LITTLE RECOURSE IF DATA QUALITY IS POOR OR DATA ARE INCOMPLETE • Because the HPV Challenge is voluntary, EPA has very limited ability to ensure that the data submitted by sponsors are of high quality and complete. While EPA and other commenters have often identified deficiencies in initial submissions, there is no legal or binding obligation on the part of sponsors to heed those comments. • EPA has agreed to conduct a quality and completeness review on final submissions, and to make known the results, but cannot compel sponsors to

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	address any problems that are identified. THE REGULATORY "BACKSTOP" FOR THE PROGRAM IS WEAK • EPA's authority under TSCA to compel testing of the 10% of HPV Challenge chemicals that were not voluntarily sponsored is seriously constrained; to date, EPA has issued test rules for only 16 (6%) of the 265 unsponsored "orphan" HPV chemicals. THE MAJORITY OF CHEMICALS IN COMMERCE ARE NOT HPVS • While, as ACC notes, HPV chemicals constitute the bulk of chemicals in commerce when measured by tonnage, non-HPV chemicals far outnumber HPV chemicals. • The TSCA Inventory contains more than 82,000 chemicals that have been in commerce at some point since 1979. Based on the 2002 TSCA Inventory update reporting, EPA reported some 5,400 so-called medium production volume (MPV) organic chemicals manufactured in 2002 in amounts above 10,000 pounds per year; an unknown number of chemicals below that threshold are in commerce in the US, because they are not required to be reported. • The European Union (EU) estimates that about 30,000 chemicals are produced there in quantities at or above one metric ton (2,200 pounds) per year, fewer than 3,000 of which are HPV chemicals. THE EXTENT OF SPONSORSHIP OF NEWLY EMERGED HPV CHEMICALS IS POOR • Of nearly 600 newly emerged HPV chemicals – those that have reached HPV levels of manufacture since the Challenge was launched – eligible for sponsorship, only 40% have been sponsored through the chemical industry's Extended HPV Program. • EPA has found wide gaps in publicly available hazard data for these chemicals. • No test plans for these chemicals have yet been made available, and industry has not provided any tracking system to monitor the status of these commitments. • No final data sets have been submitted, despite a claim when the program was launched that data would be submitted starting in 2006. • These findings indicate that the chemical industry is not making the development of, and public access, to hazard data on all HPV chemicals "evergreen" practices.
F-TA-45	Some ideas for what California can do to start advancing chemicals policy Here are some ideas for what California can do to start to advance chemicals policy and promote green chemistry. They are derived from ideas I have presented at several GCI forums, but I wanted to add them into the mix being collected via the Conversation. What can California do? • Ensure access to information gathered by others – Negotiate for access to confidential business information (CBI) submitted under the European Union's REACH Regulation and under the Canadian Environmental Protection Act (CEPA) – Require companies making/importing chemicals in California that are subject to REACH or CEPA to submit the same information to California officials – Enhance existing IT infrastructure to receive and share the large volumes of REACH data • Set clear criteria to identify chemicals of concern – Can be hazard-based (e.g., PBTs) and exposure-based (e.g., chemicals detected through biomonitoring) – Use these criteria to drive further assessment and control of chemicals meeting the criteria – Require adherence to clear timelines for conducting assessments and making control decisions • Map the flow of chemicals in California by developing and sharing production/use info – Require California producers/importers and users to submit and update information on production and processing (amounts, facility locations), uses (including in products), and post-use management

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	– Require updating of MSDSs to reflect all available data (US HPV Challenge, REACH, Canada) – Require disclosure of chemicals in consumer products • Could focus initially on priority chemicals (Canada priority list, REACH Substances of Very High Concern (SVHC) list) • Advance the science – HPV, REACH data sets use 20+ yrs. old tests (“old toxicology”) – Fail to account for: > Emerging issues, e.g., endocrine disruption, development neurotoxicity > Emerging science, e.g., low-dose effects, timing of exposure during development > Emerging methods, e.g., toxicogenomics, high-throughput screening and mechanistic assays > Perpetual concerns: e.g., cumulative, aggregate exposures, susceptible subpopulations – California is well-positioned to help move toxicology into the 21st century – Can help to develop, road-test and share new methods, testing strategies – Utilize biomonitoring data and methods to advance dose and exposure measurement – Press industry, federal government to move forward – Collaborate with universities Why do this? • Casts a broad net – to identify not only “bad actors” but also chemicals of low concern • Influences and informs chemical and product design decisions • Identifies and fills gaps – information (data and safety) and technology gaps • Empowers a range of actors – government, industry, academics, public – to advance knowledge and make better decisions about chemicals
F-TA-46	Limitations to Risk-Driven Approaches to Chemical Prioritization [NOTE: This post is based on a paper I published in the OECD Series On Testing And Assessment, No. 51, Approaches to Exposure Assessment in OECD Member Countries: Report from the Policy Dialogue on Exposure Assessment in June 2005, Chemicals Committee, Organization for Economic Cooperation and Development, p. 109, available at http://appli1.oecd.org/olis/2006doc.nsf/linkto/ENV-JM-MONO(2006)5. It is provided in part to respond to the American Chemistry Council's comments arguing for sole reliance on risk-based evaluation for chemicals.] While both hazard and exposure are clearly relevant in determining chemical risks, there are critical differences between our ability to assess hazard and exposure that have implications for the development and application of risk and exposure assessment policies. And real-world experience in chemical assessment programs that have attempted to rely on exposure information to prioritize chemicals also offers lessons for exposure assessment. In this paper I first address these issues, and then discuss their implications for risk and exposure assessment policies. Critical differences between assessing hazard and exposure Approaches to integrating exposure assessment into regulatory decision-making need to acknowledge and account for a number of critical differences between the nature of hazard and exposure information and their relative extent of availability. While both hazard and exposure are clearly relevant in determining risk, certain characteristics of exposure information pose serious challenges to sound decision-making: 1. Hazard is largely inherent to a chemical, and doesn’t fundamentally change over space or time, whereas any exposure information necessarily represents only a “snapshot” in both space and time. A chemical’s hazard is relatively intrinsic, largely or entirely independent of how the chemical is used, where or how it enters the environment, or other factors that vary with time and place. Hazard data are therefore relevant (i.e., necessary though not sufficient) in characterizing risk whatever the use of

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	a chemical, and hence are useful in understanding any and all potential uses of or exposures to a chemical -- and what kind of exposure-reducing efforts may need to be taken. Just the opposite is true for exposure, the potential for which changes depending on how a chemical is produced, used, transported and discarded. Conditions that determine exposure can and often do differ enormously for every setting and point in time that a chemical is present. And even if a "snapshot" of current exposure were able to be assembled, the next new use or activity leading to a release would alter the exposure picture. The variable nature of exposure poses a major challenge to exposure (and risk) assessment: It means that exposure assessment must be an ongoing activity, with the scope and frequency of its measurement sufficient to characterize the variation in as well as magnitude of exposure. 2. Voluntary and regulatory mechanisms for generating and collecting exposure information are undeveloped relative to those for hazard information. Extensive international consensus exists as to how to test a chemical for most hazardous properties. Detailed government-sanctioned procedures, guidelines, criteria and standards are already in place for conducting hazard tests, for assuring the quality and reliability of the results, and for determining whether the results constitute evidence of a particular hazard. Moreover, these measures allow that results are reproducible and can be independently verified. In contrast, virtually none of these mechanisms are in place to assure that exposure information is complete and accurate. Debates over what constitutes adequate exposure assessment and how to address the "moving target" nature of such information are far from resolved. Government-sanctioned procedures for generating, evaluating the adequacy of and interpreting exposure data have yet to be developed or validated, including testing and measurement standards, guidance, methods and tools. Even use and exposure information reported in sufficiently qualitative terms or sufficiently aggregated form so as to eliminate any confidential business information (CBI, see next bullet) concern is rarely systematically collected and made public. For the first time, beginning in 2006, USEPA has begun to require the reporting of basic information relevant to understanding uses of and exposure to chemicals, although it will be limited to several thousand chemicals, and will be collected only once every five years – despite enormous documented variability in these chemicals' production volumes that presumably reflects changes in their underlying use patterns. 3. Differential access to both exposure data and the means to generate them severely limit the "reproducibility" of such data. In addition to the variability and absence of agreed-upon procedures noted above, other factors limit "reproducibility," that is, the ability to readily and independently measure or verify exposure data. Most exposure data and the means to generate them reside virtually exclusively with industry. It must be acknowledged that industry has a strong interest in maintaining that exposure to its products is low, so the ability to independently measure and verify exposure data is critical. Yet physical access to many exposure "settings" (e.g., workplaces) is very limited and infrequent at best, even for government officials. Broader access to exposure-relevant information is even more restricted: Wide latitude is typically provided to claim chemical use and exposure information as CBI, preventing even its review outside government; this situation is often in contrast to that applying to hazard data, which is more likely to be deemed ineligible from designation as CBI. Finally, even chemical manufacturers have incomplete access to and information on their customers and how their chemicals are used. Intermediaries (vendors, brokers, distributors) are a formidable information flow bottleneck, as is the often-proprietary nature of information concerning downstream use and competition among suppliers. These factors serve to impede information-sharing even within supply chains, which in turn affects the extent and accuracy of exposure-relevant information that any one entity in a supply chain can provide if asked or required to do so. For all of these reasons, we believe that risk and exposure assessment at this time are simply too uncertain and unreliable to serve as a basis for deciding for which chemicals hazard data should be developed. While ultimate decisions concerning risk identification and management need to account for exposure as well as hazard, in all but the most exceptional cases, chemical prioritization approaches should be hazard-, not risk-driven.

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	Difficulty of using exposure information in chemical priority-setting: OECD experience as a real-world example The ongoing work of the OECD Existing Chemicals Program vividly illustrates the limitations to available exposure information – and to efforts to prioritize chemicals based on such information. In that program, chemical-by-chemical assessments of high-production volume (HPV) chemicals are conducted. Typically, industry collects existing information and conducts any testing needed to fill gaps in the required set of hazard information. Industry then prepares draft assessment documents, which are reviewed by health and environmental agency officials in member countries. While the primary emphasis is on hazard assessment, program procedures currently allow for exposure information to be included to "place the hazard information into context." As we have documented in detail elsewhere, in practice this exposure information is routinely being used to decide that chemicals that have been identified as possessing clearly hazardous properties are nevertheless low priorities for further work based on "anticipated low exposure." Unfortunately, the exposure information typically being relied upon has truly massive deficiencies with respect to scope, quality and completeness. Such information typically is: • very limited in scope, and hence incomplete or even haphazard in its coverage of potential exposures, because it: - covers only a portion of known production and use; - covers only a subset of relevant activities, e.g., production, transport, storage, processing, use by customers, use in consumer products, product disposal, waste management; - covers only a subset of exposed entities, e.g., workers, consumers, the general population, sensitive populations, and wildlife; - addresses only a subset of relevant routes of exposure, e.g., by inhalation, ingestion or dermal contact; through food, water, air; - rarely is based on ongoing or sufficiently frequent measurement to address variation or changing conditions; • unverified, unpublished, rarely peer-reviewed and of uncertain or undetermined quality; • frequently based on judgment or speculation, rather than on actual measurements, monitoring or validated methods of exposure modeling. Some of these deficiencies are related to the limited requirements under the program governing what exposure information is to be provided. However, others reflect the fundamental characteristics of exposure information described in the first section of this paper, as well as limitations on the extent and quality of information actually available and the capacity for effective review, and the lack of agreed-upon measures of scope, quality and completeness. The OECD Existing Chemicals Program has wrestled repeatedly with this problem over its history. Indeed, because of what many saw as an over-reliance on exposure-related considerations in the absence of an agreed-upon approach, the program went through a major refocusing to return to a primary focus on hazard characteristics as the primary driver for the program. However, despite the refocusing effort, inconsistent and insufficient exposure-related information – more than any other factor – drives the recommendation process for chemicals being assessed through the program. Implications for risk and exposure assessment policy All of the factors discussed above mean that assembling a complete and reliable exposure picture even for a single point in time faces obstacles and has proven exceedingly difficult in practice. So how should risk and exposure assessment policies – and practices – address these current realities? Guidelines development: We continue to strongly support the development of comprehensive guidelines for collection, analysis, validation and presentation of exposure information, as the much-needed foundation of any exposure assessment policy and practice. In our view, the OECD program needs to invest at least the same effort in developing a process for exposure assessment as was invested in developing the hazard screening program. There remain a number of substantial obstacles that must be solved in order to ensure that adequately robust data on exposure can be gathered. Resolving these challenges will not be easy. These obstacles include: • lack of agreement as to what exposure information is relevant and needed; • lack of consensus as to the framework and methodologies needed to conduct an exposure assessment; • limited availability of and access to internationally accepted, comprehensive measured exposure information or models for predicting exposure; and • limited information available on all uses and other exposure pathways of chemicals.

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	Guidelines need to ensure that the measured and modeled or estimated data address and are representative of the full range of actual and potential exposures that can or do occur. Procedures are needed to govern, for example, the minimum number of samples, the frequency of sampling, and other parameters so as to ensure that the results of any exposure measurements are both statistically meaningful and representative of the spatial and temporal variations present in the sampled environment. Quality assurance/quality control procedures to ensure data quality are needed. Where data are available for only a subset of production sites/release points/exposure sources, procedures are needed to determine whether and if so how extrapolations from available data can be used to characterize exposures arising from the missing sources. Adequate expert review: Policies need to provide for thorough review of exposure information. This starts with ensuring exposure-related expertise among reviewers is sufficiently diverse to address each of the various relevant exposure settings (workplace, consumer, environmental), and data generated through direct measurement as well as modeling. The review process should yield an explicit assessment of the scope, completeness and quality of the exposure information, in which any conclusions are qualified to accurately reflect the actual extent and nature of exposure information provided and hence the degree of associated uncertainty. Specific factors to be assessed should include: • Scope and Completeness: geographic, temporal extent of applicability and associated limitations; to what fraction of total production and use, to what uses, and to which specific facilities, processes, activities and products the provided information applies; which activities associated with the chemical's full lifecycle (production, processing, storage, transport, use and disposal) are covered; whether information on releases and exposures relate to workers, consumers, public or the environment; whether information is based on measurements, modeling, judgment, extrapolation. • Quality: extent of documentation provided/cited; reference to/description of procedures used; representativeness of sampling underlying any measured data; validation of any model used; peer review and extent of access to underlying data; assignment of measures of reliability; reproducibility. Accounting for the variable nature of exposure: Policies need to acknowledge and account for the inherent variability in exposure over time as well as space. For example: • For new chemicals, the nature or extent of production, use and exposure needs to be tracked and revisited/reassessed over time, not only as a chemical enters commerce but as its production level and range of uses change. During the initial review/approval process, conditions should be included that require reporting of any changes in the nature and extent of production and use and other exposure-relevant factors, and such reports should trigger a reassessment of exposure potential. • For existing chemicals, policies should also be responsive to changes in the production level or use profile of a chemical. One recent illustration of this need in the U.S. is the change that has accompanied the phase-out of pentabromodiphenyl ether and its replacement with a different chemical, the production and use of which has increased dramatically as a result. Data verification and model validation: To the extent data from industry are relied on, policies need to incorporate mechanisms to ensure and demonstrate that such data are accurate and representative, and wherever possible, to be able to independently verify such data. To the extent that modeled as opposed to measured data are relied on to provide exposure estimates, policies need to outline procedures to be employed to validate the models, provide public access to the models and their underlying data sets. Just as for measured data, policies also need to ensure that models effectively account for variation in exposure over time. Differential access: The differential access to exposure-related information (as discussed above) is a serious barrier to public confidence in both industry- and government-derived exposure assessment. In addition to adopting and abiding by comprehensive guidelines covering all aspects of exposure assessment, government needs to develop and implement mechanisms to demonstrate that it can independently verify the reliability of industry-generated exposure information; and industry needs to be encouraged or required to implement its own measures to increase confidence in the information it provides, including routine third-party review and a commitment to make information public whether exculpatory or not. In addition, policies need to consider means to break through the supply-chain bottlenecks that effectively prevent development of a full understanding of chemical processing and use. In our view, one of the key innovations offered by the European Union's REACH regulation is its intent to compel

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	information-sharing up and down the chemical supply chain. Finally, in our view, serious reconsideration of the currently overbroad broad allowances for CBI claims related to exposure-relevant information is warranted. Transparency: Policies should ensure that any descriptions of exposure information are clear and transparent in describing the scope and nature of the information and its limitations, including by addressing all of the elements specified above under Scope and Completeness and Quality. Policies should require that conclusions or recommendations be carefully written and explicitly qualified so as to limit their perceived and actual applicability to those settings for which information has been provided and deemed sufficient to warrant the conclusion or recommendation. Furthermore, the degree of uncertainty associated with a conclusion or recommendation should be stated and should reflect the extent of exposure information available. Lastly, policies should ensure that in the absence of good exposure information, exposure should be assumed possible or likely. Additional challenges Cumulative and aggregate exposures: A common limitation of exposure assessments in practice is to examine exposures only to single chemicals at single points in time, or from single sources or products, as if they occur in isolation from other exposures that are in fact relevant to understanding the true nature and magnitude of exposure. While understandable given the complexity involved in going further, this frequent failure to consider or even acknowledge the need to ultimately examine cumulative and aggregate exposures undermines the credibility of an exposure assessment. Policies, therefore, need to ensure that an accurate context is provided within which to judge a particular exposure assessment, one that accounts for factors such as: • production, processing and use of the same chemical by multiple entities; • multiple uses of the chemical leading to actual or potential exposures; • multiple routes of exposure (direct, indirect) to a chemical; • continuous or periodic release of or exposure to a chemical; and • exposure to multiple chemicals producing the same/similar effects and/or acting by the same/similar mechanism(s) Biomonitoring/environmental monitoring/health tracking: The ultimate arbiter of the value of exposure assessment is the extent to which its findings comport with reality. It is relatively rare for extensive data from actual environmental and biomonitoring to be available, and rarer still for health tracking statistics to be available that can be linked to particular exposures. Nonetheless, exposure assessment policies should ensure that such data are examined and incorporated where available, and should encourage the development of and public access to such data. Susceptible subpopulations: In addition to variation over time and space, exposure to a chemical or the effects arising from such exposure may differ among particular subsets of human or ecological populations. This variation may be due any number of factors, such as inherent differences in the subpopulations themselves (e.g., children's respiratory rates are higher than those of adults), differences with respect to proximity to, or reliance on activities associated with, particular sources of exposure (e.g., occupational exposure, dependence on a diet high in fish or groundwater as a drinking water source), or differences in sensitivity to a substance (e.g., sensitization, genetic susceptibilities). (Less understood at present are the analogous differences in ecological subpopulations.) Policies need to account for such variations and ensure protection of the most susceptible and sensitive sectors of potential exposed populations. [end]

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	The Dose –Response Principle is Key to a Science-Based Program The Dose –Response Principle is Key to a Science-Based Program To protect public health and the environment, Cal-EPA needs to assure that the approaches under consideration within California are science-based and follow the dose-response principle. The principle of dose response underlies the scientific practice of pharmacology, and is the foundation of clinical therapeutics. However this principle, which is used to determine appropriate dosages and regimens for administration of therapeutic chemicals (pharmaceuticals), is also integral to the mechanisms through which chemicals of all kinds (pharmaceuticals as well as industrial chemicals) produce the unwanted effects, also known as toxicity. The dose-response principle stipulates that there is a direct relationship between the amount of exposure to a chemical and the level of response, regardless of the response being evaluated. Therefore dose-response is a principle that underpins both the science of pharmacology (therapeutic response) and toxicology (unwanted response). Most importantly, and often overlooked by scientists without pharmacology and/or toxicology backgrounds, is that there is a dose level below which no response occurs. Although there are some who suggest that any degree of exposure to a chemical affords unreasonable risk, this assertion is without scientific basis and in fact is just plain wrong. In fact, such assertions border on irresponsibility. In any science-based program dealing with chemical exposure, consideration of toxicity must be accompanied by an evaluation of the circumstances of exposure (the dose). Illustration of Dose-Response Principle The principles of dose-response are easily illustrated. Let's consider a chemical for which it has been proven that: 1) repeated chronic exposure to high doses of the chemical causes cancer in humans; 2) acute exposure to high doses of the chemical over a short period of time causes neurotoxicity in humans; and 3) exposing women to sufficient doses during pregnancy causes a developmental syndrome characterized by mental retardation and birth defects. Now, let's ask the question: Should this substance be considered "toxic to humans at any exposure level? Also: Would this substance be considered to pose a threat for "causing cancer or developmental toxicity" to humans at any level of exposure, no matter how minute? Should this substance be 'banned"? If we know that this chemical is present commonly in food at a concentration of about 5000 ppm, would exposure to this chemical pose a concern for inducing cancer or neurotoxicity? We may also want to ask about concern for cancer or neurotoxicity when foods containing the chemical are consumed by school aged children day in and day out. Would that pose an "unacceptable hazard or risk"? Would there be a risk of developmental toxicity in fetuses exposed to this chemical in the womb when their mothers ingest 30 grams of a food containing this chemical, one to three times a day, and the chemical is present at concentration of from 3000 to 5000 ppm? If a hazard-based approach, where any exposure would be considered unacceptable, is used to answer these questions, it is likely that one would answer "yes" to all of the questions above. But, using the science-based principles of toxicology and dose-response, the answer will be no. Why? Because knowledge about the toxicity of a substance at high doses, under specific conditions of exposure, is insufficient, by itself, to determine what the potential health risks will be to humans under other conditions of exposure. Dose-response principles dictate that if exposure is maintained below a "threshold" concentration in a tissue that is the target for toxicity, no toxic effects will be manifested. This principle applies to all chemicals, both natural and synthetic. In this case, the "threshold" concentration is that dose that is necessary for toxicity to occur. Illustration Revealed So what is the chemical being referred to above? It is ethanol. Certainly abuse of alcoholic beverages chronically (high, repeated exposures over years) can cause cancer, and clearly drinking alcohol during pregnancy places the developing fetus at risk of fetal alcohol syndrome. Yet, there is no risk of developing cancer or birth defects from eating two slices of bread a day, day in and day out, even though the ethanol content in bread has been shown to range from 400 to 10,000 ppm (Logan and Distefano 1998) . Nor is there a risk of developing ethanol-induced cancer or birth defects from ingesting fruits or fruit juices, even though fruits commonly contain ethanol at concentrations ranging from 60 to 900 ppm while fruit juice (e.g., apple juice) can contain up to 5000 ppm ethanol.
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	Clearly, it is not the chemical per se that poses the risk, it is the chemical within the context of dose, where the magnitude, frequency and duration of exposure, as well as the lifestage and susceptibility of the exposed individual, determine whether the chemical poses a potential risk to human health. In the case of human drugs used to treat disease, to see efficacy, a critical concentration of the drug at the target site is needed. The same principle applies to toxicity -- effects at high doses will not be realized at lower doses if the concentration falls below the target site threshold level. If the dose-response paradigm is rejected, then for therapeutic agents “cures" would be predicted to be triggered by any dose of a therapeutic agent. However, evidence-based medical practice rejects such homoeopathic beliefs. Similarly, by analogy, hazard-only based chemical regulatory approaches should be considered as belonging in the realm of “homeopathy” rather than evidence-based toxicology and epidemiology. It is only the consideration of toxicity in combination with dose-response and the level of exposure that provides the scientific basis for risk-based chemical management approaches. Laura M. Plunkett, Ph.D. DABT Integrative Biostrategies LLC
F-TA-48	Director, Environmental Sustainability Programs Ecolab Inc. supports science and risk-based chemical management policies that balance the 'triple bottom line' of sustainability: protection of the environment, assurance of product safety and promotion of innovation in the marketplace. Ecolab encourages the members of the California ‘green’ committees in the following specifics: • Understand both the burdens and benefits of new regulatory proposals. • Find a way to successfully manage both toxicity and exposure (i.e., risk) while providing the solutions California needs. • Utilize risk assessment methods that integrate knowledge regarding potential hazards of chemicals with an understanding of their uses and exposures. • Look for product stewardship and risk management programs that establish mechanisms to assure exposures remain in the safe region for typical uses and foreseeable misuses; and • Enact laws and regulations that: • are science-based, • balance potential risks with benefits, • factor in existing scientific knowledge as well as reasonable uncertainties, and • consider the degree of risk to people and the environment." We encourage California to study the availability of data now, particularly the availability of both hazard and exposure data, so that risk determinations can drive decision making. Please coordinate information needs with other governments and other sources of information. Do not reinvent the wheel. Ecolab is in the process of evaluating products/services to evaluate the 'greenness' and 'sustainability' of our products. One of the companies we have evaluated is Chemical Compliance Systems, Inc. (CCS) which specializes in ecological, health and safety compliance, chemical security, and hazardous material management services. CCS has a database containing 220,000 chemicals and more than 75,000,000 data elements comprising 43 key environmental metrics. I first became aware of CCS on June 28, 2007 when I heard Dr. George R. Thompson, President & CEO, giving a presentation called “Web-based Databases That Facilitate Chemical, Product and Process “Green” Assessments and Automated “Green” Cleaning Product Development or Acquisition Assessments” at the 2007 Green Chemistry & Engineering Conference, Washington DC (www.GCandE.org) For products we submitted to them, they organized the results in three categories Ecology, Human Health and Safety in their default product 'report card' which weighs constituent chemicals and and their percentages in the formulation. They evaluated and produced ‘report cards’ on both concentrates and ready-to-use solutions on a number of our products, showing the sensitivity of their approach. The following procedure was used to produce each report card. For each metric, the chemical that is least sustainable/green is given a score zero and the most sustainabile/green is assigned 100. The scores in between are normalized so that each chemical (all 220,000) has a quantitative normalized score. They also have a Cross-Reference Dictionary & Regulatory Lists. The Chemical Cross Reference Dictionary contains 550,000 records of purified

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	CAS numbers and their associated synonyms. This file facilitates accurate and complete materials management data searches and product substitution research. The Regulatory List of Lists file is comprised of over 650 international, federal, state and local regulated chemical lists and their associated data, as well as numerous CCS compiled lists (e.g., incompatible chemicals, hazard classes, etc.). CCS' modules compare a single chemical inventory file against these lists and generate a multitude of regulatory reports utilized by logistics, environmental/safety/ health, and chemical security professionals, as well as first responders. I strongly recommend California evaluate CCS's capabilities for application as part of California's Green Chemistry Initiative. I believe California's efforts will benefit from use of CCS's capabilities.
F-TA-49	Risk-Based Evaluation – the One Approach that Makes Sense Chemistry has enabled the development of countless products that consumers use each and every day, and consumers want to understand what impact these products may have on the environment and on their health. Industry shares this desire, and continues to strive to develop, produce and market products that are both beneficial and safe for people and the environment. Given the complex and multifaceted technical, societal and policy elements that are inherent in the design, manufacture, use and disposal of these products, one must consider a number of factors to effectively assure their safety. Approaches to safety that are performance based and flexible will provide the greatest benefits and allow the development of innovative approaches within the context of California's Green Chemistry Initiative. Industry works to minimize exposure of workers and the public to all chemicals that could be considered hazardous as used, and we pay particular attention to chemicals considered to be hazardous to humans or the environment. At the same time, industry uses chemicals that are least hazardous, and thus require the least expense in worker and public safeguards, consistent with the production of effective and economically accessible products. The two halves of risk--hazard and exposure--are always part of our planning and never far from our minds. Approaches that utilize risk-based evaluations of chemicals to determine efficacy and safety should serve as the foundation for decision making within programs that flow from the California Green Chemistry Initiative. While the toxicity of a substance is an important consideration in a risk based evaluation, the potential for toxicity must be considered in the context of exposure--including exposure level, route, duration and timing. Every substance can produce toxicity under certain exposure conditions. Even common-place substances usually thought of as benign, such as water and table salt, can cause death when ingested at too high a dose over short periods of time. Conversely, even the most toxic substances pose virtually no risk when releases are controlled and exposures are minimized to levels below which, given an adequate margin of safety afforded by risk assessment techniques, the doses will not elicit adverse effects. For example, arsine gas is used to make microcontroller and microprocessor chips, and although arsine gas is highly toxic when inhaled, its "presence" in semiconductor chips in products used in every day life--computers, calculators, appliance microprocessors--poses no health hazards or risks from in-home normal and customary uses. So the question is not just, "How do we control toxic substances?", but also how do we successfully manage both toxicity and exposure--risk--while providing the solutions society needs? The answers to these questions are best provided through: 1) Risk assessment methods that integrate knowledge regarding potential hazards of chemicals with an understanding of their uses and exposures;

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	2) Product stewardship and risk management programs that establish mechanisms to assure exposures remain in the safe region for typical uses and foreseeable misuses; and 3) Laws and regulations that: • are science-based, • balance potential risks with benefits, • factor in existing scientific knowledge as well as reasonable uncertainties, and • consider the degree of risk to people and the environment.
F-TA-50	Quantitative Assessments of “Green” Munitions and Chemicals of Concern For many years, the Department of Defense (DOD has made a concerted effort to reduce the potential impact of munition constituent and other chemicals on human health and the environment. In 2000, the U.S. Army Defense Ammunition Center (DAC) began working with Chemical Compliance Systems, Inc. (CCS) to use CSS’s extensive centralized Relational Chemical and Product Databases as the basis for a series of integrated, web-based modules within what has become the Munitions Analytical Compliance Suite (MACS). (CCS’s centralized databases included over 650 regulatory lists.) MACS includes eight modules. In a few months, the 9th and 10th automated modules the Emissions Risk Assessment and Human Health Risk Assessment–will be added. The most comprehensive of the MACS modules is the “Green” Munitions Analytical Compliance System (G-MACS). CCS developed G-MACS for DAC and PEO Ammunition Office in 2003. DAC and CCS co-own G-MACS, which has been available to 13 military munitions demilitarization facilities and two munitions management offices from coast to coast since its development. Military munitions design engineers can use the G-MACS’s 43 quantitative ecological, health and safety criteria (Endpoint Criteria) to eliminate or reduce the use of hazardous munitions constituents to create a theoretical munition composition that substitutes alternative components, parts or chemicals, and calculates the “green” grade for the total, component, or part composition in 5 to 20 seconds. G-MACS can also quickly identify which munition constituents have an impact on any of 112 state, federal or international regulations. This electronic design capability greatly reduces the labor and time required to design a “greener” munition. G-MACS also has application to other munitions activities (e.g., acquisition handling, demilitarization). Using a munition’s National Stock Number (NSN), G-MACS can calculate a munition’s overall “green” grade, its ecological, health and safety scores, and the 43 Endpoint Criteria scores within five to 10 seconds. Because all scores are normalized on a scale from 0 (worst) to 100 (best), comparisons of the “greenness” of two (or more) munitions is easy and quantitative. The evaluator can view individual scores, from worst to best, as a means to determine those constituents that need to be replaced to improve the “green” grade. When G-MACS is combined with CCS’s proprietary “Green” Process Analytical Compliance System (G-PACS) the four stages of a product life cycle (i.e., design; manufacture; stockpile management [e.g., handling, transportation, storage]; and disposal) can be evaluated. G-PACS uses the same 43 Endpoint Criteria as G-MACS, but analyzes the chemicals used in each step of the manufacturing process, or wastestream, rather than the constituents used in a munition. The MACS Chemicals of Concern (MACS-COC) module combines the objective and quantitative 43 Endpoint Criteria with quantitative Regulatory Impact and Inventory On-Hand Criteria to calculate a ranked Level of Concern listing for any facility’s inventory. This prioritized list can be beneficial in decision making, particularly in regard to inventory management, pollution prevention, and cleanup. I strongly recommend California evaluate CCS’s capabilities for application as part of California’s Green Chemistry Initiative. I believe California’s efforts will benefit from use of CCS’s capabilities. CCS’s web-based capabilities, their innovative approach, and their willingness to develop new or modified, integrated capabilities has proven beneficial to the Army’s efforts to both be good stewards of the environment and to implement its sustainability

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	program. Although I have not used them, I am aware of CCS's non-munitions capabilities, and believe that they would prove to provide tools of value to the civilian community and decision makers.
F-TA-51	Addressing the Data Gaps Is more data always better when it comes to understanding chemical safety? In many cases, the answer is yes, but when making this determination, it is important to understand the difference between a "data gap" and a "data need." WHAT DATA IS NEEDED? The U.S. EPA has clearly distinguished "data gaps" from "data needs" in the past. Data gaps are areas that could benefit from additional data, additional analyses, or clearer presentation, while "data needs" are data gaps requiring additional work before the potential risks can be adequately characterized – an important distinction to keep in mind. As was discussed at OEHHA's October 1 – 2 workshop on "Practical Decision-Making Tools," there are many models, tools, and guidance on structure-activity relationships to provide California with a tremendous amount of knowledge about chemicals without performing direct testing. The Canadian chemical prioritization under its Environmental Protection Act (CEPA) discussed at length in the workshop made extensive use of such modeling. The oft-touted EU REACH system initially proposed broad new testing mandates, but in its final version, the regulation backed away from that in deference to concerns over animal welfare. Sound scientific decision-making does not require the blunt approach of mindless box checking that only serves to require unnecessary data and animal testing, and burdens already strained public and private resources. Simply requiring unnecessary testing would only serve to put California seriously out-of-step with scientific consensus in the U.S., Europe, and the 30+ member countries of the Organization for Economic Co-operation and Development (OECD). WHAT CAN CALIFORNIA DO? 1. California should begin its assessment of information needs by first leveraging the information that already exists on chemicals. This includes accessing the information publicly available on High Production Volume (HPV) chemicals. Through the groundbreaking HPV Chemical Challenge Program, the OECD ICCA HPV program, and industry-led extensions of that work in the US, the chemical industry has already made and continues to make more information publicly available on more chemicals than any other voluntary or regulatory program globally. HPV chemicals in this program represent more than 95 percent of the U.S. market for commercial chemicals by volume. The information provided covers 17 endpoints internationally agreed by the OECD member countries as sufficient to initially assess chemical hazards including physical/chemical properties, environmental fate, ecotoxicity, and hazards to human health. Although this database is still being populated, there is a wealth of data and a solid platform from which the state of California can prioritize chemicals of interest, and evaluate further information needs. 2. Additionally, the HPV hazard data will be soon be supplemented with the information required by EPA's Inventory Update Rule. Specifically, in 2006 chemical manufacturers and importers of chemicals with site-specific annual production of 25,000 pounds or more were required to submit the following information for chemicals manufactured or imported in calendar year 2005: • Basic company and facility site information • Chemical identify information • Specific chemical production volume • Chemical site limited status • Number of workers reasonably likely to be exposed to the chemical substance at the site of manufacture or import (in prescribed ranges); • Physical form(s) of the chemical substance as it leaves the submitter's possession, along with the associated percent production volume; and • Maximum concentration of the chemical substance as it leaves the submitter's possession (in prescribed ranges). In addition, manufacturers and importers of chemicals with site-specific annual productions of 300,000 pounds or more were also required to provide the

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	following production and use information: • Application - North American Industrial Classification System ("NAICS") codes that best describe the industrial activities conducted by the sites that use or process the substance; • Industrial functions of the chemical substances; • Approximate number of processing and use sites; • Estimated number of workers reasonably likely to be exposed to each chemical substance at all sites at which the chemical is used or processed; • Commercial and consumer uses of reportable chemical substances o An indication of whether the commercial/consumer products are intended for use by children; o Maximum concentration of the reportable chemical substance in each commercial and consumer product category; and • Estimated percentages of the submitter's production volume in each industrial function category and commercial and consumer product category. A compilation of the IUR information will be made publicly available by EPA sometime by the end of this year, and will provide the core of basic chemical "mapping" data discussed in recent Green Chemistry dialogues. 3. California should also work now to understand how it can leverage the regional chemical cooperation program recently announced by Canada, Mexico and the United States under the Security and Prosperity Partnership (SPP). The SPP program will leverage the information Canada has produced under its Chemical Management Program, and the related CEPA priority-setting. In addition, the U.S. has committed that by 2012 it will assess and initiate any action necessary on more than 9,000 existing chemicals produced in the U.S. This will include both HPV chemicals and Moderate Production Volume (MPV) chemicals. WHERE CAN CALIFORNIA GET THIS DATA? Identified below are websites where California can obtain a significant amount of information on chemicals that already exists. The HPV Challenge data is available at: • http://www.epa.gov/hpv/pubs/hpvrstp.htm A more user-friendly version of the above referenced database is being built, and should be complete later in 2007. An initial version of that database is available now at: • http://www.epa.gov/hpvis/metadata.html. Recently, the chemical industry announced that it is extending its work on HPV chemicals - calling it the Extended HPV Program or EHPV. The EHPV Program broadens the original initiative by calling on companies to provide health and environmental information on 573 chemicals that have become HPV since the initiation of the Challenge Program, and increases the scope of information requested for all sponsored HPV chemicals by asking companies to provide use and exposure information. Information from this program will be submitted to the EPA over the next four years. Additional information is being generated under the Voluntary Children's Chemical Evaluation Program (VCCEP), in which USEPA evaluates both hazard and exposure information submitted by companies which have volunteered to determine potential effects on children's health. This information is publicly available at: • http://www.epa.gov/chemrtk/vccep/index.htm Beyond the databases for these voluntary programs, there are numerous other publicly available government databases. The Toxic Substances Control Act Test Submission database, TSCATS, is a central system for the collection, maintenance, and dissemination of information on unpublished technical reports submitted by industry to EPA under TSCA. Studies on over 8,000 chemicals are categorized into three broad subject areas (health effects, environmental effects, and environmental fate). Searches can be conducted using these subject areas as well as indexing terms. • http://www.syrres.com/eSc/tscats_info.htm

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	EPA and its Office of Research and Development maintain an electronic database called the Integrated Risk Information System (IRIS) and it contains descriptive and quantitative information on human health effects that may result from exposure to various chemicals in the environment. IRIS was initially developed for EPA staff in response to a growing demand for consistent information on chemical substances for use in risk assessments, decision-making and regulatory activities. Information in IRIS is intended for those without extensive training in toxicology, but with some knowledge of health sciences. The heart of the IRIS system is its collection of computer files covering individual chemicals. • http://www.epa.gov/iris/ The European Chemical Substance Information System (ESIS) is an electronic system that provides information on both new and existing substances in the EU. It includes proposed classification and labeling for 3,300 chemicals, information and data for roughly 2,500 EU HPV chemicals and final risk assessment reports for chemicals with completed assessments. • http://ecb.jrc.it/ESIS/ The EU's REACH legislation will eventually make available hazard data on all chemicals in the European market, as well as use-specific chemical risk assessments for chemicals on the European market above a specific threshold. Data will be publicly available, fully searchable, and formatted in software known as IUCLID. The International Council of Chemical Associations has committed to submit data and assessments for 1,000 global HPV chemicals to the 30 developed nations of the OECD for government assessment. To date, 667 chemicals have been assessed under the OECD program and work is continuing. OECD assessments are published as soon as they are completed on the OECD website. The data included in those assessments are also available, via the United Nations Environment Program (UNEP). • http://cs3-hq.oecd.org/scripts/hpv/ • http://www.chem.unep.ch/irptc/sids/OECDSIDS/sidspub.html The EXICHEM database is a pointer system on current, planned and completed activities on existing chemicals in OECD member countries and other relevant bodies. It was created to provide information for the OECD member countries on "who is doing what with which chemicals", (e.g. information gathering, testing, evaluation), in order to assist countries that are identifying opportunities for co-operation. • http://webdomino1.oecd.org/ehs/exichem.nsf The International Program on Chemical Safety (IPCS - a joint program of UNEP, ILO and WHO) developed INCHEM - a freely available collection of internationally peer-reviewed documents about chemicals and chemical safety. It was initiated in 2003 in response to priorities established by the Intergovernmental Forum on Chemical Safety (IFCS) and provides convenient worldwide full-text electronic access to chemical safety-related documents provided by intergovernmental organizations. All documents referenced by INCHEM contain hazard information and the site can be queried by key-words and free text. INCHEM contains Environmental Health Criteria documents, and cancer assessments by the International Agency for Research on Cancer. • http://www.inchem.org/
F-TA-52	Innovation and Regulation Some of the suggestions posted in the Conversation with California appear to recommend that the State adopt a regulatory framework that would somehow coerce or command companies to innovate and develop "green" products or processes. The underlying assumptions seem to be that (1) the current system somehow stymies innovation and (2) forced regulation is the only way to bring about innovation. Unfortunately, neither of these assumptions are supported by the facts. Let's look at the current U.S. chemical regulatory system and opportunities to bring new, better chemicals to market (a surrogate for measuring

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	innovation). A comparison of the US system against the pre-REACH European system found that opportunities for the innovation were stifled for the European companies, not the US companies. European firms showed a lower economic performance, lower R&D productivity, lower patent productivity, lower number of polymer patents, and lower numbers of new chemical notifications (Fleisher, Manfred, Sabine Kelm, Deborah Palm. Regulation and Innovation in the Chemical Industry. Social Science Research Center Berlin. October 2000). Our current system allows companies to use the sophisticated techniques developed by EPA to assess potential risks for chemicals and incorporate the findings into future business decisions. Thus, far from being a barrier to innovation, the U.S. regulatory system confers some important benefits in the breadth and speed of technological progress. What about the second assumption that we need to regulate to force innovation? If “green” chemistry is to work, there must be inter-disciplinary collaboration among a variety of experts in chemistry, toxicology and environmental science that work in business, government and academia. No government can dictate precisely how this process for innovation and collaboration should occur. It will be unique for each circumstance. A one-size-fits-all regulatory framework will not only fail to bring about new innovation; it could, in fact, stifle ongoing innovative processes. In addition, stricter management controls (including bans) of existing chemicals provide no guarantee of “greener” outcomes, although this has been implied by others. Green chemistry explicitly identifies materials or processes that reduce health and environmental impact while maintaining or improving cost-effective performance. A regulatory action taken against an existing chemical may or may not be supported by a careful analysis of the health and environmental impact of substitute products or processes; and those substitutes may or may not provide cost-effective performance to meet the specific societal need. Unless such an analysis occurs, it is not clear that regulatory action improves health and environmental protection. The reality is many chemical companies are already addressing green chemistry objectives through their ongoing product stewardship work. Product stewardship is the practice of making health, safety and environmental protection an integral part of the full life cycle of chemical products. It includes evaluations of chemical products and their uses to help assure that those products deliver their intended benefits to society while protecting public health and the environment. As part of Responsible Care®, members of the American Chemistry Council employ a rigorous management system that is certified by third-party auditors. In addition to numerous other elements, those auditors verify that our companies have systems to manage risk associated with chemical products and that those systems include management of product development, transport, use and disposal in a safe and secure manner. Companies are also audited on their programs to protect the environment and conserve programs, as well as processes to dialogue with stakeholders about the organization’s impact on human health and the environment. ACC member companies have a track record of bringing new, innovative products to market that address new societal needs, including health and environmental protection. In addition, shifting market expectations and liability regimes are already at work in instituting the increased attention to health and environmental effects. The market is already leading the way -- the risk of a government "meat-ax" could stifle that innovation in its tracks. ACC agrees that government can and should encourage the collaborations that can produce “green” chemistry, through mechanisms such as the sharing of expertise, financial support for research, information exchange and public education. In fact, a variety of federal agencies (including EPA and DOE), the private sector, professional associations such as the American Chemical Society, Non-Governmental Organization (NGO) groups and universities are currently working together to encourage green chemistry strategies. The government can and has provided support for green chemistry outside the framework of TSCA. Those efforts can, of course, be enhanced further to improve U.S. leadership in the field. If the state of California truly wants to lead in green chemistry, it needs to be focused on encouraging innovations through incentives. The economic drag of yet more rules, regulations and restrictions will not foster the creation of new products or, more importantly, their development and diffusion across the economy

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F-TA-53	Quantitative Web-based "Green" Munitions Analyses The United States Army Defense Ammunition Center (DAC) has partnered with Chemical Compliance Systems, Inc. (CCS) to develop munition analytical compliance capabilities for the past eight years. Along with other DOD organizations, in 2003, DAC contracted CCS to develop a tool that would assist the Army in efforts to assess munitions from a “green” perspective. What came out of this was a Web-based tool known as the “Green” Munitions Analytical Compliance System, or G-MACS. Since no green criteria had previously been established for munitions, or any other product, the development of G-MACS by CCS with 43 ecological health and safety “green” criteria made a giant step forward in helping our design and manufacturing installations with an automated capability to assess the “greenness” of munition constituents early in the life cycle. The “green” scoring criteria in G-MACS was programmed to be flexible and dynamic enough to be modified as needed to support any environmental factors and/or guidelines on “greenness” that might be developed. G-MACS is unique in that it can, in combination with the CCS “Green” Process Analytical Compliance System (G-PACS), be used to “score” a munition for “greenness” throughout the life cycle (cradle to cradle). G-MACS, along with other CCS systems such as their "Green" Product Compliance Analytical System (GP-CAS), and "Green" Process Analytical Compliance System (G-PACS), could be utilized to provide a complete life cycle “green” product measuring tool that not only covers munition constituents but also, paints, pharmaceuticals, cleaning products, pure chemicals, etc. After a number of years of working with CCS and knowing the tools that they developed such as MACS and G-MACS, DAC is confident that the State of California could benefit by utilizing CCS and their GP-CAS, G-PACS and G-MACS Web-based tools.
F-TA-54	ACC's Perspectives on California's Green Chemistry Initiative The business of American chemistry is built on fundamental science. As a result, the members of the American Chemistry Council (ACC) support science and risk based chemical management policies that simultaneously protect health and the environment, assure product safety and promote innovation in the marketplace. Our industry has always relied upon innovation in its development of products and processes to meet customer needs and expectations, address new regulatory requirements, and to fulfill voluntary commitments to programs that go beyond the law. It’s important to note that “Green Chemistry” is a way of doing business was never intended to be applied as a government mandate through regulation or legislation. Indeed, the American Chemical Society’s Green Chemistry Institute states: "Green Chemistry differs from previous approaches to many environmental issues. Rather than using regulatory restrictions, it unleashes the creativity and innovation of our scientists and engineers in designing and discovering the next generation of chemicals and materials so that they provide increased performance and increased value while meeting all goals to protect and enhance human health and the environment." So how should California approach green chemistry? We think there are a number of threshold issues DTSC must be prepared to address in making recommendations on the basis of this initiative: 1. Make a baseline assessment of chemical information that is already available to the State. In ACC’s view, there is a lot of information already publicly available on chemicals in commerce, and a lot more coming on line, from other States, the federal government, foreign governments, intergovernmental organizations, and even non-governmental organizations (including industry). DTSC should be studying the availability of data now, particularly the availability of both hazard and exposure data, so that risk determinations can drive decision making. It simply makes sense for California to coordinate on information needs with other governments and other sources of information – why reinvent the wheel? More importantly, DTSC doesn’t have to wait until the end of its Green Chemistry Initiative to get the ball rolling on this important element. 2. Reiterate the commitment that the Green Chemistry Initiative will be governed by science. Many entries in the “Conversation with California” appear to be based on an underlying assumption that the current design of products and manufacturing processes is not adequately protective of health and the environment, and recommend that DTSC suggest hazard-based approaches to decision making. That’s not good policy. As DTSC acknowledged in the launch of the Initiative, science should govern the process. Americans (and Californians) are living longer, healthier, and safer lives than ever before, and significant improvements have been made in public health and the environment. An extensive legal and regulatory framework, coupled with myriad

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	voluntary programs, initiatives and innovations, has led to those advances in health and the environment. We hope that the Green Chemistry Initiative will examine the basis for the assumptions about the adequacy of current protective measures as policy options are identified. 3. Commit to understand both the burdens and benefits of new regulatory proposals. One University of California report on chemical regulation in California noted that businesses in California labor under a “labyrinth” of rules enforced by a number of agencies. Interestingly, many of the entries in the “Conversation with California” argue that even more regulation is necessary! Some have referred to Europe’s new REACH regulation as the solution – taking the interesting position that a regulatory program that is not yet even operating is now a benchmark for chemical regulation. 4. Acknowledge that engineering is a part of “green chemistry.” ACC member companies are leaders in green chemistry and green engineering in their operations and have been honored for their efforts. Modifications in process technology have significant potential to minimize possible adverse health or environmental effects of chemical substances. Many of the entries in the “Conversation with California” appear to focus largely on promoting product substitution – the simplistic substitution of one hazardous chemical for a less hazardous alternative – without regard to the consequences of such an approach, and without recognizing the important role that process improvements can have. It’s time DTSC made clear in this dialogue that engineering is every bit as important as product improvements. ACC and its member companies believe that the Conversation with California should address a number of the complex, specific issues that are implicated by the Initiative. In the weeks ahead, we intend to address issues like the role of product stewardship, the role of regulation in promoting innovation, how California might stimulate “green chemistry” and “green engineering”, and the four broad categories on which DTSC has invited specific comment. Mike Walls Managing Director, Regulatory and Technical Affairs American Chemistry Council
F-TA-55	Quantitative Green Ranking for All Chemicals A database has been created with over 220,000 chemicals (all listed to date) and all cross reference names with filters for all state and federal regulatory lists. Each chemical has assigned the 33 federal EPA Environmentally Preferred Characteristics (EPP) and additional credible Characteristics given by regulatory agences CAL EPA, other key USA states and key countries totaling 41 key environmental performance characteristics (e.g. LD 50, excess lifetime cancer risk, flammability, health hazardard indicies etc). These characteristics may be organized into three categories Ecology, Human Health and Safety. This database, updated annually, contains over 75,000,000 elements to rank products as a function of the chemicals and chemical percentages. For each environmental characteristic, the chemical that is least compatable with living systems is given a score zero and the most compatable the score one hundred. The scores in between are normalized so that each chemical (all 220,000) has a quantitative normalized score. The navy tested eight adhesives meeting MIL-SPEC by providing the chemicals that make up the products. The chemicals were tranmitted via the on-station web site database of products Hazardous Material Management System (HMMS) to Chemical Compliance System's (CCS; www.chemply.com) web site. A report of all 41 Environmental Characteristics was automatically generated, and with equal weights as the default mode, a normalized score for Ecology, Human Health and Safety and an overall Environmental Score (Green Rank Score to make the best decision for the environment). This tool may be used for face cream, road paint, military aircraft munitions or paint, any product with a list of chemicals and percentage created a true quantitative score. This tool may be utilized by acedemia, government, industry, householders, military etc to formulate-design and or determine the best products compatable with the ecology, human health and safety. The vision is that the state of California purchases the tool for the USA to be utilized for no cost by all so that the environmental may improve rapidly. This would become the biggest pollution prevention project ever and the most cost effective to reduce pollution through source reduction. The federal

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	EPA may also participate. With this tool in place via a web site sponsered by CAL EPA and or FED EPA, the products most compatible with the ecology, human health and safety may be chosen by the consumer. Also, formulations by acedemia, the govenment, industry etc may be optimized for environmental compatability. The user simply imputs the chemical makeup of a product and the web site generates a complete report of the EPA EPP chacteristics (and others from the key state and countries if desired) and a normalized score for the ecology, human health and safety and a total environmental score (green rank). This would be easy to put the information into a green label. Dr. George Thompson, PHD in Chemical Engineering developed this tool taking over 25 years for the DOD through a company www.chemply.com. The rest of the nation should benefit from this significant work.
F-TA-56	Government test all new products. Government test all new products.
F-TA-57	Legislative Changes I have conducted research on safer alternatives for the last 30 years. Over the last 17 years, my organization, the Institute for Research and Technical Assistance (IRTA), has identified, tested, developed and demonstrated safer alternatives in a range of different applications and industries. Over that period, IRTA has assisted hundreds of facilities in California in adopting alternatives. IRTA has worked on alternatives in dry cleaning, repair and maintenance cleaning, handwipe cleaning, batch loaded cold cleaning, electronics cleaning, vapor degreasing, printing cleanup, paint stripping, coatings and adhesives. In some cases, whole industries have adopted alternatives developed and tested by IRTA. Over the course of this work, I have learned much about how the system works and have become aware that, in order to ensure that safer alternatives are used, legislative changes are required. First, California needs a California Toxic Substances Control Act (CAL TSCA). CAL TSCA would require all new chemicals sold into California to be tested for toxicity before they are marketed. A set of toxicity tests that would be required would be developed by a consensus group of toxicologists with input from DTSC and the public. The manufacturers or distributors would have to conduct these toxicity tests at their own expense. CAL TSCA would also establish a set of toxicity tests that would be required for existing chemicals, chemicals that are already being used and marketed in California. In a few cases, the toxicity test information would already be available; in other cases, the tests would have to be performed. When the toxicity test data were provided by the manufacturers or suppliers, DTSC, with the help of the Office of Environmental Health Hazard Assessment (OEHHA), would evaluate the results and decide whether the chemical could be marketed (new chemicals) or whether the chemical would have to be removed from the market (existing chemicals). The criteria for deciding on this up or down vote would be predetermined by the group of toxicologists who designed the tests and DTSC with public input. Many chemicals that have toxicity problems have come on the market in the last 10 years. These chemicals are used extensively and exposure of workers and community members is high. An example is n-propyl bromide (NPB). NPB is a reproductive toxin in animals and has also caused nerve damage. It is currently undergoing testing for carcinogenicity. When the chemical was first marketed, EPA did not require toxicity testing for the substance under Federal TSCA. The chemical has been listed on California's Proposition 65 but is not on the state toxics list. Cal/OSHA and Federal OSHA have not established worker exposure levels for the chemical. NPB is used in vapor degreasing. The dry cleaning industry is considering using it as a dry cleaning solvent and there is nothing that would prevent this. Once chemicals like NPB are on the market, there is no mechanism for preventing their use in dispersive applications. Adopting a CAL TSCA would allow the state to deal with chemicals like NPB. Second, OEHHA has the responsibility of determining whether chemicals pose an unacceptable risk and that agency has few resources. OEHHA's budget should be expanded substantially. Dry cleaners in the state have been using a dry cleaning solvent called D5 for several years and D5 has

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	caused cancer in laboratory animals. OEHHA has been evaluating toxicity test results to determine whether D5 is a threat but has not completed their analysis. In the meantime, no regulatory agency can regulate D5 and the dry cleaning industry is using it extensively. Giving OEHHA more resources could speed the evaluation process and give high priority to the new work the agency would be called upon to do under CAL TSCA. Third, the California Air Resources Board (CARB) is limited in their regulatory authority and their authority should be expanded. CARB regulates consumer products but is forbidden from regulating away a whole product type. In other words, if a low-VOC or low toxicity nonaerosol product is available and could substitute for a higher VOC more toxic aerosol product, CARB cannot regulate the VOC content or toxicity of the aerosol product on that basis. CARB can set a lower VOC limit or ban certain toxics in the aerosol product if there are other aerosol products with lower VOC content or no toxics. Aerosol products are inherently not green. They lead to a very large waste stream and they rely on propellants that are often VOCs or greenhouse gases. As an example, consider antiperspirants and deoderants. Roll on products have very low or no VOC content. In contrast, aerosol products have a higher VOC content and contain propellants that may be greenhouse gases or VOCs. Expanding CARB's authority would permit the agency to establish VOC and toxics limits based on the nonaerosol products. This would allow the state to forbid the use of aerosol products in cases where there are greener products. It would also allow CARB to forbid the use of certain toxics as determined under CAL TSCA as a threat. The three legislative suggestions described here would make it far easier to restrict the use of certain materials that cause problems for health and the environment. The strategy would provide an incentive for manufacturers and suppliers to find and market greener products. This would result in better protection of the health of consumers and workers and of the environment in California.
F-TA-58	Lord Professor of Chemistry Expand education in building a sustainable technology base. • Encourage that chemists should have university courses in Green Chemistry emphasizing toxicity and ecotoxicity. • Encourage universities to develop green business and law courses, etc. • Require REACH-like analysis/reporting/removal of toxics in products. • Expand State testing of products to detect hidden toxics in all products and to produce a level playing field internationally—police your laws. • Develop a process for rapid removal of products found to be toxic by new studies that is fair to industry—State subsidized transformations?

CRADLE TO CRADLE (JOURNAL)	
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J-C2C-1	Dear Green Chemistry Advocates: Ethanol from green plant material is getting a lot of press lately as a fuel substitute. Ethanol can be used for much more than just fuel. 15 years ago I raised the idea of conducting life cycle comparisons of products produced from green plants (ethanol), vs petroleum products. The idea was that it might be shown that less hazardous waste would be produced from manufacture and use of products based on green plant chemical feedstock vs petrochemical feedstock. Kim Wilhelm may remember the idea. I raised it with him when we were both with DTSC's Alternative Technology Division. The time was not right. I'd like to take this opportunity to raise the idea again.While in college in the early 1980s, I did some research on fuel grade ethanol production. My research led me to a Fellow at UC Berkeley, Dr. Melvin Calvin, who was pioneering research on industrial chemicals from plant fibers and plant oils. A new process called acid hydrolysis showed promise for converting plant cellulose to sugar, allowing greater ethanol yields from green plants. Also, it has been known for many years that alcohols from plants and plant fiber can also be used as feedstock for producing plastics, synthetic fibers, cleaners, animal feed, and other products. This was done during WWII, when oil was rationed. The time may now be right for doing life cycle comparisons of petrochemical products to products produced from plant fiber. How would the costs compare? How would the quality compare? Would there be less toxic wastes produced? Would the wastes be less toxic? Would the wastes be less mobile in the environment? How would water use play into the study? Would the waste be easier to remediate? If the time is right, and you could use some help, I volunteer to work on the studies and write up the results. Thanks for the opportunity to bring up the idea again. Sincerely, Mike Vivas, P.E. Department of Toxic Substances Control Northern California Central Cleanup Operations Branch

CRADLE TO CRADLE (JOURNAL)	
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J-C2C-2	Dear Director Gorsen,I understand that you are soliciting suggestions for your green chemistry initiative.First, I applaud you for starting a discussion about a proactive step toward reducing the use and release of toxic substances in our environments. The tools and approaches now in use are too piecemeal and not producing fundamental solutions. Second, an initial challenge will be to develop an initiative that is reality-based. At present, there is little actual practice of "green chemistry" as that term is defined. What would be the drivers that would cause the designers and manufacturers of chemicals currently in use to redesign them? This is an important public policy challenge, as those who have invested in the status quo are not necessarily most likely to seek to change it. In addition, how to design materials to avoid threats to health and the environment is still a research question, so an effective strategy will need to bridge the considerable distance between where we are now and where you want to go. Third, I believe that it is important to understand that there are many potential decision makers who can and will influence what chemicals are used and released into the environment. These include every consumer who decides what kind of soap to buy and whether to use baits or traps for pests. This includes every company that purchases products for use in their business. It includes every entity that selects materials to use in manufacturing their own products. The information needs of these entities are diverse, but finding ways to help all of these entities distinguish between the more toxic and the less toxic alternative is a critically important need. This does not seem to be reflected in the current description of the initiative, which focuses more on what Cal EPA will do. Cal EPA can do a lot but not everything. Finally, the question of how to generate the data stream needed for unbiased assessment of the relative toxicity of various compounds (as well as processes and other types of things contemplated) needs serious attention. None of the chemicals policy initiatives have solved this problem. They are mostly relying on the kinds of testing approaches that have been in use for the last 30 years, focused on only some of the toxic effects that are of concern. It is essential to be able to accurately distinguish those compounds that are more toxic from those that are less toxic for "green chemistry," toxics use reduction, substitution or any of these kinds of approaches to lead to better decisions. We need to get serious about using the new knowledge and methods that have been generated in the last 30 years to do something smarter and better than what has been done in the past. We also need to recognize that even the kinds of data that we have had in the past is not being generated very much in the US any more. These issues need to be addressed with genuine expertise and commitment to the public interest, to avoid potential having well intended initiatives become another form of green-washing.Thank you for your leadership.cheersadkAmy D. Kyle, PhD MPHAssociate Research Scientist and LecturerProject on Science and Policy for Health and EnvironmentSchool of Public Health, University of California, Berkeley
J-C2C-3	Please don't lose sight of the environmental advantages provided by plastics. These include ... a less-hospitable surface for bacterial growth (vs paper bags, wood), ... less accidental injury (vs glass, metal), ... lower energy consumption from start to finish (especially PVC, which uses less energy in manufacture and use than most all other materials), and ... potential for energy recovery either via incineration-to-power or recycling that replaces new material manufacture (the most meaningful form of recycling.Please also don't get caught by pseudoscience that talks about harmful chemicals as if "chemicals" were a dirty word (we are all made up of chemicals), or a passion for "natural" as sacred, as if man-made/synthetic/processed were evil. The words are grossly abused, as some of the most toxic substances are "natural" (e.g., snake venom, tobacco) and many "chemicals" make our lives safer and healthier (safe drinking and swimming water, synthetic insulin, and countless household and medicinal "chemicals"). Lastly, don't lose sight of an old medical maxim, "the dose makes the poison." It's how much that counts, so that if someone says "that contains "xyz" we have to know how much xyz, and what the effects of that much might be. There are certainly substances that should be minimized and avoided, and in fact California is a leader in raising the nation's consciousness to this effect. Please continue that leadership with sound scientific and medical bases, and don't be swayed by people with pre-set agendas, often well-meaning but nonetheless wrong.Allan L. Griff, Consulting Engineer

CRADLE TO CRADLE (JOURNAL)	
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J-C2C-4	THOUGHT STARTER ON CALIFORNIA GREEN CHEMISTRY INITIATIVETom Jacob – DuPont, Sacramentotom.jacob@usa.dupont.comFor most of the last century, DuPont has been among the largest chemical producers, globally. Our 200 year heritage of leadership in workplace safety, toxicology, science and technology positioned us as a premier company in safely handling hazardous chemicals; and in innovation in chemicals that has delivered extraordinary value across society. Creation of nylon is perhaps most familiar, but that is but one example among the 34,000 patents to which DuPont's innovation has led.TRANSITION TO SUSTAINABILITY: One of the more recent examples of DuPont innovation received a Presidential Green Chemistry Challenge Award. Such awards are always welcome recognition, but this one is a particularly significant example for the CalEPA initiative. The Award was for microbial production of 1,3-propanediol – a critical ingredient in production of an entire new polymer platform (DuPont Sorona). It is the first example of a highly engineered microorganism used to convert a renewable resource into a chemical at high volume. In this case, the use of this microbe allows replacement of a petroleum feedstock with corn, with additional benefits of reducing energy consumption in manufacturing as well as improving process safety. Commercial production of this polymer began last year. This example is significant for the Green Chemistry Initiative in part because it is not "chemistry" as we have traditionally known it. Rather, it is the melding of chemistry with biology, with the aim of delivering a product that has broad value across society, but doing so in a way that is less dependant upon depleting resources, safer to manufacture, and more economical to produce than traditional alternatives – in short, that is more sustainable both environmentally and economically. DuPont has spent much of the past decade reshaping our business portfolio to position us as an agent of such "sustainable growth." Our transformation is certainly not yet complete, but it is noteworthy that it is well underway. Importantly, we are not alone in sensing and anticipating this as a broader societal transformation (a quick review of the other "Green Chemistry" award winners illustrates this). Transition toward more sustainable practices that still deliver the goods and services that societies expect represents a paradigm-shift from industry's historic role as, in a sense, the "enabler" of mass society. The new paradigm frames a more complex expectation of industry as an enabler of long term, more sustainable well-being, with a new emphasis on social and environmental responsibility. California's Green Chemistry Initiative can position the State for leadership as this transition proceeds. It is important to keep in mind, however, that this transition is already underway, and ill-conceived state intervention can just as easily retard its progress and thus the potential for California leadership."GRAND CHALLENGES" FOR THE CHEMICAL INDUSTRY: The application of science and innovation to meet society's needs and solve its challenges has always been a significant contribution of industry, generally, and the chemical industry in particular. This role of the chemical industry is no less vital today, but the challenges differ, as does the societal expectation of how we will approach those challenges. The 2006 UC report on "Green Chemistry in California" made a useful contribution to framing that larger societal need. It pointed to a 2005 conference of the US National Academy of Sciences. The focus was on the "Grand Challenges and Research Needs" for the chemical industry in both becoming more sustainable as an industry, and enabling society as a whole to advance toward greater sustainability. These include advancing our understanding of toxicology, application of principles of green and sustainable chemistry, and extending the use and sophistication of the life cycle analysis integral to green chemistry. Importantly, this broad agenda of challenges for which the society is depending upon an agile and innovative chemical industry goes beyond the more narrow conceptions of "green chemistry." The "Grand Challenges" (to which California Initiative should contribute) also include:• Renewable Chemical Feedstocks• Renewable Fuels• Energy Intensity of Chemical Processing• Separation, Sequestration and Utilization of Carbon Dioxide• Sustainable EducationAs noted above, the transformation necessary to address these challenges has already begun. It is a product of the same broad evolution in societal expectations that is also driving the movement toward green chemistry, generally, and the California Green Chemistry Initiative, specifically. "GREEN CHEMISTRY" AND CALIFORNIA: One of the benefits anticipated for the State from taking on leadership roles in sustainability issues such as climate change and green chemistry is that the State will become a nexus for answers to the World's sustainability challenges, with economic benefits in addition to the direct benefits deriving from more sustainable practices. The State is anticipating precisely such "innovation" leadership from its climate initiative, which poses significant economic implications for many of the manufacturing enterprises remaining in California. The State's future is now heavily dependant upon alternative fuels, advances in sustainable production and the like, that track very closely the "Grand Challenges" above. Importantly, industries innovating to meet such needs may, or may not, end up being based in California. In today's global economy, simply accelerating emergence of a market does not guarantee that innovation and production to feed that market will locate there. The migration of semiconductor fabrication out of California offers an interesting case in point.One of the realities in green

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	chemistry is that the “chemical industry” in California has changed in recent decades. Much of the primary chemical production has consolidated in other states and, in particular, migrated to China and elsewhere in the developing World. The dynamics for this are complex, but at its core are, again, realities of global economic competition. This exaggerates the impact of a wide range of factors of production, but the net is simply that the State is not “self-contained” in its efforts to advance notions of green chemistry. The description of intent for the Green Chemistry Initiative certainly implies that regulatory outcomes are anticipated. In that context, both already-emerging efforts of industry to fashion more sustainable practices and the fact that many primary chemical producers are not in-State, argue for very careful consideration of any regulatory proposals. This is particularly the case where unilateral state initiatives are contemplated, which must ultimately nest within any larger national regulatory structure. Additionally, there is a the growing global regulatory structure created by treaties such as the Stockholm and Rotterdam Conventions, framing systematic international approaches to persistent toxins and emerging chemicals of concern. A strategically appropriate state regulatory framework would hopefully offer incentives that reward innovation that enhances sustainability – the kind that accelerates the evolution that has already begun within industry. Innovation, however, is not narrowly a function of regulation, and it is possible for ill-conceived regulatory approaches to inhibit innovation by being overly prescriptive. It is also possible to discourage in-State investment in the kinds of innovative R&D and manufacturing sought, by imposing regulatory burden beyond what is necessary, effectively penalizing even willing industry versus competitive opportunities in other states or countries. PRINCIPLES OF GREEN CHEMISTRY: The “Principles of Green Chemistry” that evolved from the work of John Warner and Paul Anastes represent a challenge to the chemicals value-chain, beginning with the primary chemical producers, but extending downstream throughout the economy. These capture essential notions of the transition to sustainable growth, and are very appropriate as a point of reference in the Green Chemistry Initiative. However, the aim is integration of these more systematically into R&D and design of products, rather than the traditional focus of health and environmental regulations on appropriate use of products. Such design questions relating to chemicals tend to be dominantly the product of corporate (and to a degree, academic) research that is often distant from any regulatory interface, beyond basic workplace safety considerations and laboratory standards. The challenge in advancing these principles is therefore one of stimulating education and awareness in these key bastions. It is important to note that these principles and their challenge are effectively calling for an acceleration of a process already under way. They capture essential notions of that should be integrated into product design, but do not exist in a vacuum. There are forces already at work (particularly in the US) to stimulate greater attention to these dimensions of product design. To understand this, it is useful to rearrange the 12 Principles. They actually fall into two basic categories – those aimed at minimizing “environmental footprint” (waste and resources consumption) and those aimed at reducing risk. Minimize Environmental Footprint: Eight of the 12 Principles essentially argue for more explicit attention to pollution prevention and reducing resource consumption – in essence, lifecycle consideration of “environmental footprint.” These concepts have been evolving for decades as areas of increasing focus within industry. The chemical industry has been at the forefront in application of lifecycle analysis. DuPont, for example, systematically applies such analyses in the context of internal product stewardship reviews. Reducing hazardous waste has been a major consideration ever since the “Love Canal” era. Likewise, the US Toxic Release Inventory begun in the early ‘90s focused industry attention on reducing waste, generally. The potential benefits of reducing energy and natural resource consumption has long been a major consideration in some industries, but the oil embargo’s of the ‘70s broadened the number of industries viewing energy as a significant factor of production. In this larger context, the great contribution of the Green Chemistry Principles is to translate these broad drivers into very specific decision contexts of chemical design and engineering. This linkage has been taking root in many companies. The challenge is to broaden, deepen and accelerate that more explicit focus by applying the following principles:• Prevent waste: Design chemical syntheses to prevent waste, leaving no waste to treat or cleanup.• Use catalysts, not stoichiometric reagents: Minimize waste by using catalytic reactions. Catalysts are used in small amounts and can carry out a single reaction many times. They are preferable to stoichiometric reagents, which are used in excess and work only once. • Avoid chemical derivatives: Avoid using blocking or protecting groups or any temporary modifications if possible. Derivatives use additional reagents and generate waste. • Maximize atom economy: Design syntheses so that the final product contains the maximum proportion of the starting materials. There should be few, if any, wasted atoms. • Design chemicals and products to degrade after use: Design chemical products to break down to innocuous substances after use so that they do not accumulate in the environment. • Analyze in real time to prevent pollution: Include in-process real-time monitoring and control during syntheses to minimize or eliminate the formation of byproducts.• Use renewable feedstocks: Use raw materials and feedstocks that are renewable rather than depleting. Renewable feedstocks are often made from agricultural products or are the wastes of other processes;

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	depleting feedstocks are made from fossil fuels (petroleum, natural gas, or coal) or are mined.• Increase energy efficiency: Run chemical reactions at background or room temperature and pressure whenever possible. Reduce Risk: Four of the 12 Principles are specifically directed at reducing risk associated with chemical products and their production. Here as well, attention has been evolving for decades, in significant part as a function of evolution in science, technology (esp. in detection limits) and our general understanding of chemical risk. Attention to this dimension of chemicals experienced a step-change with the adoption of the Toxic Substances Control Act (TSCA) in the US in 1979 (and similar laws in Europe and elsewhere). Development of the chemical industry's pioneering Responsible Care program and its various elements is a very visible and significant manifestation of the degree to which these risk considerations have been internalized within the industry. The role of direct government intervention and enforcement in advancing this focus varies. In the US, for example, the evolution of tort law over the past 40 years has added a dimension to demands for product stewardship that has been relatively independent of specific regulatory controls. That has not been the case in most of Europe, in contrast, with the result that in the EU the formal regulatory structure (e.g. REACH) therefore plays a relatively larger role. In both these contexts, though, the potential contribution of the Green Chemistry Principles is to translate these more general concerns into specific considerations in chemical design and engineering. As with the environmental footprint elements, there are varying degrees of awareness and integration of these principles among corporations and other significant R&D institutions. The challenge is to broaden, deepen and accelerate attention to the following principles. • Design safer chemicals and products: Design chemical products to be fully effective, yet have little or no toxicity. • Design less hazardous chemical syntheses: Design syntheses to use and generate substances with little or no toxicity to humans and the environment. • Use safer solvents and reaction conditions: Avoid using solvents, separation agents, or other auxiliary chemicals. If these chemicals are necessary, use less harmful or dangerous chemicals. • Minimize the potential for accidents: Design chemicals and their forms (solid, liquid, or gas) to minimize the potential for chemical accidents including explosions, fires, and releases to the environment. CONCEPTUALIZING "GREEN CHEMISTRY" CHALLENGES: The UC Berkeley report on "Green Chemistry in California" implies a number of questions regarding the appropriateness and efficacy of current chemical practices and the larger regulatory framework within which those have evolved, particularly TSCA. It begins with expressions of concern over the volume and continued expansion of chemical production. That concern is misplaced. Chemicals are being used precisely because economic growth and well-being are being enabled by chemistry. Every chemical has unique properties. The challenge is to safely harness those properties in a way that adds value to the society. Importantly, many properties of chemicals that can be harnessed to benefit society can be hazardous and can create risk if they are not properly handled. Even chemicals with very low "hazard" can cause risk in certain conditions. The challenge of chemistry in the society is to harness the potential benefits associated with proper use of chemicals without inordinate risk. Green Chemistry is still aimed at harnessing this potential and delivering the benefits of unique chemical attributes. The difference is in giving more explicit consideration to possible lifecycle environmental and health risk in the design of chemicals and chemical products. The UC report does not focus on the Green Chemistry Principles, but rather on what it describes as systemic gaps in data, safety and technology. In essence, it seems to argue that these "gaps" are preventing the US and California from realizing the full potential of Green Chemistry – from applying the Green Chemistry Principles along the value chain. A useful starting point for discussion under the California Green Chemistry Initiative might therefore be to consider those allegations and explore specific questions that logically follow from them:Data Gap• Is there a "Data Gap"? TSCA Section 4, 5, 8 all funnel§ extensive data to EPA – is it used? Is it accessible where it needs to be accessible? ACC/ICCA HPV programs delivered base-set data across very broad§ range of high production volume "existing chemicals" – is it being used? Is it accessible? MSDS process is intended to provide basic guidance necessary to§ reduce risk – is it being used appropriately? Is it capturing necessary information? Is the information accessible (availability, language, etc.) where and when it is needed? • What is systemically missing? Where are the§ real opportunities to make a difference?• Safety Gap• Where is the Safety Gap? Chemical manufacturing safety§ is very high compared to other manufacturing and non-manufacturing environments – what is that telling us about the ability to handle chemicals safely?§ Examples of problems often involve small businesses• OSHA gap?• MSDS gap?• What is systemically missing? Where are the real opportunities to§ make a difference?• Technology Gap• Is there a Technology Gap? Is the US in danger of falling behind EU and other countries reforming their chemical programs?§ 12% of US patents – the chemical markets are in midst ofàChemical industry evolutionary change – not clear that US is less adaptive• Chemical markets demanding "greener" products and "greener" outcomes• Chemical industry is responding to that market evolution• What is systemically missing?§ Where are the real opportunities to make a difference?

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J-C2C-5	It will be interesting to see if this is actually a forum for thought or just another mutual admiration gathering. I'm trying to think of something in my life that government doesn't regulate, tax, or restrict and I'm having trouble finding something. Maybe we could consider other approaches. The answer to every problem is not a law. At least it didn't used to be that way.
J-C2C-6	Some jurisdictions have the reputation of exporting their industrial wastes, such as by not allowing the basic industry to operate within the jurisdiction and only allowing the refined product to be imported. Is this California initiative going to be built on such a concept?I deal with electricity. I heard that California has told its electric companies not to buy coal power from outside the state. Perhaps someone doesn't understand the nature of electricity. So long as California is connected to a coal plant that is outside its border, some of the generation from that coal plant can be considered to be used in California, no matter what the contract says about where the electricity is coming from.Texas faced this problem forty to fifty years ago. Interconnections with power plants outside of Texas meant that the federal government was allowed to regulate bulk power sales in Texas. Texas got rid of that problem by disconnecting most of the state from the rest of the US, forming ERCOT (Electric Reliability Council of Texas.) ERCOT is similar to the California Independent System Operator (CalISO) except that FERC regulates CalISO and doesn't regulate ERCOT.If you are truly not just paying lip service to disavowing coal generation, then you need to disconnect from the rest of the US just as ERCOT did, or perhaps set up an electrical grid slightly larger than California that does not include any coal plants.Personally, I think that the interconnected grid has greatly lowered the cost of electricity and improved reliability and that severing California's ties with the rest of the US would be a bad thing. But it seems to be hypocritical to say California will not "buy" coal power when the physics of the grid results in coal power keeping the lights on in California.I am just wondering whether California will find a way to synchronize its rhetoric with the physics of electricity.Ah, politics and polemics.Mark Lively, P.E.
J-C2C-7	Mark Lively and Tom Jacob both raised the subject of products produced elsewhere. It does seem like we need to address the issue from a global perspective. It won't help much to become extra cautious in California when most of our chemical production is movng offshore to countries with fewer or perhaps no controls. In fact, since pollution is global we risk making the problem worse. If we tighten controls here we need to implement equally tight controls or restrictions on imports. Otherwise this effort won't mean much.
J-C2C-8	Can assure you that we anxiously await the arrival reasoned and responsible improvments in the materials we use to manufacture your furniture. Knowing what needs to be changed and not having viable alternatives is frustrating. Working with put your money in the black box C2C consultants is even more frustrating. Please make this work! You do your part, we'll do ours!
J-C2C-9	Grorge your right on. And the goverment usually makes laws and regs with tanted data.
J-C2C-10	By changing the process of development from chemically-based to an earth-friendly product will solve the problem only partially. Like previously mentioned by others, the chemicals have made life easier for mankind. Why not redesign products in such a manner than they can be reused for more than one purpose? This will result in less landfill waste and less energy trying to recycle. Now recycle is a big business. It should not be the case with this policy. I recently read an article that the process of making food wrap uses more energy and chemicals. Is there an alernative way to reuse the product more than once? Business do not want to develop products that can be reused for want of more revenue. This is where regulations help. More incentives should be provided to business that increase the life of a product and not just a use-and-throw product. Consumers should be educated to reuse. Unless business advertise it consumers do not want to think about it. Toys have been made to transform so the child sees more than one toy. Why not other products as well?
J-C2C-11	This all sounds good, however, les think the processes through. From start to finish. and be realistic. Many greener approaches to saving the atmoshpere have resulted in more toxic substances being used that affect the health of humans. ie: automotive paints and chemicals, and the recent MTBE problems contaminating the water supply. Be realistic in yur approach, rahter then idealistic and maybe things an get done.

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J-C2C-12	Thank you for hosting the green chemistry symposium yesterday June 20, 2007. I learned a tremendous amount but have some questions, comments and potential solutions. 1. I had the opportunity to visit Europe for the first time this spring. While there I read in the newspaper and watched on the BBC about the EU Reach initiative. Germany, while supporting the initiative had questions on the effects on its industry. Interestingly, the Germans referred to the US, England and other EU countries as "deindustrialized." They noted that Germany still derives 40% of its GDP from manufacturing while the others no longer include manufacturing in their top GDP generating businesses. I bring this up to note that they wish to preserve their industries and wished to evolve the standards to be workable. Some of the proposed green initiatives would simply put so many costs on industry that they will just move to China, India and other developing (rapidly industrializing) countries as many already have. Many of the green initiatives might have the effect of simply moving the manufacture and disposal of these products and their wastes overseas. Take for example the "recycling" of e-wastes and ship scrapping. The virtual outlawing of disposal of these wastes has simply moved the hazardous wastes to China, India and Indonesia where the activities are unregulated and the wastes are disposed directly to soil, rivers, air and into the bloodstream of child and abused laborers. http://www.ban.org/photogallery/index.html http://www.basel.int/index.html Constructive suggestion 1: Can any initiative, policy, or even regulation state that the companies manufacturing or subcontracting manufacturing, purchasing, or exporting products, materials, and wastes be held responsible for upholding those principles in all their business even if they occur in another country? If we can't then we are just moving the problem to our poorer neighbors. For example, many pesticides banned by our country by the EPA for sale in this country are still manufactured as one of our DTSC permitted facilities (Amvac) and sold overseas (see LA Times). CFCs are banned in this country but are still available in Mexico, last time I was down there. 2. Is the testing of all chemicals before their release actually practical? My late friend Dr. Lou Levy (toxicologist) explained to me that studies for each chemical takes from 5-7 years and they are not always conclusive (like the recent perchlorate problem). Can there still be innovation or even an incentive to innovate if every chemical must run this gauntlet? Constructive Suggestion 2: Perhaps it would be better to prioritize the chemicals which we know now are being discharged in significant amounts and which are not being treated or survive such control systems as POTWs. For example, nitrates and pesticides from farm lands are creating dead zones with no life off the coast of Oregon, Louisiana, and other areas. Shouldn't this take precedence over a nanograms per liter of birth control drugs being discharged by POTWs, or are the risks comparative? When we look at the big picture we have the ocean and land being contaminated by hundreds of millions of tons of mercury from the burning of coal. This contaminates the ocean, our ocean fish protein sources, the entire ecological food chain and land throughout the world. Is this as big or a smaller problem than still sustpected endocrine disruptors? Constructive Suggestion 3: I think we should enforce the laws we have before passing any new ones. While we are seeking to regulate very small amounts of some chemicals the City of San Diego still has an exemption to discharge "advanced primary treated" (sewage with the solids settled out with chlorine added) directly to the ocean. Ain't politics great! Hazardous facilities are still walking away from their waste sites because they are not required to fund their remedies until the entire site has been investigated. So companies just stall the investigation until they can go bankrupt. This happens because DTSC policy trumps the health and safety code law. Constructive Suggestion 4: Aren't there chemicals where the amount and type of treatment by drinking water purveyors and POTWs can be improved to simply destroy these contaminants. The manufacturer would have to be charged a surcharge to finance this advanced treatment. Constructive Suggestion 5: Since most of these "green chemicals and processes" have not yet been invented. Could a surcharge on the known to be hazardous or toxic materials be charged to finance INDUSTRY and academic research to create substitutes? Thank you for the opportunity to comment. Andy Cano

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J-C2C-13	Good evening. My name is Jeff Henderson and I own an international manufacturer's representative company called SPAP COMPANY LLC. SPAP is a hybrid, independent, international manufacturer's representative for SME California companies that: 1.Make unique, highly-differentiated, preferably patented, medical, health, diagnostic, functional foods and beverages, green/sustainable chemicals, ingredients, materials and technological products that can be beneficial to people and our planet 2.Would like to have their products systematically promoted and marketed into foreign countries where their products have not yet penetrated 3.Have created products that can build new, green industrial bases for Californians seeking employment 4.Are looking to accelerate the return/shorten the time horizons to their investors from currently untapped overseas revenue streams 5.Have seasoned managerial capabilities in not just domestic, but international, markets 6.Are making "greentech" products or services that have applications in foreign countries 7.Are not internally staffed to systematically promote and market their unique line of products into foreign countries To get a better idea about who I am and what my company does, can you please have a look at my articles, interviews and testimonials on my website link listed below. I have been looking for a California companies that are making unique and highly differentiated green chemistry products for export to foreign markets. Sometimes these companies are so small that they are off-radar so I am hoping that I can start to communicate with green chemistry bloggers about these type of California green chemistry manufacturers that are currently manufacturing in the Golden State. I am interested in talking to these types of companies for my overseas buying/import/distribution networks.Can you please e-mail at: skipperbuzzy@earthlink.net Thank you. Sincerely,
J-C2C-14	I believe people are aware of the Special Report by Michael Wilson (UC Berkeley) prepared for the California Senate Environmental Quality Committee in 2006 titled: Green Chemistry in California: A fraemwork for Leadership in Chemical Policy innovation. It discusses the deficiencies in current US/state policy, therefore the chemical gap,the safety gap and the technology gap. It discusses what the European are doing with REACH. (which follows RoHs and WEEE). Several countries are trying to follow the European Union's REACH type legislation to better manage the risks of "man-made" chemicals and use. If anyone would like a copy of this article which I got from the author, please let me know. Nilmini Silva-Send nsilvasend@haleyaldrich.com
J-C2C-15	Before California wastes any time on this initiative, I would become fully aware of what the EPA is doing with their Design for Environment program. Its full implementation is well thought out and makes any work by California unnecessary. The last thing formulators need is another California standard different from EPA standards. The VOC standards are complex enough and Green standards from California will make the complexity even greater. Tom Forsythe

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J-C2C-16	YES!!! Let's get started. The combination of green chemistry, green engineering, and biomimicry, biology is transformational and will enable us to create the future. This is beyond filling in gaps and removing toxics, although it will address those areas when applied. The vision and overall strategy are key to keeping the entire effort focused. Also, there are many systems that already lend themselves to the creation and growth of green chemisty, such as Total Quality Management, i.e., cradle to cradle, with the quality aspect being sustainability in this case. Start to finish with methods to measure and quantify environmental and financial impact. While the overall plan is needed, it helps to concurrently work with a model or prototype. As this progresses, it will reveal more and more detail, thus adding experience and substance to the overall plan implementation. I'm planning on being in Sacramento for the public forum on Wednesday, June 27. I hope to meet many of you there and establish the beginning of relationships that lead to significant momentum for a focused and well-coordinated Green Chemistry Initiative in CA. Hopefully, this will spread rapidly beyond CA. Sandy McDonald CEO, Managing Partner, GreenHouse Partners An early stage startup focused on rapid commercialization of green technologies and green chemistry. MS Degree, Polymer Science, BS Degree, Chemistry email: samcdonald27@aol.com
J-C2C-17	If Calilfornia installs Plasma Reactors at waste managements site. We would be looking pretty good. There intense heat disolves everthing except nuclear waste. The energy the the Plasma Reactors creates powers itself and has left over for the grid. The by product is a syntheic gas that can be converted to hydrogen. Good luck

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J-C2C-18	The Silicon Valley Leadership Group, which represents 210 employers in Silicon Valley, would like to offer our perspectives mainly as that of chemical end-users, especially in respect to R&D efforts that often use small quantities of tightly managed chemicals to drive technology breakthroughs. We propose the following ideas under this topic: • Consumer Education: Well-informed consumers will not only handle and dispose of chemicals more safely, they will demand safer products with closed loop lifecycles. We need to expand consumer education regarding product life cycle costs and impacts (e.g. appropriate selection, use, disposal, and alternative materials or practices). Disseminating information could occur through traditional media as well as outreach through community partners as well as the private sector. Employers are happy to share good information with their employees. o Improve the quality of communication between all stakeholders (regulatory agencies, industry manufacturers and users, and the public) by educating how chemicals are created, screened for use, and managed through a process. Show people “a day in the life of a chemical.” o Improve transparency and public disclosure, while being mindful of intellectual property and trade information. Provide complete chemical risk information in a way the public can access, understand, and absorb. Create convenient, credible chemical evaluation tools that businesses, schools or individuals can easily use when selecting chemical products. Pfizer’s Solvent Alternatives Chart listing three columns of encouraged or discouraged chemicals for internal use is a stellar example that should be replicated. ? Show examples of the risk as well as the hazard. Define as high, medium and low and compare to products and services used by consumers everyday. If something is a hazard, show the alternatives or how the risk relates to§ the pathways for exposure (Is it in a product, or solely for use in a process? If it’s in a product, what entails safe use? etc.) Labels, while well-meaning and accessible, can be confusing, vague, and§ desensitizing. Due to global distribution chains which make it difficult to single out specific labeling just for one state such as California, labeling should be used with restraint. o Enable and streamline disposal of household hazardous waste (curbside pick-up or more local collection centers.) Improve the publicity of and accessibility to this disposal. Also educate on the safety measures used around disposal centers, because community backlash toward collection points is probable. • Study and disseminate information on the cost of waste. Educate that one user’s waste is another’s food.
J-C2C-19	There appears to be a complete disregard for TSCA (not perfect, but an amazingly powerful 30 year old FEDERAL program for addressing many of the issues of concern here). I hear people saying that they don't know which chemicals are produced in the state and how much. That information exists. Manufacturers are subject to TSCA and submit Form U's during the reporting cycle. EPA compiles the information and there isn't any reason that the information cannot be broken out by state to establish priorities. There is already an enormous body of information available that took years to generate, and it would be foolish and shortsighted to ignore that data in favor of a system (i.e., REACH) that is, as of yet, unproven. REACH hasn't been implemented: no data has been collected/submitted/analyzed, and the rush to throw out everything generated to date in favor of something we haven't even seen work is frighening. It is critical that thoughtful consideration be given to the overall process.
J-C2C-20	My name is Steve Levine and I am the founder of Excellent Packaging & Supply. We distribute a comprehensive line of biobased foodservice packaging. I would consider these products to be the result of green chemistry because you are combining sustainable products to replace Old Carbon (fossil) feed sources. The utilization of agricultural waste materials to replace petroleum feed stocks is green chemistry that is a vital part of arriving at the solution to our waste stream issues. Local production of packaging used locally and then composted. The most efficient carbon footprint is one that does not travel. We must work together to create the infrastructure which will move us away from such total reliance on Fossil Fuels.

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J-C2C-21	I have read with interest the various comments above and enjoyed participating in the June 27th workshop. I am a bit disappointed by the degree of cynicism expressed on this Blog, though I certainly respect highlighting issues and constructive suggestions on things to watch out for in order to ensure that our efforts in Calif are worthwhile and beneficial. There are many thoughts that came to mind as I read through these various comments. Here are my initial perspectives on a few of the issues that have been brought up: 1) Chemical industry's innovation—we applaud programs within the chemical and other industries that reduce toxicity, waste, and expended energy in products and processes. However, the reality is that our homes are still filled with toxic materials, our neighborhoods and workers are exposed to toxic industrial contaminants, our waterways and air are polluted, scientific research continues to demonstrate that environmental toxins are tied to serious health and environmental degradation, and the costs of addressing these problems are skyrocketing. This requires major change in our production models, how we grow our economy, and how we define what is safe or acceptable. 2. Chemicals are beneficial--I don't think anyone would argue that the use of chemicals has brought many benefits to society. That said, I would argue that when a chemical is toxic to people, animals, or the environment, its benefits are to a significant degree reduced. Not recognizing this is like saying we will give a patient medicine that will kill a disease, but will also kill (or hurt in some way) the patient. The challenge for us is to rethink how we view benefits and how we make products. In other words, we need to add safety/non-toxicity to the mix of benefits and goals that are considered when we develop products and the chemicals of which they are made--and place them on an equal footing with the other benefits. I believe we also need to weigh benefits realistically; something we don't always do. One of the examples alluded to above was the advantages of plastic. Plastic doesn't break as easily as glass, so is considered safer. However, I would respectfully argue that the potential harm to society as a whole from getting cut by broken glass is minimal compared to the toxic issues related with ubiquitous exposure to plastic products and their environmental impacts. No doubt we could find examples of tragedies from the use of both glass and plastics and I am not suggesting that we do away with plastic. I am simply saying that we must consider benefits with health and safety in mind, as well as the numbers of people or being impacted by one of the other and the breadth of the environmental effects. 3.) Chemical industry is largely outside of Calif.-- this is true and something we have to work through as we make decisions here. There is no reason for the state not to act however. Perhaps even more importantly, it would be foolish for our industries, even those that outsource their manufacturing, not to develop alternative means of production based on green chemistry principles given the reality of greater global regulation, the costs of managing toxic chemicals, the costs of worker illnesses/injuries, the costs of environmental clean up, and the growing awareness of investors/fiduciaries about these issues. As a resident of Silicon Valley, I would certainly hope that our local corporate leaders will consider these external forces as they continue to innovate in order to protect and strengthen our local economy. 4) Need for incentives--My organization (Clean Water Action) is very interested in exploring the ways the state and communities can help foster green chemistry innovation in California, including incentives. That said, I have not yet heard what those incentives should be, despite a recent research project where we interviewed stakeholders from a wide variety of constituencies, including industry. My own experience working in industry is that our business community is often the most creative part of our society, and that companies that will continue to grow and succeed are those who innovate when they see an avenue to gain a competitive advantage. If companies don't respond to the realities I've mentioned above, where will they be in the future? 5) Regulation--Let me be upfront about this. In the interviews I've already mentioned, the one thing I did hear consistently, including from a number of those representing industries, was that money and regulation were in reality what drive companies to change. Voluntary programs were viewed in general with a jaundiced eye and not deemed as usually successful. As an organization we certainly don't want to create regulations that are not well thought out and of little use; nor do we want to create rules that just lead to further problems (like the MTBE issue). But, we and our 20,000 Calif. members do believe that regulation will play an important role in moving toward a less toxic economic model. Fortunately, we also believe that such a model will create competitive advantages for our businesses. 6) The Data Gap--Despite regs like TSCA and other programs, we do not have adequate information on how chemicals we use impact human health or the environment,

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	how they are being used, where and in what amounts they are being used, etc. This is certainly true for the public at large, but I think what is even more problematic is that end-user industries that use chemicals or parts with chemicals in them have limited knowledge what they are using or what the alternatives are. The information up and down the supply chain is weak or non-existent and we believe this is one of the first things that needs to be rectified. To do that, we need the information to be gathered on chemicals from the very start, which is why we support regulations that will require health and use information for high volume production chemicals being used or imported into California. Sorry to be long winded. We certainly appreciate this forum to sound out our various perspectives and look forward to getting into more specific actions and strategies to move forward. Andria Ventura, Clean Water Action
J-C2C-22	Hello, The post from Mr. Tom Jacob – DuPont, Sacramento, is one that should be read carefully. It is a great post. It is respectful, factual, and opens the door to a robust and objective discussion. It separates the reality of the change management process from the uncertain promise of increased jobs, wealth, health, etc. I wish I could write as well. What I have to say will sound 'preachy' in comparison. All I can ask is forgiveness, because this is not my intent. The Green Chemistry initiative involves one of the largest scales of change possible- change of the behaviors of an entire society. A good analogy to keep in mind is whether the governor of any State can mandate that all of the citizens look, act, and feel a certain way. It is not possible to shift a society without a huge cost and prolonged period of time. Nothing significant is going to happen in 2 years. Nothing significant is going to happen in 2 years. My guess is that this is a 'hundred year' change and will occur incrementally, with about 10% of the change state realized each decade. Mr. Jacob raises a very important issue that is foundational to change management- what are the specific gaps relative to the envisaged end state. Note that the end state must be clearly defined. Less toxic chemicals = more wealth and health is not an end state, it is simply the hope of a benefit. Hope is good, but one must be able to describe exactly the result desired. The desired state can then be compared to the current state and there can then be a frank discussion about the approaches to closing the gaps. Effective gap analysis is not the most critical change management issue, however. The most critical issue is not even defining/designing the "Green Chemistry" state. The most critical issue is the readiness of the organization (society) for the change. A lot of work needs to be done before consumers create enough market force to shift entire value chains. It can happen, and we can find evidence in 'green' markets and products today, but it is non-optional. This change must happen for the hope of greater wealth and health to turn into reality. History is littered with industrial changes that went bust because the consumer could care less. This is a key point. If consumers could care less, other products will fill the gap. Concerns are not unfounded relative to lower-quality products from lower-cost geographies sweeping in and decimating California industry. It is a law of business. You cannot add value that a consumer will not pay for and expect to survive for very long. A key change that has to take place rests with consumer attitudes and habits. The pioneering work of eco-psychology relatively to creating a fertile demand (market) environment is a critical construct. It is, after all, a system, and the system has to be well understood before it can be changed from within. There is an opposing side and therefore “roundness” to everything in the scale of human experience: life to death, good versus bad, even the earth, the seasons, the day, time, etc. It all depends on balance. Why do I say this? Because I want to stress that any approach that seeks to influence just a part of the system cannot succeed in a societal system bounded by the laws of human nature and ecosystems. Control death and what do you get? Control industry instead of consumers and what do you get? No output is an accident. Every output is the exact result of the system inputs and how the system works to change the inputs into outputs at each level. The output can be either something valued by others, something needed to make the organism run (and is consumed in the running), or waste. Regulators regulate industry, not society. The Green Chemistry initiative runs the risk of being only a half of a solution and therfore suboptimal. In this respect its

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	potential success is highly questionable. Effective change management requires understanding the desired output, the transformation processes that lead to it, and the inputs into every major level of the organization (society) and the transformation processes. Inputs occur in the context of the environment enveloping the whole system. Culture is the biggest pro and con issue for the society and each major element of the system. Culture eats change for lunch. Should we, as a society, lead something so broad out of an Agency which has a culture of regulation? When push comes to shove, the culture is very likely to resort to emergency regulations in order to make a point, meet a deadline, patch a perceived gap, or just because "it's what we do." To be fair, the same "fallback" potential exists at every level. This is why change takes so long- it takes a long time to overcome the habits that cause people to retreat to what has worked in the past rather than take the harder path forward. If you do what you have always done you will get what you have always got. One of the last truly important considerations I can offer here is that no change happens without an initial drain in resources, decline in performance etc. No change happens without an initial drain in resources, decline in performance, etc. Society must be willing to make the investment and stay the course. In a change this profound, there will be a prolonged period of investment and pain, even temprary declines in performance. The vision of greater wealth and health is not a given. It takes a lot of investment in time, energy, capital, and the experience of unfortunate mistakes to move forward. The MTBE failure in California is a classic example. It is also an example of why this average citizen is not entirely convinced that driving this from a regulatory perspective is the best approach. The MTBE case is a classic example of one agency (The Air Board) mandating a "good change" that ultimately turned out to be a very bad change in another area (The Water Board). Some will say that is exactly the sort of issue the Green Chemistry initiative will prevent. Perhaps, but I suspect that even if the initiative existed at the point the Air Board acted, MTBE likely would have been pushed through for its potential clean air benefits. Apparently no one in a position of power came to know that fiberglass was permeable to MTBE. The issue was not the chemical per se, but the intersection of many different circumstances, none of which is likely to have halted progress in an of itself before all of them came together in the field and triggered the first incidences of the chemical turning up in environmental media samples. As it was, I think the U.S.G.S. sounded the alarm early, when they started seeing MTBE in water samples from across the country, but it took years for the Agencies to act. This is exactly what I mean when I say "culture eats change for lunch." The key is to change the inputs that create perverse, counterproductive, and barrier behaviors. How could the system have been changed to create an MTBE scenario concerned with net environmental impact instead of air impact? This is a relatively easy question compared to the "what if" questions that surround a subject as broad as shifting society away from the use of synthetic "high risk" chemicals. These are not easy questions. The inputs occur at every level and step of the societal processes. It will take years to build the necessary understanding and linkages to begin the organizational change design, let alone the decades it will take to implement it, and then more decades to see an appreciable response in the environment. Should we give up? Absolutely not! We must not retreat, but we have to beware of falling back to old approaches and "five-year plan deadlines" in the face of a huge and complex issue. People must be wary of the "easy fix' of asking the agencies to declare the bad chemicals and force manufacturers to stop using them. We have to tackle the whole problem for the sake of the future. Piecemeal solutions won't work, because the issue is too comprehensive. Everything under an umbrella this big is interrelated. If a neutral forum can be established to bring together thought leaders from every aspect of society (industrial, financial, health, civil, etc.), I think it might be possible to set a goal for a comprehensive change management design and plan by 2012. I imagine this will yield change management experiments that will take place over another ten years, with concurrent shifts to the green chemistry principles. With appropriate feedback loops, design improvement and substantial change implementation can be underway by 2020 or so. What realistic goals would we want to see going into the process? Thank you for allowing me the opportunity to comment. regards, Michael Cox

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	New Almaden, CA
J-C2C-23	I just completed a review of the new blog and felt compelled to add my two-cents, however simple the language and scope. I believe the Green Chemistry Initiative to be our one, best chance to reveal the true environmental impact of our society's manufacturing processes and building practices in California. As importantly, the effect to today's occupational and public health concerns. We will not be able to advance solutions to these issues if not also engaged in the collective fostering of innovations in product design and subsequent support of their use. The organizations that I represent are challenged with the development and promotion of but a few alternative technologies that generate a tremendous impact in the parallel course of sustainability & human health. We have found risks to success most associated with grandfathered interests, not the science that backs up the application of the technology, or realized cost savings to the user. We will continue our efforts, and greatly appreciate yours as well.... Nick Sleeth

CRADLE TO CRADLE (JOURNAL)	
Number	**Full Comment**
J-C2C-24	Dear Director Gorsen: I recently reviewed "Sustainability in the Chemical Industry," a National Research Council of the National Academies report. Appendix E of this publication contains a diverse suite of options that I recommend you consider for the Green Chemistry Initiative. The authors of this study have provided an outline of challenges and possible solutions that may be useful in guiding the Green Chemistry Initiative. Recognizing the need for serious scholarship concerning the challenges and research issues related to infusing sustainability into the chemical industry, a wide spectrum of experts and supporting organizations were involved in the study. Some of the fields represented are: chemistry, agricultural chemicals, petrochemicals, pharmaceuticals, industrial research management, business strategy and innovation, and environmental health and safety. The report's sponsor included the American Chemical Society, US EPA, Los Alamos National Laboratory (US Department of Energy), the National Science Foundation and the American Institute of Chemical Engineering. I am enthusiastic about the value of "Sustainability in the Chemical Industry" and I encourage you to consider this report in the process of developing a list of policy options. For your reference, you may view Appendix E through the following link: http://books.nap.edu/openbook.php?record_id=11437&page=156 Respectfully submitted, Merob Shimeles, DTSC 2006-2007 Executive Fellow
J-C2C-25	I had neglected to mention - one of our emerging tech products is an alternative to traditional building insulation. A cradle-to-cradle product that is manufactured at a zero-waste facility. Forgive me, Nick…

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J-C2C-26	Existing Chemicals: 1. What if California required all chemical manufacturers and importers of chemicals, regulated by TSCA, to have a baseline toxicity and eco-toxicity data included on their Material Safety Data Sheet (MSDS) in Sections 11 and 12 as listed below? Section 11 (toxicological information) Oral LD50 Skin LD50 Eye Irrigation Data Inhalation LC50 Section 12 (ecological information) 96 hour LC50 fathead minnow 96 hour LC50 bluegill 96 hour EC50 water flea 2. In addition to the above, what if data on toxicity endpoints, such as neurotoxicity, endocrine disruption etc. were required to be included? New Chemicals: 3. What if TSCA required all new chemicals to have the above mentioned baseline toxicity and eco-toxicity data on the Pre-manufacture Notification (PMN) form? The goal is to identify substances of hazardous properties and to evaluate the risks of human and environmental exposure. 4. What mechanisms could we use to collect information on chemical use in California? Information about chemicals in products? Potential Information Categories 5. What factors has your business taken into account (i.e market, environmental need, external, internal stimuli to develop, etc) to develop and/or manufacture the commodities, products, and/or processes that your business provides? (Please identify the industry type and describe the processes) 6. What was learned during the development of commodities, products, processes that you would recommend to avoid and/or to apply to the development of new Cradle to Cradle (C2C) products or processes.? 7. What successes and/or failures i.e. business, environmental perspectives, etc. of these C2C commodities/products, processes would you recommend to avoid or practice? 8. What areas in your business and/or organization's would you explore new innovative possibilities for novel and potentially market successful and environmentally compatible C2C projects? 9. What is the most effective process to ensure there is future increased emphasis on products that can be characterized with C2C in their preparation, manufacture, distribution, disposal? 10. What if legislation mandated take back programs for specified products and commodities? 11. How should California measure the movement towards a Green Chemical Economy? 12. What if, California required establishment of initial "Green Metrics"? What rate of change will be considered "significant"? Who should measure the rate of change?

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	13. Should there be unique C2C standards for common businesses that do similar activities, such as oil refining, polymer syntheses, computer chip manufacturing, agriculture? How will they be defined? Who will define them? If defined, who will monitor/assess their practice? 14. How can California and the US EPA synergize their efforts to move to a Green Chemical Economy? 15. Are there economic strategies to address the possible more costly greening of preparation, manufacture, distribution,disposal? Who should bear them (if more costly)? Who decides who should bear them? 16. Are there reasons why we should or shouldn't adopt the Canadian Lists for the list of chemicals requiring information submittal, such as differences in volume or the types of industrial chemicals used in California? 17. Is there a rationale for having a different system for existing and new chemicals and products? What is the rationale? What should the differences be and why? 18. Are there reasons why we should or shouldn't adopt REACH? If we don't choose to adopt REACH it its entirety, are there aspects that make sense for California? 19. Should a Green Chemistry process be phased in over time and how might the phases be prioritized and structured? 20. What if California adopted a chemical use policy that augmented the federal Hazardous Substance Act of 1960 by 1) amending the definition of products; 2) requiring labeling similar to the Federal Nutrition Labeling & Education Act of 1990, that requires disclosure of chemical information in products and commodities to educate the public about the chemicals and the health hazards and/or implications of their use? 21. What process should be considered to make decisions on chemicals where there is incomplete toxicological information, such as carcinogenicity and mutigenicity? 22. How should the public obtain information about chemicals in products? Should product labeling be required? Should there be a database containing toxicological data that is available to the public? 23. What should the decision process be to determine which chemicals should be modified to be less toxic or to determine if there are available substitutes? 24. How should economic costs be factored into decision making? Are there methods to monetize the costs and benefits of new processes? If so, what are they? 25. Do we need to establish priorities for the review of existing chemicals and what information do we need to establish priorities?

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J-C2C-27	The Green Chemistry Initiative held a public stakeholder meeting on August 17th in San Jose. The goal of this meeting was to gather input that will provide recommendations for developing a consistent means for evaluating risk, reducing exposure, encouraging less-toxic industrial processes and identifying safer alternatives. The comments below were received as a direct result of the breakout session on cradle to cradle. If you have any thoughts or suggestions on the ideas shown below, please respond and share your views. • Involve other agencies, e.g. DHS. • Rethink the processes for allowing chemicals into the market. • Educating the companies and consumers world-wide. • Enforcement. • Fines for non-compliance. • Non-compulsory good manufacturing practices (GMP) for products. • Responsible producer management at end-of-life. • Teach green chemistry and green design at schools. • Define cradle to cradle? • What is the real objective? • Expand information on toxicity and use. • Leverage information to make better decisions. • Using CUPA's to put more information out. • Hazard, risk and exposure should be more available. Difference of opinion on how the information is to be used to make decisions. • Life cycle analysis. • Focus on review and regulate products. • Data on products/chemistry. • Incentives-need information on good/bad. • Financial (Green Building) responsibility. • Light bulb example disposal. • California should take lead. • Waste=food (nutrient). • Transparency of product contents. • Give consumers an informed choice. • Give retailers an informed choice (all the way up chain). • Address the need of person asking for information. • Seek alternative processes and designs. • Advance the discipline life cycle analysis include education and training. • Manufacture responsible for testing and hazard analysis. Consider manufacture liability. • Educate early in education process. • Include GC education in curriculum ie UC environmental ethics. • Design with intent of EOL *Take back

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	*Producer responsibility with idea of economic change of design *Facilitate COUGE recycling *Design to be biodegradable Design to last • Look at what currently doing for baseline for products and what's in environment. • System needed for imports. • Figure out how to deal with priority labeling for personal care products and cleaning products. • Celebrate achievements in sustainability (products + business models) eg. EPA Awards (communicate achievements + challenges) • Provide more/enough research to evaluate alternatives meaningfully. • Look to past, find information that is already out there. • Business model that captures components-anticipates the end of product use. • Enable tools + infrastructure for reuse/refurbishing/recycling + tracking. Thinking about waste and secondary products. • Tools to help conserve chemicals-especially end users. "Reward end pointers, not inputs". • Policy for maintaining + tracking mass balance. • Share innovative business models/stories. • Product reuse opportunities. • Disincentives cost of disposal. • Incentives to use different products and components. • Create pricing signals. • Green marketing. • Producer recovery responsibility. • Focus on feed stocks petroleum. • Establish a goal ex LEED standards lb. goal should be zero. • Changing existing standards to allow for a zero waste framework. • Remove barriers (regulatory and social) to technological innovation. • Tax waste. • Broad implementation of EPP. • Alternatives Analysis. • Environmental Footprint Metrics.

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J-GC-1	Maureen, et al. - Per your request, I am sending this to let you know my initial comments on your Green Chemistry Initiative. I am encouraged by what I've learned so far. You have identified an important issue, framed it in a way that acknowledges the opportunities and challenges, appear willing to foster and consider creative solutions, and have established a process for building broad-based support for your efforts. As I mentioned when I discussed this with you previously, I think that the greatest challenge will be making decisions giving a lack of scientific certainty. When it comes to these chemicals and their possible replacements, we often lack the most fundamental information needed to make good decisions. I suggest that you add "decision-making given scientific uncertainty" to your list of challenges. This scientific uncertainty issue points to a second challenge that should be added to your list: How to fill data gaps as quickly as possible in order to make reasonable decisions. We don't want to be a deer in the headlights and we don't want MTBE-type solutions to our chemical policy problems. We need to find the right balance but we also need to maximize the knowledge we possess so that we maximize our changes of making good decisions. I think that the first step in addressing that challenge will be to assure that all agencies take full advantage of the statutory authority established under AB 289 (Chan, 2006). DTSC and others must start requesting chemical data using the provisions established under AB 289. At minimum, decision-makers will need to know how to measure a chemical and its byproducts in the environment and all there is to know about the toxicity of those chemicals and byproducts. With regard to toxicity, agencies need data on all toxicological endpoints, including cancer, reproductive effects, developmental toxicity, genetic toxicity, neurotoxicity, immunotoxicity, endocrine disruption, and respiratory toxicity. It is frightening to think that we make decisions everyday about the use and handling of potentially toxic chemicals without knowing the first thing about most, if not all, of these toxicological endpoints. Also with regard to possible solutions, I suggest that you carefully consider "alternatives analysis" as a superior approach to making chemical policy decisions. This decision-making approach is explained in Making Better Environmental Decisions by Mary O'Brien (2000, MIT Press). This book should be a must read for all of those engaged in this Green Chemistry Initiative. Finally, I would hope that you would consider taking the extra effort necessary to assure that this initiative benefit from the active involvement of representatives from our most polluted communities. This means having to educate community members about this process and provide them with ongoing opportunities for meaningful involvement in the decisions you make. Please do not have all of your meetings in Sacramento. Have them in Barrio Logan, Wilmington, Maywood, Commerce, Huntington Park, South Los Angeles, Del Amo, Pacoima, Riverside, Mira Loma, East Palo Alto, West Oakland, Midway Village, Bayview Hunters Point, Richmond, and other places where people have spoken out against environmental injustice. Grounding your discussions in the needs of these impacted communities will only serve to improve the outcome of this process. In the end, we will measure the success of your efforts not only in terms of policy outcomes but also in terms of community involvement and support. Thank you for considering my comments.

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	Joe ********** Joseph K. Lyou, Ph.D. California Environmental Rights Alliance www.EnviroRights.org **********
J-GC-2	In line with the approach taken in Mass., DTSC, and Cal/EPA ought to strongly consider forming a partnership with the UC. In Mass., the Lowell Institute at the U of Mass was established to collaborate with industry, and to conduct research on "green" alternatives, and sustainable manufacturing. This was very successful. The sheer number and complexity of businesses in California precludes Cal/EPA and DTSC from doing anything meaningful on their own; it would require a huge number of staff and resources. A research institution with the clout and resources of the UC should be tapped for assistance. I suggest partnering with the UC to create an institute for sustainable manufacturing and green chemistry research. "Planning is most effective when its practiced in advance"-William McDonough Robert J. Brushia Senior Scientist California Environmental Protection Agency's Department of Toxic Substances Control Hazardous Waste Management Program Regulatory and Programs Development Division
J-GC-3	Dear Colleagues, The UC report, Green Chemistry in California: A Framework for Leadership in Chemicals Policy and Innovation, points to the problems of the Data, Safety, and Technology Gaps that have emerged in the chemical production system in the U.S. and in California. These Gaps are a consequence of weaknesses in chemicals policy, particularly with respect to the federal Toxic Substances Control Act. Actions taken by DTSC as part of the Green Chemistry Initiative should focus on correcting these Gaps. Measures that do not address these Gaps might provide incremental benefit in certain industries but will not correct the underlying structural problems in the chemicals market that are occurring as a result of these Gaps. Correcting these Gaps will steadily improve investment in green chemistry in California by improving the flow of information in the chemicals market, improving regulatory oversight, and introducing additional incentives to motivate entrepreneurial activity in green chemistry science and technology. The UC report does not directly address the role of the University of California in helping the state implement a modern, comprehensive chemicals policy. There is clearly a vital role for the University, however, in an array of green chemistry issues, from economic and policy matters to technical aspects of chemical design, production, and technology diffusion. In preparing the report over a period of two years, we identified an enormous need in California for a University-based entity that is able to employ the resources of the University to the problems in the chemical production system, and in the chemical market and its regulatory oversight. I propose that the Green Chemistry Initiative include a component dedicated to improving the capacity of the University of California to engage effectively with the chemicals policy and technology issues in California. The UC Berkeley and UCLA campuses are the natural locations for locating this work. Berkeley and UCLA have the capacity and stature to provide continuing intellectual leadership in this arena and to steadily increase the number of campuses involved in supporting the Green Chemistry Initiative. The Center for Occupational and Environmental Health (COEH) at Berkeley and UCLA are the natural homes for this work. COEH has a 25-year record of outstanding service to public and environmental health in California, and it is a multi-campus, multi-disciplinary entity that is capable of grappling with the multi-dimensional

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	problems inherent in chemicals policy and in the Green Chemistry Iniative. The COEH green chemistry report produced for the California Legislature is testimony to COEH's expertise and commitment to excellence in this arena. COEH has sites at Berkeley, Davis, San Francisco, Irvine, and UCLA. Additional campuses, such as UC Merced, can be brought on-line with COEH to address specific topic areas, such as toxics in plastics, or the economic viability of bioplastics in California, for example. Merced and other campuses, however, are not able to provide overarching leadership within the UC system that will be essential for a robust Green Chemistry Initiative by Cal/EPA. Proper placement of the Initiative within UC is critical at this juncture. Please let me know if I or others at Berkeley and UCLA can be of assistance to you in this aspect of the Initiative. Finally, congratulations on outstanding leadership, for placing California on the forefront of chemicals policy reform and green chemistry innovation in the U.S.! Respectfully submitted, Michael P. Wilson, Ph.D, MPH Assistant Research Scientist Center for Occupational and Environmental Health School of Public Health University of California, Berkeley

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J-GC-4	Dear Director Gorsen, I understand that you are soliciting suggestions for your green chemistry initiative. First, I applaud you for starting a discussion about a proactive step toward reducing the use and release of toxic substances in our environments. The tools and approaches now in use are too piecemeal and not producing fundamental solutions. Second, an initial challenge will be to develop an initiative that is reality-based. At present, there is little actual practice of "green chemistry" as that term is defined. What would be the drivers that would cause the designers and manufacturers of chemicals currently in use to redesign them? This is an important public policy challenge, as those who have invested in the status quo are not necessarily most likely to seek to change it. In addition, how to design materials to avoid threats to health and the environment is still a research question, so an effective strategy will need to bridge the considerable distance between where we are now and where you want to go. Third, I believe that it is important to understand that there are many potential decision makers who can and will influence what chemicals are used and released into the environment. These include every consumer who decides what kind of soap to buy and whether to use baits or traps for pests. This includes every company that purchases products for use in their business. It includes every entity that selects materials to use in manufacturing their own products. The information needs of these entities are diverse, but finding ways to help all of these entities distinguish between the more toxic and the less toxic alternative is a critically important need. This does not seem to be reflected in the current description of the initiative, which focuses more on what Cal EPA will do. Cal EPA can do a lot but not everything. Finally, the question of how to generate the data stream needed for unbiased assessment of the relative toxicity of various compounds (as well as processes and other types of things contemplated) needs serious attention. None of the chemicals policy initiatives have solved this problem. They are mostly relying on the kinds of testing approaches that have been in use for the last 30 years, focused on only some of the toxic effects that are of concern. It is essential to be able to accurately distinguish those compounds that are more toxic from those that are less toxic for "green chemistry," toxics use reduction, substitution or any of these kinds of approaches to lead to better decisions. We need to get serious about using the new knowledge and methods that have been generated in the last 30 years to do something smarter and better than what has been done in the past. We also need to recognize that even the kinds of data that we have had in the past is not being generated very much in the US any more. These issues need to be addressed with genuine expertise and commitment to the public interest, to avoid potential having well intended initiatives become another form of green-washing. Thank you for your leadership. cheers adk Amy D. Kyle, PhD MPH Associate Research Scientist and Lecturer Project on Science and Policy for Health and Environment School of Public Health, University of California, Berkeley
J-GC-5	I thank you for the opportunity to comment on the Green Chemistry Initiative. I am not an environmentalist, but rather a chemist, consulting for an international trade organization, the Perlite Institute. In the past, several specific chemical topics have gotten me excited as possible replacements for toxic or somewhat toxic materials. These include geopolymers and ionic liquids (low melting temperature salt compositions that can replace organic solvents in industry), More recently, the California Air Resources Board determined that soil fumigants should be regulated as smog-forming compounds, and may require farmers to cut back use of these chemicals. Perlite, as supplied, is a sterile plant growing medium, and has potential use to fully utilize farm acreage. Perlite also holds water near plant roots, enabling better usage of irrigation water. Thank you for supporting research into environmental issues. Ken Wiener, MS

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J-GC-6	Several years ago, CAL-EPA worked with UC Davis as I recall, to create a California Chemical List of Lists which allowed manufacturers to view chemical ingredients with restrictions. Where did it go? Discontinued due to lack of funds? Also, if CARB VOC definitions were the same as local SCAQMD definitions, then manufacturers might not get as confused when trying to develop compliant green products for the California market. Rob Johnson Industry Environmental Specialist
J-GC-7	Posted from an email sent by Thomas W. Oakes, PhD. Following is what we see as needed to create energy with no harmful chemistry to California. If you can use this approach please include us as participants. 1. Make electrical energy by using on-site direct photoelectrochemical hydrogen generation. This process employs only solar energy to chemically splitting water deriving hydrogen. 2. Hydrogen may be used in fuel cells to generate pollution free energy. 3. Hydrogen may be burned in ovens, furnaces, generators, and vehicles without producing any pollution to the environment. Thomas W. Oakes, PhD Solar Hydrogen Co
J-GC-8	The new European chemicals legislation REACH (Registration, Evaluation, Authorization and restrictions of Chemicals) should be a model for California to review, Their website is http://ec.europa.eu/echa/home_en.html
J-GC-9	Hi, I hope the first step is to properly define "toxic" and "non-toxic" and that we will use rational scientific-based information to create these definitions. I hear these words used incorrectly all the time, especially by those demanding that only non-toxic ingredients be used or by those selling products that supposedly "contain no chemicals" and are completely "non-toxic". I wonder how they made these "chemical free" products, since everything, except light and electricity, is a chemical? This is just a bunch of nonsense and "non-toxic" is just a marketing word with no set scientific definition. Other than food, what isn't toxic to some degree? Salt water and rubbing alcholol are both "toxic". Are we going to ban them next? We need to get past the "Marketing" of Green and get serious about the subject. Personally I'm tired of hearing irresponsible marketers and activist use these incorrectly to frighten the public and law makers- suggesting that "non-toxic" should be the goal and anything less is not good enough. Unfortunately, this is usually just rhetoric... and not based on anything factual or scientific. We've got to stop this type of dangerous thinking before we can make improvements. In my opinion, those who use irrational fear and paranoia to push forward their own agendas are the bigger problem. We need scientific facts to solve these issues, not more "spin".

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J-GC-10	Here are my main points to add to the discussion. 1. Precautionary principal - Require that producers of materials including chemicals prove they do not hurt human or life-support system health before they are allowed to be sold. Such a requirement would go a long ways toward our cradle to cradle ideal for everything. 2. Law - Pass a law that requires the manufacturer of health and life-support harming materials to pay into a fund that the state and its municipalities can use to properly recycle discarded materials or their residues that end up in the state. A proviso to this law would be that the more harmful materials a manufacture creates the more they will have to pay into the fund. This will incentives material manufacturers to come up with chemical solutions that get the job done while being life-support system benign. More on this subject can be found on my web site, www.jimbell.com <http://www.jimbell.com/> . Then click on Jim's First Book then on Chapter III: Eco-nomics: Exposing the Myth of Economy vs. Ecology
J-GC-11	There are two ways I believe we could solve this problem: 1: We could have government subsidies on CFLs to encourage consumers to spend their money wisely. Considering how big of an issue global warming is, and how much the current administration has complained about foreign energy dependency, I believe this would be an appropriate use of government funds. 2: Another way we could address this problem would be to start a program to donate CFLs to those whose incomes fall beneath the poverty line. One way to do this would be to have them given out with food stamps (without detracting from the amount that they receive for food stamps) or to put donation bins in various care providers for the poor. Another thing that came to my attention recently was the extreme energy waste in theme parks, such as Disneyland. I believe we could start a lobbying effort to get Disneyland to convert to solar power. They have such resources that this conversion would almost immediately become profitable, and they could even sell some of their energy to the people in the surrounding area. I emailed Disney about this issue but they did not repsond; partially, I think, because I am one person with very little political voice. I would like to start a campaign to encourage them to convert to solar power, but I'm not entirely sure how to go about doing that. Thank you for your time, ~Kathleen Richter
J-GC-12	I believe non-toxic is over stated. Reduce risk is the direction we should head.

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J-GC-13	The Silicon Valley Leadership Group, which represents 210 employers in Silicon Valley, would like to offer our perspectives mainly as that of chemical end-users, especially in respect to R&D efforts that often use small quantities of tightly managed chemicals to drive technology breakthroughs. We propose the following ideas under this topic: • As Ken Geiser with the UMass Lowell Center stated, green chemistry is a perspective and an approach, not a technology. Therefore, it can't be legislated or mandated, but can be nurtured and encouraged. It's a journey, not a destination. Government's role should be carefully considered, and devoted to the highest priorities for impact. • Encourage – do not regulate. Regulation cannot keep up with technology. Carefully consider how much it would cost the state to police any new mandates versus establishing a voluntary program. Regulatory agencies need to be partners, not just punishers. Emerging trends of socially responsible business can enable this cooperation. Comprehensive product lifecycle documentation is growing, driven by the private sector. Responsible product procurement is also a growing trend. • Be respectful of the current practices of corporations. Many high-tech, bio-tech and pharmaceutical organizations have effective and well-established processes in place to screen chemicals before they are used in the workplace, in their manufacturing processes and in their products. They work diligently to protect their employees, their customers and the environment. • Include small businesses in the Green Chemistry planning process. Set up an education program as many may not know how to properly handle chemicals. Sometimes there are language barriers and cultural differences. • Create a system which will encourage continual progress rather than one-time improvements. • Establish fair and reasonable funding mechanisms. • Use caution when banning substances outright. Even the most hazardous chemical does not pose a risk if it cannot get into the human body. In some cases, the chemical may be used in a manufacturing process, but not be in the final product so there is no public exposure. Carefully weigh the benefits of the chemical vs. the risk; in some cases the benefits may outweigh the risk. • Manufacturing is increasingly globalized. The requirements of California, other states and the international community are becoming increasingly integrated. In order to improve compliance, reduce cost, and minimize competitive impacts, the laws of California should harmonize with those of other states and countries. This will avoid dumping and justice concerns as a result of California policies, as well. • Incentives: Encourage development and implementation of green alternatives through many incentives such as awards, contests, grants, streamlined permits or similar business-enabling actions. o Major corporations could work to comply with standards set by NGOs and thereby be listed as green. Many people are investing in green companies and this would increase the value of the shares. o Advertise green businesses. o Provide for a reduction in fees if a corporation is in compliance with or outperforms established standards. Aim for revenue neutrality; discourage negative practices and reward better practices. • Partnerships: Increase the interaction and collaboration between industry and academia to develop greener substitutes for certain chemicals and/or processes. o Develop internships in industry so chemistry students are exposed to the private sector processes and decision making as soon as possible. o Chemical safety, pollution prevention, environmental fate, toxicology and green chemistry curriculums should be expanded in secondary and higher education. Industry can help design a relevant curriculum. o Introduce principles of green chemistry at the middle school level. • Tools and Resources. If the Pfizers and DuPonts of the world develop a green chemistry tool, they can be encouraged to share it with others lacking the resources or expertise, potentially through licensing agreements or creative intellectual property arrangements (such as the Creative Commons model). o In the future these tools could be a whole subset of the Green Chemistry Revolution. Consultants, open sources software packages, web pages, etc. would provide a way

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	for information to be exchanged and utilized to make greener products and services. • Provide regulatory agency technical expertise to organizations without robust internal resources or to those in more traditional or stable manufacturing processes. o Include small businesses in the green chemistry process. Set up an education program for them as many may not know how to handle chemicals. Be sensitive to language and cultural differences. • Retraining: Establish certificate programs and/or refresher seminars for the current chemicals workforce. Small/medium businesses do not have the resources available to develop these programs. • Substitutes: Manufacturing processes can be extremely complex. Determining the suitability of alternative chemicals requires a thorough understanding of the toxicology and environmental fate of proposed alternatives, in addition to performance characteristics, to avoid substituting one problem for another. In addition, chemical substitution can take considerable time and financial resources for businesses to research, test and qualify product changes. • Reporting: Any proposed chemical reporting frameworks should make use of and integrate with existing systems, rather than create new ones. Most regulations do not deal with the entire product life cycle; at best we are only looking at small pieces of the whole puzzle. A move to electronic reporting would enable more accurate information that is enables better analysis (see the Santa Clara County Fire Chiefs Association Unidocs web-based hazardous materials reporting system: http://www.unidocs.org/index.html). Clarify the aims and benefits of reporting. Be respectful of resources. • Information: Develop a centralized database of chemicals and their properties to share information among users, insurance underwriters, manufacturers, retailers, raw materials suppliers, the government etc. Be sensitive to trade information. o Avoid standardized lists that are currently available. In some cases the chemical may be on the list for its physical properties (ie. flammability), not because of its toxicity. Policy action on chemical risks should be prioritized according to toxicological and epidemiological data. Prioritize action according to sound scientific data.
J-GC-14	We can move from cradle-to-grave to cradle-to-cradle when the market drives this process, i.e. a green product is a better product, a green product is favored by consumers/clients. Green industries will be the ones surviving because there operations are sustainable.
J-GC-15	Our company provides services to businesses not the general public. Parts of our services include chemicals used for water treatment. There are a range of chemicals. Some are synthetic and some are derived from biopolymers. We feel that there is a major difference in the potential for long term safety and impacts on human and environmental health. We do not want to be part of a future problem by providing chemicals that we feel may have negative impacts in the long run. However, currently there is no proactive mechanism to set the conditions for chemical selection by our clients besides price. There is a reactive method solely based out of a concern of long term liability, but, in truth, that is exceptionally hard to qualify due to the lack of a regulatory framework. Businesses, in general, are not nearly as receptive to paying more to do the "right thing" because they have to compete against other businesses. Consumers make health and safety choices for themselves and if they chose to spend more to do the right thing they are not at risk of losing business. I have been on the front lines of talking to managers about making those choices. A few will chose the more environmentally safer alternative if it cost more, but they are a small minority from my experience. It is not that those who do not choose the environmentally safer alternative are all bad people. Currently, they are not breaking the law by choosing synthetic materials that could have negative impacts. It is hard for many people to envision that their actions will have a material impact on the environment or health so they chose the cheaper material. I am frequently asked if it is illegal to use a material for water treatment. The answer is no. It is illegal to use the material in a way that negatively impacts the environment. However, there is so little enforcement of current environmental standards and, except in blatant cases, it is very hard to tell that some action has a long term impact. This is especially the case when they are not required to test for the material or its impact. Many times I have been told that unless it is illegal they want to use the cheaper alternative. We want to be part of protecting the environment and human in both the short and long term. The problem is that we do not feel that there is any type of framework that creates a business environment that provides any real incentives or rewards to clients that use safer materials (and/or operating methods). In fact, those that chose safer materials are penailized by lower profits then the guy next door.

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	I agree with a comment by an earlier post that says that it is hard to actually define what is "safe" or "non-toxic" versus "unsafe" or "toxic". Just because something is natural does not ensure that it is "safe". Sorting out what is acceptably "safe" or "non toxic" includes not only the material, but how it is used. No mater how problematic it is to categorize these types of issues, I think it is critical to proactively moving to green chemistry (at least in our industry). Like it or not, I firmly believe that when it comes to getting the majority of businesses to move towards consuming green chemicals the state sets the bar and the operating parameters. Business groups squeal like stuck pigs when they have to make changes. Air bags were going to bankrupt the auto industry; Removing lead would bankrupt the gas companies, etc. In reality when there is a demand solutions tend to appear. Without the demand (or push) no better solutions would have appeared. So if the State (or other governmental entity) does not set the standards and framework that push or provides incentives to businesses to use green chemistry, it is not going to happen based upon my experience. Part of the framework is going to involve the difficult process of deciding the parameters for which category a chemical (and it use) falls into. Otherwise as an earlier poster noted, People claim a material is "non-toxic" when it is not, etc. We have been down this road with the water boards. At one point, a regional board developed some basic framework for using polymers in stormwater treatment. Part of the requirements included being able to test for the material at a level below its toxic threshold and a filter capable of removing the chemical prior to discharge. These requirements opened up a host of questions such as the validation of the test? What was an acceptable filter? What about by-products? No one was sure who had the authority (or time) to answer these questions. A bigger problem was that there was some serious doubt that the regional board actually had the authority to put in place even those requirements. I think the green chemistry initiative is a great idea. I think that the long term use of a lot of the materials currently being used (and ones not yet developed) will have serious consequences for our health and environment in a cumulative manner that is not readily apparent by people when they make individual decisions. I want to be able to be a part of a business that has a positive impact on our society, but we need to have a regulatory framework that not only encourages and supports but actually drive movement in the direction of green chemistry. This can be through prohibitions, costs structures, or different operational requirements for using non green chemistry. I really hope something does come from this effort and it is not just another lofty goal without any real mechanism for making it happen on the ground. It will not be easy to figure out how to do it, but without it, I do not see widespread adoption of green chemistry by businesses. Sincerely, Joe Gannon
J-GC-16	*[This comment has been moved to the "Toxics in Products by Design" discussion.]* We have been very active in attempting to be green in using all biodegradable cleaning products by using Shaklee green products for years. Thank you for establishing this Initiative for helping to keep California Green. However, there is one glaring problem with the major cities of California and about 1/3 of the drinking water distribution companies in the US. Instead of using chlorine as a primary disinfectant along with prefiltration of surface water sources to avoid the disinfectant-by-products, they are now using chloramine which is a combination of chlorine and ammonia. ..... *[Please see the Toxics in Products by Design discussion for the complete text of this comment - Web Coordinator]*

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J-GC-17	Dear Secretary Adams: The Dow Chemical Company (Dow) applauds the goals of California Environmental Protection Agency's Green Chemistry Initiative. We appreciate the transparent process that Department of Toxic Substances Control (DTSC) Director Gorsen has adopted and look forward to contributing to the broad collaboration now known as a "Conversation with California." In that spirit, we offer these initial comments as part of that conversation. We were pleased to speak at the DTSC's first Green Chemistry Symposium in October 2006 in which we mentioned just some of the ways Dow is developing greener products and processes. Green Chemistry is a framework that has driven numerous improvements over the past decade resulting in a variety of products and processes with a lighter environmental footprint in numerous organizations including at Dow. Dow is the recipient of several Presidential Green Chemistry Awards recognizing Dow innovations in products and processes. In California, Dow recently received one of the first Pollution Prevention awards from DTSC's Chemical Industry Challenge Program. Globally, Dow, through its 10 year "2005 Goals," achieved reductions of 1.6 billion pounds of solid waste, 183 billion pounds of wastewater and 900 trillion BTUs of energy – enough to power 8 million U.S. homes for a year - just as examples. The $1 billion investment to achieve these results saved $5 billion in return. Dow's experience, through its 2005 goals and other activities, has demonstrated the strength of science and technology to solve problems, the positive relationship between green chemistry and economic prosperity, and the power of innovation when the intent is clear and the approach is flexible. It was based on this success that Dow established its 2015 Sustainability goals focused on three areas: We will collaborate with people in our communities and others to help create stronger, safer communities. Our goals: • Local Protection of Human Health and the Environment • Contributing to Community Success We will innovate to improve confidence that our products are managed safely throughout their lifecycle and develop products that will make a lasting, positive improvement on the world. Our goals: • Product Safety Commitment • Sustainable Chemistry • Products Designed to Solve World Challenges We will elevate our understanding of our impact on global ecosystems and work towards the efficient and effective use of our precious resources. Our goals: • Energy Efficiency and Conservation • Addressing Climate Change More details on all of the goals are available at http://www.dow.com/commitments/goals/index.htm One goal, the sustainable chemistry goal, is of particular relevance to California's Green Chemistry Initiative. This goal uses green chemistry as its foundation and incorporates a life cycle approach. Using a life cycle perspective is critical if we are to stop creating solutions that have unintended consequences in other areas. History abounds with these examples: One such example is the use of tetraethyl lead in gasoline to improve performance and fuels efficiency. Although and effective additive in gasoline, emission of lead and the corresponding human heath effects are well documented. Society then turned to methyl-tert-butyl ether (MTBE) which again met the performance needs of gasoline, but raised groundwater contamination concerns. Now the fuel additive of choice is ethanol which is creating disruptions in the food supply, particularly for economically disadvantaged people. Each of these products could have been considered green chemistry if not viewed from a life cycle perspective. In addition, Dow is working to incorporate the social value of a product or service into the assessment. Not all solutions are of equal value to society. Those, which meet basic human needs for food, shelter, water, health and security on terms the poor can afford, are clearly of greater value than luxury items, iPods versus water pipe for example. Measures of social value are a challenging, but critical and evolving area, of sustainability. Inherent in any life cycle approach, which looks across a broad array of dimensions, environmental and social, is an acknowledgement of trade-offs. It is highly unlikely that one product or service will perform better across all dimensions. Today these tradeoffs, while being made, may not be acknowledged up front. For example, corn to

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	produce transportation fuels may improve the country's energy security, but corn also has issues with topsoil erosion and fertilizer runoff. Compact florescent bulbs are lower energy and longer lasting than incandescent, but they also contain mercury which can be released into the environment if not recycled. In manufacturing processes, there are trade-offs that must be made on a much more basic level: renewable feed stocks vs. energy consumption vs. inherent hazards vs. efficacy of the product vs. cost to produce vs. waste production, etc. Some green processes can improve several of these dimensions, but rarely can they all be improved. If we are to make better decisions for the long term, these tradeoffs need to be understood and communicated from the start. Dow views our 2015 sustainable chemistry goal as integral to refining our decision making as a company using a sustainability perspective which drives innovation throughout the company. We would applaud DTSC using green chemistry to promote innovation in California as well. Innovation is a process that can be fostered through incentives and clear visions. It does not lend itself well to regulation or mandates. Flexibility will allow organizations to apply their full capabilities and unleash the creativity of their people to develop solution not yet imagined. And we need to remember that "breakthrough" innovations and discoveries are hard-fought, difficult and time-consuming undertakings. We should not lose sight of the incremental improvements in safety, toxicity, energy consumption, waste, etc., being made every day. Incentives clearly could be used to reward innovators and early adopters of new products and services. While incentives can be constructive in nurturing new technology, they are not a long-term solution. Dow feels that products, processes and services must ultimately be profitable on their own to be truly sustainable. We caution DTSC against prescriptive approaches and approaches which are narrowly focused. Many would frame the Green Chemistry Initiative very narrowly, with a focus on toxics use reduction or renewable feed stocks promotion, etc. Green chemistry is about using chemistry in safer and more novel ways to deliver solutions. Dow encourages DTSC to approach green chemistry as an opportunity to • spur innovation through incentives • incorporate life cycle perspectives into decision making • account for the social impacts and benefits that products and services provide and • be transparent about the trade-offs made across the dimensions of the life cycle as we improve our solutions over time. Again, thank you for the opportunity to engage in open and frank dialogue on an issue of such importance. We look forward to continuing the discussion and we are available to clarify any of these comments or offer opinions on the Initiative as it advances. I can be reached at (925) 432-5122 or fischback@dow.com Randy Fischback Public & Government Affairs Cc: Maureen Gorsen, DTSC Jeff Wong, DTSC
J-GC-18	We prefer to emphasize strict labeling of contents as opposed to strict prohibitions and paperwork obstacles that favor large corporations and shut out smaller more innovative corporations. This can be characterized as rewarding good behavior and proper disclosure rather than punishing and burdening good and bad equally. Bob Rawson President, International Wastewater Solutions Corp. iws@sonic.net

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J-GC-19	Green Chemistry through Responsible Care Green chemistry is a concept of eliminating a source of hazardous chemicals before you ever create them. The goal is to fix the problem (generating waste) up front without having had to deal with it at the back end. If we generate material at the back end, we have to protect, secure, and eventually dispose of it. The end result is a greater risk of exposure for the company and the communities. Our State is looking for a way to address this issue. I propose there is a method already out there that responsible chemical companies use to address hazards to themselves and the community. That is the Responsible Care Program of the American Chemical Council. The Program utilizes a Responsible Care Management Systems (RCMS) to go above and beyond government requirements, and the results are communicated openly to the public. RCMS consist of an integrated and structured approach to drive results in seven key areas: 1. Community awareness and emergency response, 2. Security, 3. Distribution, 4. Employee health and safety, 5. Pollution prevention, 6. Process safety, 7. Product stewardship. Companies follow these established management system to ensure that their processes are operated as safe as possible and their products are handled in a stewardship manner. The basic credo of this management philosophy is “Plan-Do-Check-Act”. Before an operation is going to be performed in an area, it is planned out very extensively. There are a variety of tools the chemical industry has been using(Environmental Health and Safety Reviews, Root Cause Analysis, HAZOPS (Hazardous Operations), etc). All these methods have degrees of analyzing the systems in which we look for risks and either eliminate, substitute, or control them. An example may be for a chemical that can cause a fire or explosion hazard. The first goal would be to eliminate it. If the process needs the chemical, we will try to substitute it for a less flammable one. If we can’t eliminate it or substitute for it, we will control it. One of the best controls is to minimize the inventory of the chemical on hand (i.e. to limit the amount of fuel). We do the evaluation process until the whole operation is planned out. This planning process minimizes the risk before an operation is even built. Once it is planned out, we “do” it. We follow strict guidelines in implementing the process as spelled out in the plan. We monitor it closely so no short cuts are taken. The third step is to “check” it, or as I like to say, “did you do what you say you did?” We do an analysis of the system to make sure that we are doing and getting the safe design that was planned out. This is the quality control step of the process. The final check is “act”. Simply put: if anything is out of compliance with the plan, we correct or act on it. This is the correcting of the ship when it moves off course, or correcting the process before a real upset condition happens. The above process of Plan-Do-Check-Act is a defined method used by the chemical industry. This ensures that the chemicals being handled are done in the safest manner possible and it also minimizes the generation of off-quality (hazardous waste) material. This process demonstrates that chemicals can be used in a “Green” manner. A link to the Responsible Care site can be found at:http://www.americanchemistry.com/s_responsiblecare/sec.asp?CID=1298&DID=4841 Robert M. Hafner, ASP Safety Manager,

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J-GC-20	An Idea to be Included in to K- 12 Education I found out that some college students (not in a science major) do not know that a florescent lamp or a TV in their room becomes hazardous when they break. The representatives of the Chemical companies told at the “Green Chemistry” meetings at DTSC, all chemicals that are used in a home and garden will become hazardous if they are not used in recommended quantities and not disposed in a safe manner. This principle will be true for new “green chemicals” as well. “Safety Ville USA” is a place for school children to learn road hazards and how to follow road rules. Based on a similar idea, California can develop a “Safe Home and Environment” place for children to visit and learn about household hazardous substances, safe use of products and safe disposal of wastes. Information about exposure symptoms can be handed to them. This may be a good place for children to be exposed to “Green Chemistry Principles” and encourage students to learn chemistry. The state of California could ask the Chemical Industry and non profit organizations to fund such a project. As new scientific knowledge come to our attention, such a place can be updated and modified to teach new principles to children. “Green chemistry” practiced in Europe and other countries can be taught to Californian children to think beyond our borders and study/adopt working models from other countries. In addition, this learning environment can promote “Green Products” to the next generation of consumers. Currently Polylactic acid polymers derived from plants such as corn are used to make biodegradable and compost-able bags containers etc. The current research seems to indicate these bio-plastics can replace the petroleum based plastics. However these alternatives are not brought to the attention of an average Californian since they are used mostly in Europe. Although the costs of such products are higher than the petroleum based products, many Californians may be willing to buy “Green Products”. Businesses such as restaurants who like to go “Green” may add the cost, check the marketability and pass the cost to the consumers. The education of people of California will push the businesses to go “Green”.
J-GC-21	I would like to recommend that you consider the National Research Council of the National Academies' report "Sustainability in the Chemical Industry." For more information, please refer to my submission, posted on July 26th, under the Cradle to Cradle category. Appendix E of this report is available through the following link: http://books.nap.edu/openbook.php?record_id=11437&page=156 Respectfully submitted, Merob Shimeles, DTSC 2006-2007 Executive Fellow
J-GC-22	Thank you for allowing me to add to the comments that the state of California is gathering for future policy on green chemistry. It is in the state's long-term interest to create and institute laws that incentivize the creation of new, green chemistry products while disincentivizing the use of chemical products in our state that open the door for class action lawsuits. In addition, the value-added, green chemistry products of the future that move from the college lab to the companies here in the Golden State creates the types of clean jobs that state legislators in California should focus on enabling in the 21st century. The workers that hold these types of jobs would not only be creating these green chemistry products for the USA marketplace; they would be creating products for a vast international market awaiting such innovative products. Moreover, since jobs related to exports spike payrolls, the state can expect an expanded tax base while at the same time addressing quality of life issues that are real and amplified by the huge population we have. With its great university system, VC community and vibrant entrepreneurial class all contributing to an economy that dwarfs every other state, California legislation continues to need to be as oracular as possible to lead the country and the world in undoing the damage that we have collectively wrought. In "The Rise of the Creative Class: And How It's Transforming Work, Leisure, Community and Everyday Life", its author, Dr. Florida, talks about how knowledge workers now and in the future will want to live and work for companies that have vibrant and stimulating entertainment, social, artistic and and outdoor activities in their communities. California has several clusters of communities that have these prerequisites. But if access to these after-hours work activities continues to be offset by serious environmental problems, these types of specialized workers will go elsewhere thus hampering our state's ability to compete, let alone lead and influence, so much of the business and cultural world.

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J-GC-23	CYANIDE IS GREEN If “cradle to cradle” is a trait that helps define the concept of GREEN CHEMISTRY, then Cyanide should be considered GREEN because, when used properly, Cyanide is a Cradle to Cradle “Enabler”. CYANIDE IS A VALUABLE RESOURCE AND AN ELECTRO-PLATERS’ FRIEND Cyanide is a simple compound that contains Carbon and Nitrogen (CN) attached to a metal. It acts as a “solvent” and complexes with many heavy metals and allows electroplaters to dissolve the heavy metal compounds into aqueous mixtures. Some of the electroplaters’ commonly used compounds are cadmium cyanide, copper cyanide, potassium copper cyanide, sodium copper cyanide, gold cyanide, potassium gold cyanide, sodium gold cyanide, nickel cyanide, silver cyanide, potassium silver cyanide, sodium silver cyanide, and zinc cyanide. CYANIDE HAS MANY “POSITIVE ADVANTAGES” It is an excellent metal “CLEANING AGENT” in the preparation of the parts to be electroplated. It is “EASY to DESTROY” allowing heavy metals to be readily precipitated and removed from the waste stream generated in the electroplating process. It increases production yield percentages by reducing rejects because of its “FORGIVING PROCESSING PROPERTIES” such as tolerance of contamination and contemporaneous cleaning ability. It saves electricity, water, and labor by minimizing stripping and re-plating that are needed with less robust processes. It allows stable multi-metal plating solutions to be built (constituted) for “ELECTROPLATING METALLIC ALLOY DEPOSITS.” These alloy deposits can have characteristics that are far superior to a single element metal deposit, and can improve the properties of commercial and industrial hardware and products. The use of cyanide as a stripping agent can also prevent damage or scrap to many types of substrates that are compatible with it. Although cyanide has short term toxic properties, it does “NOT ACCUMULATE IN THE HUMAN BODY” and is “DEGRADABLE” in the environment. CRADLE TO CRADLE FOR CYANIDE CHEMICALS: The life cycle of metal cyanide complexes used in the plating industry typically follow these steps: 1. Metals are commercially mined from the earth; 2. Metals are converted to metal cyanide complexes; 3. The metal cyanide complexes are dissolved in aqueous plating solutions creating metal ions; 4. The metal ions are reduced (electroplated) using direct current with the electrons attracting the metal ions causing a chemical reduction to a metal atom on the part being plated; 5. The residual plating solution on the parts that is not directly returned to the process is rinsed off with water and are routinely conveyed to a permitted waste treatment facility. 6. The cyanide is destroyed in the waste treatment process, releasing the metal ion to be converted to a metal hydroxide for gravity precipitation. 7. The precipitate is dewatered using filters and becomes plating sludge; 8. The plating sludge is sent to be recycled (usually in metal mining and smelting operations); 9. The metal is then recovered and recycled to be used another day. In general use, cyanide has the reputation as a dangerous and deadly compound. However when cyanide is used and treated/destroyed at regulated metal finishing facilities, there has been virtually no record of public exposure to the notorious effects of cyanide poisoning. Cyanide promotes the cradle-to-cradle concept by enabling the simple recycling of many tons of valuable metals each year that otherwise would fall into the cradle-to-grave mentality and be disposed off at a hazardous waste landfill. Note: EFFECTS OF SHORT-TERM EXPOSURE OF CYANIDE: Sodium cyanide irritates and severely damages the tissues of the eyes, the skin, the respiratory tract, and the oral and gastrointestinal tract. Cyanides poison the vital organs of the body (for example, heart and lungs) including areas of the brain that regulate the proper functioning of those organs. Exposure may result in convulsions, unconsciousness, and death. Sam Bell Water Quality Committee Chairman Metal Finishing Association of Southern California sbell@metalsurfaces.com

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J-GC-24	We already know what materials work, and what don't. It's greed that prevents us from going green. In order to clean our act up, we must focus on the route of the problem-Petroleum. As a consumer we have a choice, but as more plastic bottles replace glass; we are forced to buy toxic packaging. I think that every state could do more to recycle, and offer rewards to individuals who make bold steps to eliminate waste. We must voice our opinions, and create laws that will convince businesses to reduce waste in their packaging, and production. Logistics facilities should be monitored, and fined for excessive waste. Simply put-the less petro-plastic- the better. Cancer is on the rise, and there is no doubt in my mind that plastic bottles contribute to this rise. Time is now to act, for our health, for our environment, and for our independence.
J-GC-25	I have been conducting research in re-formulations and re-engineering of chemical processes for more than 14 years. I certainly favor the idea of designing chemicals in a way that eliminates 'waste' of any sort wherever possible. However, my own experience indicates that the matter of as little as two cents per gallon can currently sway a manufacturer one way or another on which processes are used to create chemical products. One of the ways I see government (i.e., green chemistry initiatives) 'supporting' new formulations and new process patents is through taxes and incentives. The carrot and the stick still works, even if it is not subtle.

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J-GC-26	The Green Chemistry Initiative held a public stakeholder meeting on August 17th in San Jose. The goal of this meeting was to gather input that will provide recommendations for developing a consistent means for evaluating risk, reducing exposure, encouraging less-toxic industrial processes and identifying safer alternatives. The comments below were received as a direct result of the breakout session on green chemistry. If you have any thoughts or suggestions on the ideas shown below, please respond and share your views. • What is green? • What incentive the government provides the industry to move to green chemistry. • More involved relationship between the industry and academia with regards to toxicology. • Alternatives developed by universities. • Industry sharing best practices. • Rating and labeling system. • Information for the consumer in the supply chain. • Have an expansive view of green chemistry-not just substitutes. • Need to identify incentives for industry. *R&D tox credits *Tox credits for green chemistry capitol investments *Low interest loans *Technical assistance • Branding for Green Chemistry products. • Promoting academic programs. • Leverage data from other sources as a starting point. • Changing the consumer marketplace/attitudes. • Can not rely on consumer choices. • Better design up front. • Prioritize bad actors for restricting use. • Risk based on most vulnerable. • Already looking at every phase of exposure. • Will Green be hot tomorrow? • Disagreements as to what is toxic. • Companies not sure what they need? *GC and sustainability *Companies are innovators • Some are formulators. GC needs to come from innovators. *Incremental improvements! *Work day in/day out • Working on life cycle analysis. • Get away from idea we need to do things as always done. • Stakeholder meetings-discussion w/out penalties.

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	• We generally have same goal, different ways to do it. • Celebrate successes-Look for good rather than focus on the bad. • Look for commonality. • Celebrate best practices. • Green business program. • Ecomark locks in standards of today's technology-needs to take into account innovation. • Not that one product is better, but rather illumination of process. • Do something w/information! • Encourage sharing of existing Green Chemistry practices, incentives and barrier. • Better understand specific data gaps. • MSDS • TDS • C of A • Grants program. • Taxes or fee (panalize) for company not following GC. • Incentives for company that do GC. • Work at university. • Corporate education-exchange of information including BMP's. • Use public to drive GC. Credit database for public to get green information. • Green label. • Green seal-state certification. • Check state standards for labeling it. • Add Green Chemistry performance criteria to end product requirements> will influence design. • Want "harmonized" regulatory structure. Ex. Asia should have same requirements as CA. Make CA a front-runner/leaders' not an aberration. • Tax credit for R&D. • Help buyers track their purchases for qualities they thought they were buying. • Industry mentoring [large to small] • Train chemistry students in ecotox + green chemistry. • Use ACC and large orgs to facilitate interactions between industry and customers + include mentoring. • What is Green Chemistry? Define it! Include molecules. Research and development incentives for least toxic products alternatives. • Early childhood development chemical impact research should focus. • Testing methodology mechanisms. • Database of chemicals to safely identify alternatives. Alternatives analysis. • Encourage cooperation. *Patent system? • Educating consumers about the advantages of buying green products. • Environmental footprint labeling on products a.k.a. "wine spectator model".

GREEN CHEMISTRY (JOURNAL)	
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	**Done by a credible 3rd party • Replace low bid with lifecycle cost analysis in public contracting.

GREEN CHEMISTRY (JOURNAL)	
Number	**Full Comment**
J-GC-27	Any regulations requiring registration or restriction of chemicals should only apply to formulators/ manufacturers of raw substances/ preparations and the first user of raw substances/ preparations in the manufacture of simple components. Chemicals in their raw form are the most potentially dangerous to people and the environment. Substances in electrical components are by-and-large stable and stay in the component. Substances in manufactured electrical components are far safer than the chemicals in their raw form, which are more reactive and in much higher concentration. Regulation should not cover finished electronic products. Substances part of any potential regulation should be prioritized with regard to their hazardousness. Substances should be added to the list of regulated substances only in small periodic batches such as the Canadian Chemical Management Program (CEPA 1999). http://www.chemicalsubstanceschimiques.gc.ca/challenge-defi/index_e.html#1. This would improve the ability of manufacturers to comply with the program and for CA regulators to administer the program. This method is preferable than having a large number of substances all be subject to regulation at one time such as under the European REACH (Registration, Evaluation, and Authorization of Chemicals). Any deadlines associated with the regulation should be of a time period spanning a number of years in order to give all chemical manufacturers sufficient time to comply with the requirements.

TOXIC BY DESIGN (JOURNAL)	
Number	**Full Comment**
J-TD-1	Please don't lose sight of the environmental advantages provided by plastics. These include ... a less-hospitable surface for bacterial growth (vs paper bags, wood), ... less accidental injury (vs glass, metal), ... lower energy consumption from start to finish (especially PVC, which uses less energy in manufacture and use than most all other materials), and ... potential for energy recovery either via incineration-to-power or recycling that replaces new material manufacture (the most meaningful form of recycling. Please also don't get caught by pseudoscience that talks about harmful chemicals as if "chemicals" were a dirty word (we are all made up of chemicals), or a passion for "natural" as sacred, as if man-made/synthetic/processed were evil. The words are grossly abused, as some of the most toxic substances are "natural" (e.g., snake venom, tobacco) and many "chemicals" make our lives safer and healthier (safe drinking and swimming water, synthetic insulin, and countless household and medicinal "chemicals"). Lastly, don't lose sight of an old medical maxim, "the dose makes the poison." It's how much that counts, so that if someone says "that contains "xyz" we have to know how much xyz, and what the effects of that much might be. There are certainly substances that should be minimized and avoided, and in fact California is a leader in raising the nation's consciousness to this effect. Please continue that leadership with sound scientific and medical bases, and don't be swayed by people with pre-set agendas, often well-meaning but nonetheless wrong. Allan L. Griff, Consulting Engineer
J-TD-2	This seems as good a place as any to talk about PEX plumbing. I've read the fine print and there isn't much in the way of unbiased information. The California Plumbing Code has been lobbied by the pipe industry. Lets cut throught the big business and determine if PEX is really green and healthy. Its cost effectiveness is outweighing true science.
J-TD-3	I would like to see the elimination of chemicals in our lawns and gardens that are used for cosmetic purposes. i.e Scott's Turfbuilder Plus, Weed Be Gone, Roundup, etc. To facilitate this, I would like to see a law that requires new home builders to keep, or to add topsoil to a new home so that the grass or other groundcover could grow naturally without 4 applications of weed killer per year.
J-TD-4	... one probably need not look too far to see that the LA area is pretty bad but its so much better than in the late '50s thru the '60s. This is no longer mostly caused by automobiles but by the currently still uncontrolled exhaust from diesel engines (ships,trucks, busses, locomotives) and jet aircraft in and around the greater LA area that support the the port of LA and LAX. Confirmation is simple - just park your car for a few days at either location or drive behind a buss or big rig. All these polutients hang in there due to the inversion layer and the typical on shore winds push it inland then blocked by the mountains. The automobile is continusouly blamed as the bad guy and its true to some point. Hell, even small engins (lawn care, motorcycles, generators, etc) have 'polution controll systems'. However its time to establish realistic controlls on the otherwise uncontrolled emissions produced by the ships, busses, trucks, locomotives aircraft and their support vehicles.

TOXIC BY DESIGN (JOURNAL)	
Number	**Full Comment**
J-TD-5	Hi, I hope the first step is to properly define "toxic" and "non-toxic" and that we will use rational scientific-based information to create these definitions. I hear these words used incorrectly all the time, especially by those demanding that only non-toxic ingredients be used or by those selling products that supposedly "contain no chemicals" and are completely "non-toxic". I wonder how they made these "chemical free" products, since everything, except light and electricity, is a chemical? This is just a bunch of nonsense and "non-toxic" is just a marketing word with no set scientific definition. Other than food, what isn't toxic to some degree? Salt water and rubbing alcholol are both "toxic". Are we going to ban them next? We need to get past the "Marketing" of Green and get serious about the subject. Personally I'm tired of hearing irresponsible marketers and activist use these incorrectly to frighten the public and law makers- suggesting that "non-toxic" should be the goal and anything less is not good enough. Unfortunately, this is usually just rhetoric... and not based on anything factual or scientific. We've got to stop this type of dangerous thinking before we can make improvements. In my opinion, those who use irrational fear and paranoia to push forward their own agendas are the bigger problem. We need scientific facts to solve these issues, not more "spin".

TOXIC BY DESIGN (JOURNAL)	
Number	**Full Comment**
J-TD-6	"What strategies do you think California should pursue to encourage manufacturers to take greater responsibility for the products they produce that contain toxic materials?" While pondering this question I found myself separating it into two parts. Let me explain a possible train of thought. • The question is actually larger than the stated above because manufactures go to where there is product demand or where they think they can create product demand. So demand shift must be considered as a fundamental element in the category of "What strategies do you think that California should pursue?" • In an effort to answer the second half of California's proposed question "to encourage manufacturers to take greater responsibility for the products they produce that contain toxic materials?" One would have to answer a parallel question first. o What has California done that has worked to encourage manufactures to under take greater responsibility for their products that they produce that contain toxic materials? In the past history of recent decades as a consumer; I am and hopefully you are able to recall some things that have worked 1. Legislative Efforts – have helped on numerous toxic reduction efforts. Example a. Mandatory emissions standards for automobiles in California. This has had a tremendous impact by mandating a shift in demand allowing the auto manufactures to voluntarily comply if they want to participate in the California market. 2. Usage Fees (Tax) can help to move a products sales price closer to the total product life cycle costs (inclusive of decommissioning, disposal, clean up, associated human health care cost, and environmental rectification costs that are now born by tax payers). a. Bottle Tax. – gives an incentive to be environmental conscious to reduce the toxins in the waste we consumers create b. Cigarette Tax – provides a disincentive for consumption. 3. Rebates for use of preferred product purchases – Example a. Rebates for Hybrid automobile purchases. As a possible thread here I would like to solicit input from others that could help expand the list of - What has California done that has worked? Then we can shuffle the tools successfully used in the past, against the new issues of concern. For example: If we wanted to reduce the consumption of one time use plastic (and paper) shopping bags, a usage fee could be charged per bag at the point of use. At some point in on a cost matrix, the cost to use them would begin to out weigh the inconvenience of bringing you own. We can also explore the gaps and opportunities of what has worked before to discover the fresh new ideas that will cause others within their sphere of influence to rise to the occasion at hand. Final note and challenge: All of the examples sited above involve some financial incentive or disincentive to manipulate change in demand. I would greatly appreciate the addition of examples that apply to the more altruistic side of humanity and business ethics but they do not come readily to the forefront of my recollection.

TOXIC BY DESIGN (JOURNAL)	
Number	**Full Comment**
J-TD-7	The Silicon Valley Leadership Group, which represents 210 employers in Silicon Valley, would like to offer our perspectives mainly as that of chemical end-users, especially in respect to R&D efforts that often use small quantities of tightly managed chemicals to drive technology breakthroughs. We propose the following ideas under this topic: • Consumer Education: Well-informed consumers will not only handle and dispose of chemicals more safely, they will demand safer products with closed loop lifecycles. We need to expand consumer education regarding product life cycle costs and impacts (e.g. appropriate selection, use, disposal, and alternative materials or practices). Disseminating information could occur through traditional media as well as outreach through community partners as well as the private sector. Employers are happy to share good information with their employees. o Improve the quality of communication between all stakeholders (regulatory agencies, industry manufacturers and users, and the public) by educating how chemicals are created, screened for use, and managed through a process. Show people “a day in the life of a chemical.” o Improve transparency and public disclosure, while being mindful of intellectual property and trade information. Provide complete chemical risk information in a way the public can access, understand, and absorb. Create convenient, credible chemical evaluation tools that businesses, schools or individuals can easily use when selecting chemical products. Pfizer’s Solvent Alternatives Chart listing three columns of encouraged or discouraged chemicals for internal use is a stellar example that should be replicated. Show examples of the risk as well as the hazard. Define as high, medium and§ low and compare to products and services used by consumers everyday. If something is a hazard, show the alternatives or how the risk relates to§ the pathways for exposure (Is it in a product, or solely for use in a process? If it’s in a product, what entails safe use? etc.) Labels, while well-meaning and accessible, can be confusing, vague, and§ desensitizing. Due to global distribution chains, labeling should be used with restraint. o Enable and streamline disposal of household hazardous waste (curbside pick-up or more local collection centers.) Improve the publicity of and accessibility to this disposal. Also educate on the safety measures used around disposal centers, because community backlash toward collection points is probable.
J-TD-8	I think any effort to implement green chemistry requires a huge data gathering and database development effort. Data should be gathered regarding all chemicals manufactured in or used in commerce in California, and how and where and in what volumes they are used. Additional data regarding available toxicity characteristics should also be gathered for each of those chemicals. Gaps in toxicity data should be identified. The data could then be used to "rank" chemicals in terms of volumes used, and toxicity characteristics. Initial efforts should then focus on working with industry to find viable, safer alternatives for the highest ranked chemicals (i.e., those that pose the biggest threat in terms of toxicity and volume), while at the same time engaging industry and our University system to fill in any gaps regarding toxicity data. In evaluating and ranking chemicals, consideration should be given to the benefits of each chemical. Thank you for the opportunity to comment.

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Number	**Full Comment**
J-TD-9	The City of San Clemente has begun to realize that someone has to take the lead and start moving forward on this important issue. They stated the following to put a city ban on syrofoam used in city facilities and sponsored functions: The City of San Clemente has a duty to protect the natural environment for present and future generations. The City may further exercise environmental stewardship by reducing the amount of polystyrene that enters our waste stream and by reducing the amount of polystyrene debris that enters the City's storm drains, watershed and coastal environment. By reducing the amount of polystyrene waste entering the natural environment, the City also serves to protect the fragile ecological balance of our natural environment. For these reasons, the City passed a ban on the use of single-use polystyrene foam products in City facilities and at City-sponsored, -cosponsored, and permitted events. I was hoping that the DTSC could do something like this for our department and branch out to other departments from there. Maybe it will catch on if DTSC takes the lead. Here is the attached link to view the Ban on their website. I hope this is helpful to you. http://san-clemente.org/sc/standard.aspx?pageid=453
J-TD-10	We have been very active in attempting to be green in using all biodegradable cleaning products by using Shaklee green products for years. Thank you for establishing this Initiative for helping to keep California Green. However, there is one glaring problem with the major cities of California and about 1/3 of the drinking water distribution companies in the US. Instead of using chlorine as a primary disinfectant along with prefiltration of surface water sources to avoid the disinfectant-by-products, they are now using chloramine which is a combination of chlorine and ammonia. The EPA admits in its own documents that the human health studies are insufficient to determine the safety of its use in our drinking water. So, this chemical has been put into our drinking water without sufficient human health studies. And, it is 2,000 to 100,000 times less effective against E-Coli and Rotaviruses, respectively. It has been labeled "Toxic" for the environment by Canada where accidental water run offs into their streams and rivers have killed the salmonoids in the water. We can add additional chemicals to our fish tanks to keep the fish from dying but nothing protects the frogs and amphibians from chloramine. For those of us who have an impaired immune system (in my case it is due to having six months of chemo after my cancer surgery 13 years ago) we cannot drink this water. The WHO also refers to boiling the water to get rid of the bacteria, etc., for at least ten minutes before consuming it by those with an impaired immune system, the elderly and infants under six months. However, if these people are sensitive to the disinfectant, it will only concentrate the chloramine since it does not boil out of the water as chlorine does. I am a part of a grass roots group who have been trying to get a waiver from the EPA to have San Francisco go back to chlorine as a disinfectant until the human health studies have been completed. At that time, when it is documented that it is not safe for human consumption, we ask that they add prefiltration to keep down the DBP's to acceptable EPA levels. We have heard from hundreds of people who have adverse dermal, inhalant and digestive reactions to this toxic water disinfectant since it was introduced into our water supply in Feb 2004. Just by having this one toxic disinfectant in our water, we are risking the health of our population and damaging the environment. Chlorine has been extensively studied for over 70 years. Chloramine has not. We can easily filter chlorine out of our drinking water in our households if we don't like the taste but the safety of our drinking water will not be compromised. However, we cannot easily filter the bonded chloramine out of the water. So, for those of us who are sensitive to it, we must purchase and carry home bottled spring water which is an additional inconvenience and financial burden. Especially for the seniors who are on a fixed income and can't handle carrying the large water bottles. I personally have to wash and prepare all of my food with spring water because I am having so many digestive

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	problems otherwise. Plus, I cannot eat out in restaurants and order anything that is boiled or steamed for the same reason. The EPS scientists have told us that they have studied chlorine and ammonia separately but have not been mandated or funded to study them together. Please help us get this studied and taken out of our water until they are completed. It is because of this new toxic water disinfectant that we've had such a huge increase in the purchase of bottled water and therefore, adding to our precious land fills at a much faster rate that expected. As you can see, adding chloramine to our drinking water has had many adverse effects in trying to keep California "Green". Our web site is _www.chloramine.org_ http://www.chloramine.org) ... please go to it to view documented cases or rashes with photos as well as much more information about this toxin going in to our water. Sincerely, Claudette L. Main
J-TD-11	Technological advances have generated more environmentally friendly electroplating technologies (e.g., cyanide-free plating solutions). However, a wide-spread switch to more "green" plating practices has been hampered by outdated "milspecs" (i.e., the military specifications for most plating done for military and aerospace applications). Many milspecs were established one or more decades ago. Milspecs mandate a particular plating chemistry in many cases. For example, some specs require cadmium plating to be done in a cadmium cyanide plating solution for some applications, regardless of whether or not cyanide-free cyanide plating could achieve the same end-result. To facilitate Green Chemistry, one suggestion I have is to work with the military and aerospace industry, as well as the plating industry, to evaluate and revise outdated milspecs to allow for more "environmentally friendly" plating chemistries.
J-TD-12	Hello, I agree with Robert Brushia regarding the need for coordinated data collection and sharing. RoHS suffers from a lack of mandated standardized data reporting formats, just as MSDS' did until the form and content were prescribed. It's not enough, however, to just mandate what data must be reported and in what format. You also have to take a role in making the data available to others- a data clearinghouse. This usually gets the least attention, because it is seen as "too expensive" and "not our problem." These are not acceptable responses. The system must avoid the waste of effort that results from widely duplicated data collection and reporting. A central data store can help ease the burden. regards, Michael Cox New Almaden
J-TD-13	DTSC asked the following in an email: Another recall related to toxic materials in consumer products has been issued, this time by Mattel. You decide: Is this a case of toxics in products by accident or by design? Of COURSE Mattel did not specify paint with lead for their products! They're not idiots! They're just cheap - and they cut the wrong corners. My take is that this is a failure of their cost reduction strategy. Here's what I surmise happened: Go to China, be seduced by extremely low cost of goods sold, don't do a stringent audit of the contractor's supply chain business practices, fail to do follow-up audits, and WHAM! You get caught with your pants down. There are supplier management best-practices that identify and either eliminate or manage rogue suppliers; these have been around since at least the 1980s. Evidently the Toy industry (and, I'm quite sure, other industries) could use some help in this matter.
J-TD-14	Regarding Rob Brushia's post, the Department of Defense has a program to move towards "greener" chemistry and I'm sure would be quite amenable to hearing about this. See https://www.denix.osd.mil/. Working with the DOD, with their large physical presence in California, may be a way to leverage their knowledge and expertise and reduce the impacts of "emerging contaminants", as they call it.

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Number	**Full Comment**
J-TD-15	Quite a few years ago, I saw an article about German car manufacturing in which the cars featured were subject to regulations requiring each part of the car to be recyclable, from the steel frame to the upholstry. The article said that manufacturers were required to take their products back at the end of their useful lives for recycling in order to reduce the impact on landfill. Would such a policy applied to Silicon Valley have the effect of encouraging them to find green solutions to the toxics used in computers? Would such a policy create incentives for companies like Mattel to make certain that their products did not contain toxics before placing them on the market?
J-TD-16	In response to the question about the Mattel recall and if this is a case of using toxics by design or by accident, I would say it is somewhat of a moot question. In the end, the lead should not be in the paint and it is the responsibility of the manufacturer to ensure that that is the case. Clearly the lead was put into the paint by the paint manufacturer for some reason. But the downstream user, in this case Mattel, responsibility to make sure they know what is contained in their materials, manufacturing processes, and final products before they put them on the market--especially when those products are for children who are the most vulnerable to toxicants. We recognize that the information up and down the supply chain has traditionally been limited. We see two actions as being critical: 1) better toxicity and use data from chemical manufacturers, 2) insistence by end user businesses that suppliers produce non or less toxic materials for them and testing procedures to ensure that the materials they buy meet safety goals.
J-TD-17	It is great to see California taking the lead on this issue. Chemical products are of course an important part of the economy and our modern lifestyle. Thinking about the options to offer chemical manufacturers, whether including toxins by design or by accident. A. Test the product to demonstrate its safety to human health and the environment. OR B. Pay some nominal amount (or percentage of the price) per unit (kilogram, liter, gram,...) sold into a state "trust fund" used to mitigate, manage, or remedy toxic effects discovered later. Or C. Explicitly and up front guarantee the product's safety, taking full responsibility and liability for any effects that might emerge later. To trust the results of A, there may need to be an objective and highly qualified testing organization, plus clear established criteria. Thank you for the opportunity to comment.
J-TD-18	The Green Chemistry Initiative held a public stakeholder meeting on August 17th in San Jose. The goal of this meeting was to gather input that will provide recommendations for developing a consistent means for evaluating risk, reducing exposure, encouraging less-toxic industrial processes and identifying safer alternatives. The comments below were received as a direct result of the breakout session on toxics in products by design. If you have any thoughts or suggestions on the ideas shown below, please respond and share your views. • If toxics in products unavailable then producer must apply for exemption and have a take back responsibility. • Weigh the benefits and risks and other impacts of take back programs. • Avoid exporting toxic products and waste to developing countries. • Shift the physical and financial responsibility of management of hazardous products at the end-of-life. • Educating producer and consumers of end-of-life management of products. • No plastic water bottles at the next green chemistry meeting. • Curbside hazardous waste collection. • Take back programs/product stewardship. • Another point of view: Do not use these products in the first place. • Stricter regulatory requirements for toxic chemical use as a stick. *Needs criteria *Penalties • Market incentives as a carrot. • Define Toxics by Design.

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Number	**Full Comment**
	• Lifestyle analysis. • Cost benefit analysis-not consensus. • Prioritize and assess bad actors for restructure use. • Incentives *Carrot *Stick • Implement and high level so no inter agency conflicts. *Balancing concerns e.g. fire safety/health impacts of BFRs • Need to overcome need alternatives incentives. • Difference of opinion as to what is toxic. Different groups/ different ideas. How much risk? *Is there good substitute? *PBD's fire risk v health • Sustainability of company depends on good choices. • Toxics risk assessment depends on exposures. • Use best available science. • Toxicity is a continuation. • Use current best available. State of the art methodology. • Cumulative exposure counts (not just linear). • Protect most vulnerable. • Not just dose response-other data. • Reg v. accepted practice. • Science sources disagree. • Start with things on which we agree. • Mix of chemicals troublesome. • Lucky to have prop 65 list. Start with this. • Safe dose-how to determine. • Consider disposal process to determine safety. • Compromise between groups. • CMR data is good, but other methods not yet well developed. State needs to do this-endocrine disruptors, for example. • Evolutionary-will gain a lot of knowledge in next few years. • Prioritize the list (working with all groups). • All goes back to transparency. • Open conversation. • Open to new ideas. • Some companies already being open-some products more complex, though. • Just start with something. • Less dangerous chemicals. • Safer alternatives available.

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	• Known bad/alternatives available. • Less dangerous chemicals. • No known alternatives. • Known bad/existing no alternatives develop. • Consider exposures/hazards associated with EOL use. • Utilize existing databases + integrate different databases (initial priority). • Co. anonymously provides product chemical data into database. • Do LCA for every component of product. • Develop “appropriate” test methods. • Utilize Gl processes from other countries database. • Bans with appropriate transition on toxic chemicals. • Establish criteria for bans. • ID acceptable toxic LPE levels. • Favorable treatment for green products. • Categorize chemicals and products; triage them to appropriate regulation. • Current liability law provides incentive to reduce toxics in products by design. Utility vs. toxicity>seek to maximize utility. • Screening systems for procurement to reduce toxics. • More information about how to maximize utility and minimize toxicity. Full information on alternatives and both their toxicity and utility. • Full information to end-consumer and designer and procurement departments. • Difficult to identify differences of toxics by design and by accident. • More unified regulatory system. • Prioritize what is out there. *Petroleum feed stock • Educate the consumer. *Labeling • Identify and catalog chemicals of concern. • Assemble all available information and assess-coherence and usability of existing information. • Identify, utilize, and integrate fund existing programs. • Identify high priority products and put in to place programs similar to DFE@USEPA. • Better funding for the infrastructure that allows us to treat uneliminatable toxics. • Educate public about relative risk. • Publish chemical contents of products. *On product *On the web • Toxics that remain in product vs. toxics that leeches into the body/the environment. • Recognition of stepwise improvement. *Credit the past

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J-TD-19	Again, we're being asked if a toxin in a product(this time lead in the children's watering cans) is intentional or accidental. It remains unclear to me what difference it makes. The bottom line is that toxins should not be in childrens (and other) products. It is the manufacturer's responsibility to ensure that the products they release to the marketplace don't contain these materials. While they may be mislead by their suppliers as to ingredients in paint, plastic, etc, it is incumbent on them to test their products to ensure safety. If their supplier has sent them something that does not comply with their specifications, they need to deal with that directly with the supplier. But at the end of the day, it is up to the product manufacturer to make sure that they are not putting the public at risk.
J-TD-20	Andria, I couldn't agree more. Manufacturers must be responsible for what is in their products; so they must define, control, and know what should, and what should not, be there. Then they MUST ensure that the right suppliers are chosen and managed in such a manner as to ensure that their material specs are met. This does not call for any more government bureaucracy than we already have (e.g. NO import czar!) -- it calls for legal and criminal action where warranted, and for the consumer to vote with their pocketbook. And finally, it calls for industries and companies sourcing overseas to look beyond short-term cost savings and spend the time, money, and resources necessary to implement the supply base management best practices that have existed and been successful in managing supply chains for the past 20 or so years, and adapt them to the requirements of the Chinese culture, or get out of China.
J-TD-21	Ban the sale of toxics in products by design in California, if there are non-toxic or less-toxic alternatives. Especially, if the alternatives are economical. A good start would be for California to ban the sale of Mercury containing thermometers. There are plenty of alternatives that are accurate and available.
J-TD-22	Basic (good) public policy: Tax what you don't want. Specifically, set an escalating tax that makes it prohibitively expensive to produce products with certain known toxics, thereby effectively phasing-out said toxics by dates certain. This way the market has certainty, which in turn spurs investment in alternatives. Use 1/2 of the tax collected to mitigate toxic impacts (human or other), and the other 1/2 as grants/incentive/seed money for the study and development of non-toxic alternatives. In the unlikely event no alternative is developed for products not necessary to prevent or address health or safety emergencies, so be it.
J-TD-23	As a former employee of a small silicon valley machine shop, I've always questioned the use of toxic (perc) de-greasers. Incentives should be used to move industry towards non-toxic de-greasers.

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J-TD-24	For the sake of full disclosure, I should note that I am a toxicologist employed by the Department of Pesticide Regulation, in the California Environmental Protection Agency. I submit the following ideas to be considered as options: Cal/EPA should develop a fact sheet on chemicals policy in the U.S. and post it on their GCI website to educate the general public. Cal/EPA should develop layperson information on common chemicals in common commercial products for the purpose of educating the public. Cal/EPA should engage in culturally appropriate outreach to consumers to help them make informed choices and move purchasing towards greener products. Media such as television commercials (featuring Arnold Schwarzenegger, perhaps), comic books, radio, could be utilized. Partnering with Hollywood would go a long way. Cal/EPA should develop guidance on what its citizens as individuals could do to move towards greener, sustainable living. Cal/EPA should work with the U.C. system to develop a green chemistry curriculum for all chemistry and engineering majors. Cal/EPA should work with other state agencies including DGS to develop information on green purchasing, and disseminate this information to counties and cities and to private sector businesses for their use. Responsible parties should be required to report new factual information regarding adverse health effects of their products or of the individual constituents of their products. This information could be reported to a centralized, publicly addressable database. The adverse effects reporting requirements for pesticides, as set forth in Section 6 (a) (2) of the Federal Insecticide, Rodenticide, and Fungicide Act, could be used as a starting point. Responsible parties should be required to identify the individual constituents of their products or, if that information was considered to be confidential business information, to provide the appropriate health information on their products.

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J-TD-25	Options for the Green Chemistry Initiative The U.S. EPA has partnered with various stakeholders and industry groups as part of its “Design for the Environment” program (see: http://www.epa.gov/dfe/pubs/tools/ctsa/index.htm & http://www.epa.gov/dfe/pubs/). First, I suggest Cal EPA use, to the extent possible, any useful information already developed by the U.S. EPA through its Design for the Environment Program (why reinvent the wheel). Second, I suggest the Cal EPA look at several elements developed by the U.S. EPA regarding how a business should “design for the environment”. The U.S. EPA suggested businesses should: • Evaluate the human health and environmental impacts of its processes and products. -Although various incentives may be offered to support this activity, statute or regulation requiring this type of activity may be required. -One incentive could be some sort of “green” business award, and associated press releases from Cal EPA. • Identify what information is needed to make human health and environmental decisions (e.g., hazard characteristics data and identification of “safer” alternatives). • Consider cross-media impacts and the benefits of substituting chemicals. • By reducing the use and release of toxic chemicals through the innovation of cleaner technologies that use safer chemicals. -This is where a partnership between Cal EPA and the UC and/or CSUS systems may provide needed research support. -This is where incentives may also be helpful to encourage certain desired behaviors (e.g., tax incentives for research and development, statutory or regulatory requirements, awards for innovation, etc.) • Implement pollution prevention, energy efficiency, and other resource conservation measures. • Make products that can be more readily reused, refurbished, remanufactured, or recycled. -The EU’s WEEE Directive and accompanying RoHS Directive accomplish this by requiring electronics to essentially be designed with recycling/reuse in mind, and by requiring manufacturers to pay for end-of-life management. -The US EPA concluded that one of the primary problems with end-of-life management of stockpiled Ewaste is that it is difficult to recycle because it historically was not designed with recycling, reuse, or resource recovery in mind. • Monitor the environmental impacts and costs associated with each product or process. -This could be done by the Cal EPA and its BDOs once data on the chemicals being used and their respective potential impacts are collected. • Recognize that although change can be rapid, in many cases a cycle of evaluation and continuous improvement is needed. -Cal EPA can support this in the long term by partnering with UC and CSUS to incorporate “green chemistry” curricula in college engineering and chemistry courses. -Incentives may help.

TOXIC BY DESIGN (JOURNAL)	
Number	**Full Comment**
J-TD-26	The State of California needs to collect information on usage of chemicals and work on methods for reducing the use of toxic substances. Clearly some other States have done more to address these issues and California needs to benefit from their experience if California is to develop a leadership role in Green Chemistry. The following programs need to be considered for adaptation in California: Massachusetts Toxic Use Reduction Act (TURA) passed in 1989 and amended in 2006. This act currently requires manufacturing companies using certain toxic chemicals above a threshold to file a report describing their use of the chemical and to develop a Toxics Use Reduction plan for each chemical. Although the companies are not required to implement the plans, the law has resulted in a reduction of toxic chemical use, chemical waste, and chemical emissions, saving industry millions of dollars and conferring significant health and environmental benefits. Oregon's Toxics Use and Hazardous Waste Reduction (TUHWR) Act, passed in 1989, also targets the reduction or elimination of toxic substances use and hazardous waste generation. In June 2005, a new law was passed that made significant changes to the TUHWR program. Under the current law large toxics users, as well as large and small quantity generators are required to develop a reduction plan and report completion of the plan. In addition, the business must also complete an "Implementation Summary" which reports how the plan implemented and describes the successes, challenges and future opportunities for waste reduction. Other legislation in Oregon includes an executive order introduced in 1999 called for the reduction of persistent, bioaccumulative, and toxic substances (PBTs) by using various approaches to determine the sources of PBTs in an attempt to eliminate their release by 2020. In 2000, the Oregon Department of Agriculture adopted an emergency rule that prohibited any use of pesticide products containing ten specific active ingredients identified as PBTs. In 1996, the city of Eugene passed a toxics right-to-know law requiring companies to keep an accounting of toxic chemicals and submit their accounting to the city, which posts them on a web site. Companies also pay a fee, based on volume. The New Jersey Pollution Prevention Act (1991) requires industry to draft plans that identify areas or procedures that could reduce or prevent the creation of environmental pollution. The New Jersey Worker and Community Right to Know Act of 1983 mandates that public and private employers make available hazard information for substances to which workers or communities could potentially be exposed. This act encourages the identification and implementation of techniques that minimize the need to use and generate hazardous substances in industrial activity. The Act requires facilities to develop Pollution Prevention Plans to show that there are business opportunities in pollution prevention, but it does not mandate that facilities implement any of them. In addition, Plan Summaries and Plan Progress Reports must be submitted.

TOXIC BY ACCIDENT (JOURNAL)	
Number	**Full Comment**
J-TA-1	Please don't lose sight of the environmental advantages provided by plastics. These include ... a less-hospitable surface for bacterial growth (vs paper bags, wood), ... less accidental injury (vs glass, metal), ... lower energy consumption from start to finish (especially PVC, which uses less energy in manufacture and use than most all other materials), and ... potential for energy recovery either via incineration-to-power or recycling that replaces new material manufacture (the most meaningful form of recycling. Please also don't get caught by pseudoscience that talks about harmful chemicals as if "chemicals" were a dirty word (we are all made up of chemicals), or a passion for "natural" as sacred, as if man-made/synthetic/processed were evil. The words are grossly abused, as some of the most toxic substances are "natural" (e.g., snake venom, tobacco) and many "chemicals" make our lives safer and healthier (safe drinking and swimming water, synthetic insulin, and countless household and medicinal "chemicals"). Lastly, don't lose sight of an old medical maxim, "the dose makes the poison." It's how much that counts, so that if someone says "that contains "xyz" we have to know how much xyz, and what the effects of that much might be. There are certainly substances that should be minimized and avoided, and in fact California is a leader in raising the nation's consciousness to this effect. Please continue that leadership with sound scientific and medical bases, and don't be swayed by people with pre-set agendas, often well-meaning but nonetheless wrong. Allan L. Griff, Consulting Engineer
J-TA-2	I am an alternative healthcare practitioner-Please get with the Union of Concerned Scientists and discuss these issues- They have much to say and have great ideas. Go to Real Goods.com in Hopland, CA for a totally green approach on every level of life. Educate the individual as to what items they use daily are toxic and penalize the companies for selling them... Dupont, Monsanto- all the chemical companies producing Round up draino-etc. There is science available medically thatproves illness is caused b y the chemicals such as thes in our water supply etc. on the lawns our kids and animals play on. Reeducate the companies that green is economically sound for the future of their company and the planet. Al Gore talk to him...The time is now to go back to basic natural chemical combinations bakingsoda and lemon to clean countertops etc. We are killing ourselves with too many chemicals in combination. Sincerely A
J-TA-3	Hi, I hope the first step is to properly define "toxic" and "non-toxic" and that we will use rational scientific-based information to create these definitions. I hear these words used incorrectly all the time, especially by those demanding that only non-toxic ingredients be used or by those selling products that supposedly "contain no chemicals" and are completely "non-toxic". I wonder how they made these "chemical free" products, since everything, except light and electricity, is a chemical? This is just a bunch of nonsense and "non-toxic" is just a marketing word with no set scientific definition. Other than food, what isn't toxic to some degree? Salt water and rubbing alcholol are both "toxic". Are we going to ban them next? We need to get past the "Marketing" of Green and get serious about the subject. Personally I'm tired of hearing irresponsible marketers and activist use these incorrectly to frighten the public and law makers- suggesting that "non-toxic" should be the goal and anything less is not good enough. Unfortunately, this is usually just rhetoric... and not based on anything factual or scientific. We've got to stop this type of dangerous thinking before we can make improvements. In my opinion, those who use irrational fear and paranoia to push forward their own agendas are the bigger problem. We need scientific facts to solve these issues, not more "spin".

TOXIC BY ACCIDENT (JOURNAL)	
Number	**Full Comment**
J-TA-4	The Silicon Valley Leadership Group, which represents 210 employers in Silicon Valley, would like to offer our perspectives mainly as that of chemical end-users, especially in respect to R&D efforts that often use small quantities of tightly managed chemicals to drive technology breakthroughs. We propose the following ideas under this topic: • Improve import standards. Many of the hazards come from incoming products that are manufactured offshore in regions without comparable chemicals policies. • Establish corporate and manufacturing codes of conduct. Instigate appropriate due diligence for products and for consumers. • Develop Best Practices for supply chain management. Look not only at what goes out the door, but what comes in. Better supply chain management would help us determine how toxic chemicals get into articles. • Manufacturers should demand full disclosure from their suppliers. • Establish product and process benchmarks. Distinguish between process chemicals and product chemicals. • Help establish a product safety/product liability organization to determine a check list and review products for safety. For example, we have CPSC for product safety and UL for fire/electrical safety; we could do the same for chemical safety.
J-TA-5	Governor Schwarzenegger's Executive Order S-20-04, which was signed in December 2004, calls for the State of California to reduce energy consumption in state buildings by 20 percent by 2015. Reaching this goal has required benchmarking energy use in state buildings as well as a mandate that new buildings and major renovations larger than 10,000 square feet are certified Silver or higher according to the Leadership in Energy & Environmental Design [LEED] Green Building Rating System, which advances energy and material efficiency and sustainability. Since the Governor's "green building initiative" conserves resources, reduces greenhouse gas emissions and reduces operating costs, why not extend his initiative to the private sector?

TOXIC BY ACCIDENT (JOURNAL)	
Number	**Full Comment**
J-TA-6	I agree strongly with Frank Teng's comments here. I also agree with those various comments discussing how we need far more serious research with more modern methods to address our broad ignorance about the effects of toxins as measured in a conventional manner. So many toxins in the marketplace haven't been studied at all--part of the gaps in chemical industry enforcement which need filling, as another person mentioned. We know so little about toxins at low levels in longer-term exposures, or the synergistic effects of combinations of toxins, or what happens when you recycle or burn or process materials mechanically or chemically. Then there's what happens to it in the acid of a seagull's stomach, or that of a fish. Drop bits in the ocean accidentally, and then any toxins in them can get eaten by people, second-hand. I anticipate serious regulatory and legislative challenges just to achieve the funding required for the beginnings of adequate research. This effort may also be competing with efforts to increase funding for basic research on global warming. I anticipate that good research-question design will try hard to work on both problems, or be complementary to work on that problem. Good product design in future will help mitigate problems in that arena as well. That's exciting to me. A lot of fast-moving educational efforts by really credible lobbyists will be required to persuade both legislators and CFOs that worthwhile projects will come out of the risky expenses involved. For example, there's the risks of digging out all kinds of expensive liabilities. Who knows where basic toxin research might lead, or where expensive fingers might be pointed? Many anti-tax and anti-regulatory groups will insist that it's far easier to remain head-in-sand, pretending there's just nothing to worry about. Some industry groups will not want another set of regulators staring at their records. Some social justice groups will be supportive, but others will be deeply offended at spending money anywhere that isn't immediate, basic support of people in trouble. Some watchdog groups will question the integrity of various proposed research institutions. Efforts like this will need lobbyists with practiced answers for all these groups. I think that the most exciting aspects of the cradle-to-cradle design ideas are the ways in which these groups can be stimulated to join forces and help out to achieve their ends, along with broader goals in cradle-to-cradle projects. For instance, it could mean proving lower building running costs for anti-tax groups, mitigation of air and ground pollution in badly-impacted neighborhoods for social justice groups, better production line economics and lower risk production for manufacturing managers, and so on. It's exciting to see examples out there where this kind of manufacturing has been achieved. Basic research funding doesn't have to be based entirely in the legislature, or codified in government regulatory purposes. Getting it done piecemeal by industries who have a stake in the results is one way to get it done at all, but that may or may not generate an overarching set of standard practices and useful statistics. In any case, both public and private sectors have to show good arguments to justify spending money on such research. It has to be presented by people they'll bother to listen to. I find it exciting that really credible folks are talking about it from different sectors.
J-TA-7	Mike Wilson made an interesting comment at the 6/27/07 Green Chemistry Initiative Stakeholder Meeting that caught my attention. He commented that it is as if we are holding a box being full of many unconnected puzzle pieces. This certainly is an accurate description of the many disconnected pieces of information from many diverse viewpoints. However, some of the pieces are connected and have been connected for some time. The most important pieces of information are not individual chemicals (whether assessed by hazard or risk), they are the longstanding operations of specific extractive, processing and manufacturing industries that generate most of the chemical hazards. In addition to looking at HPV chemicals, POPs, endocrine disruptors, etc. we should be looking at specific industry sectors and industries within sectors that generate the largest volume and most toxic products/wastes: green production and processing perhaps? Although I am trained in chemistry, for years I have been frustrated with the futility and actual distortion of taking a "periodic table approach" to the work we do at DTSC. An approach based solely on the toxicity of individual chemicals is not very meaningful or effective in the work we do at DTSC with multi-chemical wastestreams. In my opinion, the history and organization of the overall chemical industry production process (extraction, processing, products and wastes) holds important information that has tended to be neglected in favor of a pure science/"chemicals" approach. I hope that someday this will change.

TOXIC BY ACCIDENT (JOURNAL)	
Number	**Full Comment**
J-TA-8	Oregon does or did add $100 to the cost of all cars. When the car's useful life ended, its body was worth $100. We could add a similar fee to cosmetics, batteries, medicines etc. Maybe then people would litter less and not add unused cleaning fluids to our sewage sludge.
J-TA-9	I think we must not forget the children who at a young age have a deep connection to the earth and land and really do care. As a children's author I travel to schools and am amazed when I see children as young as four years able to relate to concepts of recycling and landfills when given the information in terms that they can understand. I think that reaching out to the children is the key because they will turn to their parents with excitement about helping and motivate the adult to take notice. When you take children to a landfill and show them the exciting things going on there it is science and chemistry and helps them to see and understand energy , recylcing and pollution. Using children's stories on these topics has brought understanding to thousands as I have toured the USA and Africa. Keep it simple and they will understand,relate and then want to help to make a difference.
J-TA-10	Fortunately there is a wealth of publicly available information for purchasing and sustainability managers to make decisions that reduce the environmental hazards, health hazards, and even cost of chemical inventories. The problem is the shear volume and disparate sources of the information. Dolphin Software (www.dolphinsafesource.com) provides tools that collect and analyze this information to display it in an easy to understand picture that allows purchasers to choose products and customers that fit their standards. In other words, the state of California and private industry can get a real-time view of their chemical inventory hazards and act state-wide to reduce both cost and risk. The tools are out there; we just need the will to use them.

TOXIC BY ACCIDENT (JOURNAL)	
Number	**Full Comment**
J-TA-11	The Green Chemistry Initiative held a public stakeholder meeting on August 17th in San Jose. The goal of this meeting was to gather input that will provide recommendations for developing a consistent means for evaluating risk, reducing exposure, encouraging less-toxic industrial processes and identifying safer alternatives. The comments below were received as a direct result of the breakout session on toxics in products by accident. If you have any thoughts or suggestions on the ideas shown below, please respond and share your views. • Supply chain management. • Government responsibility for international cooperation on imports and exports of products. • Penalties and citations. • Consider exposure not just toxicity. • Move beyond risk assessment. • Best practices for supply chain manufactures. • Mechanism for improving flow of information through manufacturing process. • More flexibility in permitting. • Disclosure of content confidential STMTS-Government. • Randomize testing by government. • Enforcement-retailer and upstream. • Corp. responsibility so government not solely responsibility. • Government imposed change US. Consumer market drivers. • 1-4 Dioxane, for example. • How often does this happen? (can be criminal element) • How to know what's in products from abroad. • Rigorous internal process controls • Bigger companies can do this, but what of mom/pop business. • Retailers hold companies to certain standards. • Everyone needs to play a role. Mom/pop retailers as well in process. Way to have access to information. Plus need sense of responsibility. Don't have background to ask right questions. Need education on this. Don't have time, staff. • Build knowledge data base. Need to be held to minimal level. • Rating system on manufacturers information-but not good/bad. • Whose responsibility for data. Need qualified people, or things listed may not actually be a problem. • Rely on suppliers for information, now want expert opinions. • Uncomfortable with "good" "bad" list. • How about a scorecard? Things to declare. List criteria user decides. • Need to agree on criteria. • Depends on application. • Take worker exposure into account. • Prioritize on risk and exposure • Look for current + next generation technologies to help with product recalls and reveal, e.g. toxic information in products. • Organization needed to ID.

TOXIC BY ACCIDENT (JOURNAL)	
Number	**Full Comment**
	• Require testing prior to reuse or equivalent information. • Enforcement (spot check-market place) (assuming product standard with penalties). • Relook at what's "toxic" to include emerging containment effects in endocrine disruption. • Evaluate synergistic effects of chemicals in products. • Recommend manufactured require certified by suppliers. *Third party testing *Third party auditing • Chemicals as tools to accomplish process should be greener. • Precursors/raw materials should be qa/qc'd. • "Toxics release" clarify and define. • Greater supply chain stewardship + scrutiny clarify location of liability in the whole chain of manufacture + sale. • Assistance to small manufactures to improve/safeguard quality of inputs, ex. Pooling resources to facilitate QA/QC. • ID areas where standards/regs can be strengthened. • Voluntary efforts to improve quality of inputs. • Expand testing of products and food. • Company accountability for out souring. • Improved enforcement. • Strengthening international trade agreements. • Technology exchanges with companies in other countries that mass produce products to help identify less toxic alternatives. • Improve consumer visibility of products. • Product liability consequences. • Leveraging supply chain consequences. • Encouraging media publicity and engagement. • Establish academic programs in product stewardship. Promulgate cradle-to-cradle design curriculum into multiple disciplines (from a low level i.e. high school) • Supply chain transparency enforcement.

TOXIC BY ACCIDENT (JOURNAL)	
Number	**Full Comment**
J-TA-12	For the sake of full disclosure, I should note that I am a toxicologist employed by the Department of Pesticide Regulation, in the California Environmental Protection Agency. I submit the following ideas to be considered as options: Cal/EPA should develop a fact sheet on chemicals policy in the U.S. and post it on their GCI website to educate the general public. Cal/EPA should develop layperson information on common chemicals in common commercial products for the purpose of educating the public. Cal/EPA should engage in culturally appropriate outreach to consumers to help them make informed choices and move purchasing towards greener products. Media such as television commercials (featuring Arnold Schwarzenegger, perhaps), comic books, radio, could be utilized. Partnering with Hollywood would go a long way. Cal/EPA should develop guidance on what its citizens as individuals could do to move towards greener, sustainable living. Cal/EPA should work with the U.C. system to develop a green chemistry curriculum for all chemistry and engineering majors. Cal/EPA should work with other state agencies including DGS to develop information on green purchasing, and disseminate this information to counties and cities and to private sector businesses for their use. Responsible parties should be required to report new factual information regarding adverse health effects of their products or of the individual constituents of their products. This information could be reported to a centralized, publicly addressable database. The adverse effects reporting requirements for pesticides, as set forth in Section 6 (a) (2) of the Federal Insecticide, Rodenticide, and Fungicide Act, could be used as a starting point. Responsible parties should be required to identify the individual constituents of their products or, if that information was considered to be confidential business information, to provide the appropriate health information on their products.

Glossary of Acronyms and Terms

ANSI	American National Standards Institute (ANSI), a non-governmental organization
BFR	Brominated flame retardants
BTU	British thermal units
Cal/EPA	California Environmental Protection Agency
CalPERS	California Public Employees Retirement System
CalSTRS	California State Teachers Retirement System
CAS	Chemical Abstract Services, a division of the American Chemical Society
CBI	Confidential business information
CCS	Chemical Compliance Systems, Inc. (CCS), a U.S. Army contractor
CEQA	*California Environmental Quality Act*
CEPA	*Canadian Environmental Protection Act* (of 1999)
CEPUP	Chemical Education for Public Understanding Program (CEPUP) at the Lawrence Hall of Science, University of California, Berkeley
CFC	Chlorofluorocarbons
CGCI	California Green Chemistry Initiative
CICC	Chemical Industry Council of California
CIWMB	California Integrated Waste Management Board
CSUS	California State University System (CSUS)
CUPA	Certified Unified Program Agency (CUPA), a local governmental entity implementing specified state environmental regulatory programs; Health and Safety Code section 25404(a)
DAC	Defense Ammunition Center (DAC), U.S. Army
DfE	Design for the Environment, a USEPA program
DGS	California Department of General Services
DOD	U.S. Department of Defense
DPH	Department of Public Health
DPR	Department of Pesticide Regulation
DSL	Domestic Substances List (DSL), a Canadian list of chemicals pursuant to CEPA

Glossary of Acronyms and Terms

DTSC	Department of Toxic Substances Control
EDC	Endocrine disrupting compound or chemical
EEI	Education and the Environment Initiative
EPCRA	*Emergency Planning and Community Right to Know Act* (EPCRA), a federal statute
EPEAT	Electronic Product Environmental Assessment Tool, a USEPA developed tool to compare computer desktops, laptops and monitors based on their environmental attributes
EPP	Environmental preferable purchasing
EPR	Extended producer responsibility
ETV	Environmental technology verification
EU REACH	The European Union Registration, Evaluation, Authorization and Restriction of Chemical substances regulation
FIFRA	*Federal Insecticide, Rodenticide, and Fungicide Act*
GIS	geographic information system
G-MACS	"Green" Munitions Analytical Compliance System (G-MACS), U.S. Army
Green Chemistry	The design of chemical products and processes that reduce or eliminate the use and generation of hazardous substances and toxic chemicals.
HARP	Hot Spots Analysis and Reporting Program
HESI	Health and Environmental Sciences Institute (HESI), a non-governmental organization affiliated with ILSI
HFC	Hydrofluorocarbon
HHSA	California Health and Human Services Agency
HPV	High Production Volume (HPV) Challenge Program, a federal USEPA program
ILSI	International Life Sciences Institute, a non-governmental, non-profit organization
IPM	Integrated pest management (IPM)
IRIS	Integrated risk information system, a federal USEPA compilation of electronic reports on specific substances
ISO	International Organization for Standardization, a non-governmental organization of national standards organizations
IUR	Inventory reporting update, a federal USEPA regulation pursuant to TSCA

Glossary of Acronyms and Terms

K-12	Public school grade levels, kindergarten through twelfth grade
LCA	Life cycle analysis (LCA)
LEED	Leadership in Energy and Environmental Design (LEED) Green Building Rating System,™ a program of the U.S. Green Building Council, a non-governmental organization
LWDA	California Labor and Workforce Development Agency
MACS	Munitions Analytical Compliance Suite
milspec	Military specification (U.S. Army, U.S. DOD)
MSDS	Material safety data sheet (MSDS)
NAS	National Academy of Sciences
NDSL	Non-Domestic Substances List (NDSL), a Canadian list of chemicals pursuant to CEPA
NPEP	National Partnership for Environmental Priorities Program (NPEP), a USEPA program
NTP	National Toxicology Program, a program administered by the federal Department of Health and Human Services
OECD	Organisation for Economic Co-operation and Development (OECD), an international organization
OEHHA	Office of Environmental Health Hazard Assessment
P2	Pollution prevention (P2)
PBDE	Polybrominated diphenylethers (PBDEs), part of a broader class of brominated chemicals used as flame retardants
PBT	Persistent, bioaccumulative, or toxic
Proposition 71	2004 popular initiative establishing the California Institute for Regenerative Medicine to regulate and providing bond funding for stem cell research
PVC	Polyvinyl chloride
QSAR	Quantitative structure-activity relationships (QSAR), a methodology that correlates structural or property descriptors of compounds with activities
RCRA	*Resources Conservation and Recovery Act*, the federal law
R&D	Research and development
REACH	Registration, Evaluation, Authorization and Restriction of Chemical substances regulation, a European Union requirement
RWQCB	Regional Water Quality Control Board

Glossary of Acronyms and Terms

SARB	State Air Resources Board (also informally, ARB)
SCSA	California State and Consumer Services Agency
SETAC	Society of Environmental Toxicology and Chemistry (SETAC)
SPP	Security and Prosperity Partnership (SPP), part of the trilateral "Montebello Agreement" between the governments of Canada, the United States, and Mexico to share chemical information
SRF	State revolving fund
SWRCB	State Water Resources Control Board
TAC	Toxic air contaminant
TRI	Toxics Release Inventory (TRI), part of the federal *Emergency Planning and Community Right to Know Act* (EPCRA)
TSCA	*Toxic Substances Control Act*, a federal law
TURA	*Toxics Use Reduction Act*, a Massachusetts statute (M.G.L. Chapter 21I)
UC	University of California
UCB	University of California, Berkeley
UCLA	University of California, Los Angeles
US	United States
USEPA	United States Environmental Protection Agency
USGBC	United States Green Building Council, a non-governmental organization
VCCEP	Voluntary Children's Chemical Evaluation Program (VCCEP), a federal USEPA program , which is part of EPCRA
VECAP	Voluntary Emission Control Action Programme (VECAP), established by the brominated flame retardant industry
VOC	Volatile organic compound
vPvB	Very persistent or very bioaccumulative
Wiki	A collaborative approach, such as a website whose content can be edited by anyone who has access to it

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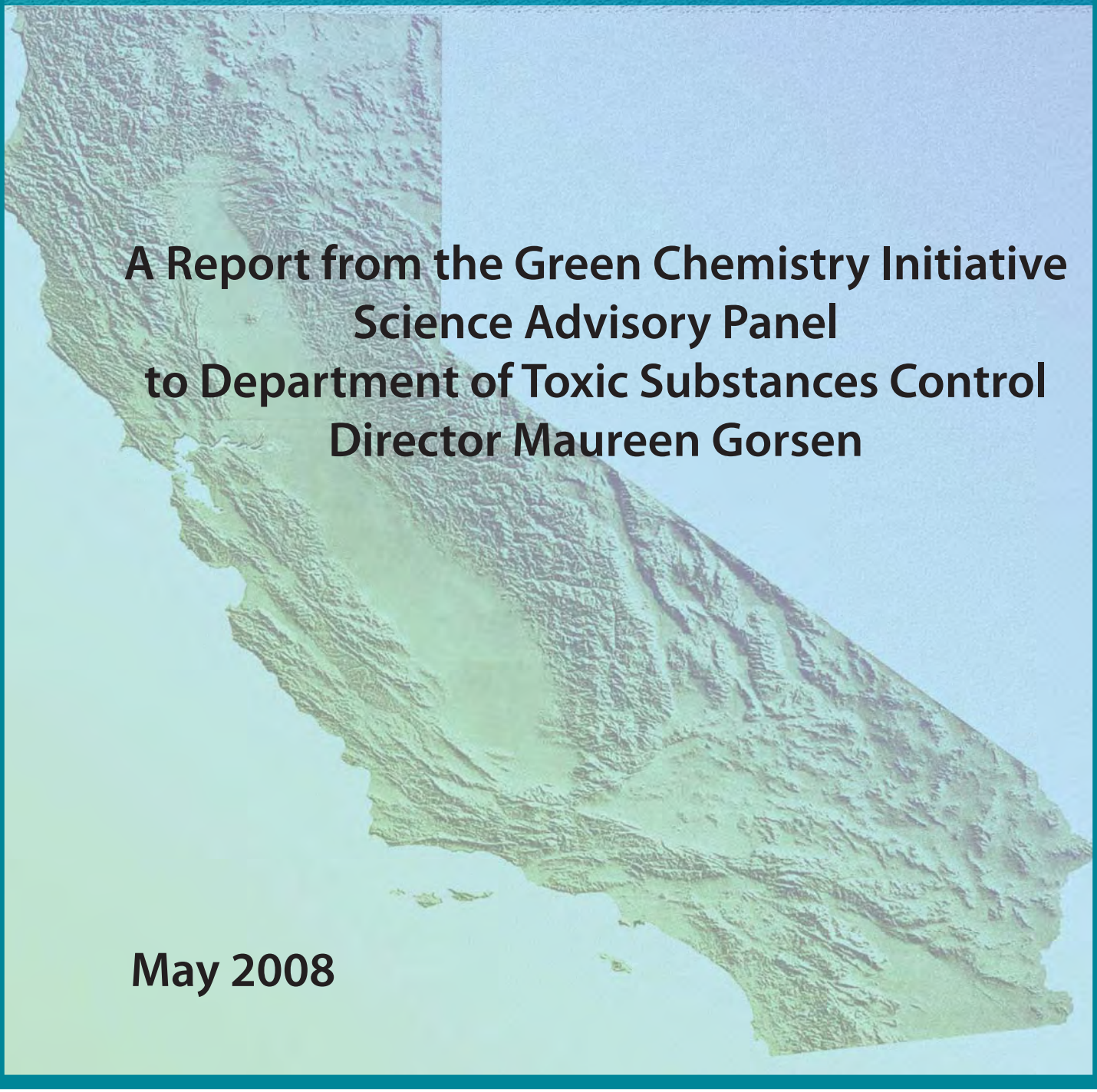
APPENDIX B

Science Advisory Panel Report—May 2008

Green Chemistry Options for the State of California



A Report from the Green Chemistry Initiative Science Advisory Panel to Department of Toxic Substances Control Director Maureen Gorsen

May 2008

NOTICE

This report was written as part of the activities of the Green Chemistry Initiative Science Advisory Panel. The Panel is a public advisory group structured to provide balanced, expert assessment of scientific matters for the purposes of providing advice to Department of Toxic Substances Control Director Maureen Gorsen on scientific matters pertaining to the advancement of green chemistry. This report has not been reviewed for approval by the Agency; therefore, the contents of this report do not necessarily represent the views and policies of the Department of Toxic Substances Control or the California Environmental Protection Agency. Mention of trade names of commercial products does not constitute a recommendation for use.

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Executive Summary

Green Chemistry Options for the State of California

Green chemistry has been called chemistry's approach to creating a sustainable future. Implementing green chemistry techniques can help protect human health and the environment while opening new economic opportunities in the design and use of chemicals, materials, products and processes.

This report is the product of deliberations over the course of seven months by experts in the areas of chemistry, environmental health science, toxicology, chemical production, chemical policy and law, risk and alternatives assessment, human health, exposure assessment, environmental fate, and engineering. While the Panel was not constituted to represent the interests of the full array of stakeholders in chemicals policy, it nevertheless brought together significant expertise from diverse points of view and succeeded in agreeing to advance this final report.

The result is a framework for advancing green chemistry and a collection of options that have been proposed by one or more individuals on the Panel. While many of these options enjoy broad support among the panel members, the degree of support for any single option is neither stated nor implied.

The deliberations resulted in agreement by all members of the panel on one central concept; that is, that the advancement of green chemistry in California is an effective vehicle to promote innovation in ways that also protect human health and the environment and provide new economic opportunities to the people of California.

While strategies to accomplish this goal may differ among the members of the panel, the framework put forward by the Panel outlines the need to affect the behavior of a broad range of actors along three fundamental dimensions to bring about the adoption of green chemistry practices in California:

- Willingness
- Opportunity/motivation
- Capacity

The Panel believes that California can motivate new investment and innovation in green chemistry by addressing existing data, safety, and technology gaps. This will be accomplished through a variety of strategies that affect both the supply of, and demand for, green chemistry (and associated processes, technologies and approaches). Indeed, the Panel acknowledged from the outset that to advance green chemistry, California will need a blend of both supply and demand-side approaches.

Supply-side options – including initiatives in education and research and economic incentives – help to facilitate innovation in green chemistry as applied to products, processes and technologies. Demand-side options help to inform the marketplace and promote acceptance of these products, processes and technologies through economic and regulatory policy. Below, we summarize the categories of options described in Sections II and III of the Report.

Science Advisory Panel options on the supply side include those aimed at:

- instilling green chemistry into education (Section II.A.);
- supporting research and innovation in green chemistry and engineering (Section II.B.);
- building green chemistry capacity through development of tools, methodologies and strategies for developing greener chemicals (Section II.C.); and
- providing incentives to industry and recognition of its efforts (Section II.D.)

Panel options on the demand side include those aimed at:

- identifying and prioritizing chemicals or chemical uses of concern (Section III.A.);
- developing, improving and effectively employing regulations (Section III.B.); and
- developing incentives to boost demand for green chemistry (Section III.C.)

Together, these supply and demand strategies are intended to provide California with a broad range of options from which to formulate a comprehensive green chemistry policy.

The Green Chemistry Initiative Science Advisory Panel

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I. The Green Chemistry Initiative Science Advisory Panel

In April 2007, Linda S. Adams, Secretary for Environmental Protection, launched the California Green Chemistry Initiative. The Secretary requested that Department of Toxic Substances Control (DTSC) Director Maureen Gorsen lead a broad public process to generate ideas that could fill information and safety gaps about chemicals, develop overall policy goals, and identify and recommend policy options.

The California Green Chemistry Initiative to date has consisted of two phases. During Phase One, from April to December 2007, participants brainstormed hundreds of green chemistry options. These options were compiled into the Phase One report. Phase Two included three concurrent tracks:

- Draft Frameworks
- Key Elements[1]
- Science Advisory Panel

The Green Chemistry Initiative Science Advisory Panel (Panel) was created in the fall of 2007. This 21-member Panel consisted of leading thinkers and proponents of green chemistry. Panel member are experts in chemistry, chemical engineering, environmental law, toxicology, public policy, pollution prevention and cleaner production, environmental and public health, risk analysis, materials science, nanotechnology, chemical synthesis, and research. This report summarizes the work and work products of the Science Advisory Panel. To read brief biographies of the Panel members, see Appendix A.

1. A. The Green Chemistry Initiative Science Advisory Panel Process

In order to organize itself to address the many issues related to advancing green chemistry, the Panel formed five subcommittees, with a sixth "synthesis" subcommittee consisting of the chairs and co-chair of the other five. The five topic areas for subcommittee discussion and green chemistry options development were:

Subcommittee 1: Advancing Green Chemistry Through Evaluation of Data Needs and Availability, chaired by Drs. William Carroll and Richard Denison;

Subcommittee 2: Advancing Green Chemistry Through Alternatives Assessment, chaired by Drs. Nicholas Ashford and Michael Dourson;

Subcommittee 3: Advancing Green Chemistry Through Evaluation of Incentives and Barriers, chaired by Dr. Daryl Ditz with assistance from Dr. William Carroll;

Subcommittee 4: Advancing Green Chemistry Through Education and Information Dissemination, chaired by Dr. Ken Geiser; and

Subcommittee 5: Advancing Green Chemistry Through Science and Technology, chaired by Dr. Paul Anastas.

Each subcommittee met over the life of the Panel to develop background material, reports, and options to advance green chemistry in California. The Panel met twice in San Francisco, in order to work together, and to hear comments from the public. (Those comments are cataloged in the meeting notes, in Appendix E.)

As the Panel reached the end of its work, the "Synthesis Committee," led by Panel Chair Dr. John Warner, worked to align the options developed and prepare this final report. It is important to note that while there was substantial agreement on many of the options developed by the subcommittees, the Science Advisory Panel did not attempt to reach consensus on the options developed for presentation to Director Gorsen. **Therefore, this report presents a range of options the Science Advisory Panel has identified for the state to consider. These options can work together to advance green chemistry in California; no single option or category of options is likely to suffice. Rather, the state needs to draw from all of the policy instruments available to it, and assemble and utilize a full and diverse set of options, if it is to create both supply and demand for green chemistry, bridge key gaps hindering current efforts, and effectively carry out the core functions of a comprehensive chemicals policy.**

Special Note: Each of these options was developed by one or more individual members of the Science Advisory Panel. Neither any individual option nor any combination of options should be regarded as representing the consensus of the Science Advisory Panel.

John Warner, Ph.D., Chair

Mission and Vision of the Green Chemistry Initiative Science Advisory Panel

Vision

The State of California has a chemicals policy in place that protects the health of Californians and the environment. The policy assists Californians to:

- implement strategies to stimulate a green chemistry industrial revolution to drive technological innovation and the development of safer, healthier, and more sustainable chemicals, products and processes and approaches across their life cycles.
- move from a system where materials are on a one-way trip from the cradle to grave to a system where products are recovered as raw material for reuse in new products and processes without harming human health or the environment.
- develop strategies to encourage the use of less-hazardous products, processes and approaches by encouraging the use of less-hazardous alternatives.
- motivate and support new investments in safer and more sustainable products, processes and approaches.

California has an unprecedented opportunity to establish new mechanisms to promote economic development while protecting human health and the environment. In order to accomplish this, all stakeholders must be represented and their concerns and issues heard. As an advisory panel of diverse backgrounds, we will strive to articulate to the DTSC various opportunities and issues from multiple perspectives, so that the agency may move forward in its work. We will be sure to identify concepts on which there is consensus. Where there are differing opinions, we will make every effort to represent the various viewpoints in a fair and honest way.

Mission

The Mission of the Green Chemistry Initiative (GCI) Science Advisory Panel is to advise Department of Toxic Substances Control Director Maureen Gorsen on scientific and technical matters in support of the goal of the GCI to significantly reduce adverse health and environmental impacts of chemicals used in commerce, as well as overall costs to California society, by encouraging the redesign of products, manufacturing processes and approaches. The panel will assist Director Gorsen in developing green chemistry and chemicals policy recommendations, and will ensure that these recommendations are based on a strong scientific foundation. The initiative is broad in scope and will consider a wide range of options, in an effort to identify the most effective means of strengthening California's use of green chemistry.

I. B. Green Chemistry: History and Concepts

In their 1998 book, Green Chemistry: Theory and Practice, Science Advisory Panel members Paul T. Anastas and John C. Warner defined "green chemistry" as:

> …the utilization of a set of principles that reduces or eliminates the use or generation of hazardous substances in the design, manufacture and application of chemical products.

The science of green chemistry addresses pollution prevention at the molecular level. Over the past decade or so, the field of mechanistic toxicology has made significant advances. While our understanding of the molecular structure-activity relationships that control impacts of molecules on human health and the environment is far form complete, there are many general relationships that have been discovered and explored. It can be expected that knowledge in mechanistic toxicology will continue to grow and expand in the future.

The principles of green chemistry serve to link this structural and mechanistic understanding of hazard with scientists who design and invent chemical products and processes. By following these principles, scientists can design materials that are inherently less hazardous.

In order for a technology to be legitimately considered "green chemistry," it must be practically applicable for commercial use. Therefore, in addition to the reduction of hazard, the technology must demonstrate appropriate product performance and economics. Green chemistry, as the molecular science component of sustainability, seeks to create products that simultaneously protect human health and the environment while being consistent with sustainable economic development.

Sadly, safer alternatives have not yet been invented for many hazardous materials currently used in society. One part of the larger effort to create a sustainable future for society must focus on promoting the innovation of green technologies. At present, undergraduate and graduate degree programs in chemistry and materials sciences at our colleges and universities do not require any formal training on the human health and environmental impacts of chemicals. The absence of this knowledge creates a workforce that is unprepared to meet society's demand for safer alternatives.

John R. Balmes, M.D., Vice-Chair

To better understand the options presented in this report, it is important to define "green chemistry" and its relationship to s concepts. The term "green chemistry" can be defined as "the invention, design, and application of chemical products and processes to reduce or to eliminate the use and generation of hazardous substances."2 It should be noted, however, that the International Union of Pure and Applied Chemistry (IUPAC), and a number of other organizations and corporations, use the term "sustainable chemistry" to define the same concept. Nonetheless, this highlights an

important departure from previous practice in that it demands regulation of downstream impact as well as of processes and materials used. Green engineering, as defined by the United States Environmental Protection Agency (U.S. EPA), is the "design, commercialization, and use of processes and products that are feasible and economic while minimizing the risk to human health and the environment and the generation of pollution at the source." [4]

Life cycle thinking is essential to both green chemistry and green engineering and should be differentiated from the useful life cycle assessment and life cycle analysis tools that have been developed to carefully consider the overall impacts of chemicals and technologies over the history of their development, production, use and disposal. Finally, it is important commitment to sustainability and sustainable development. Indeed, it has been noted to understand that all of these terms have been incorporated into the broader, global that green chemistry is the chemistry field's response to creating a sustainable future.

Finally, "green chemistry and engineering" is not meant to include end-of-pipe approaches, the provision of personal protective equipment, and the like.

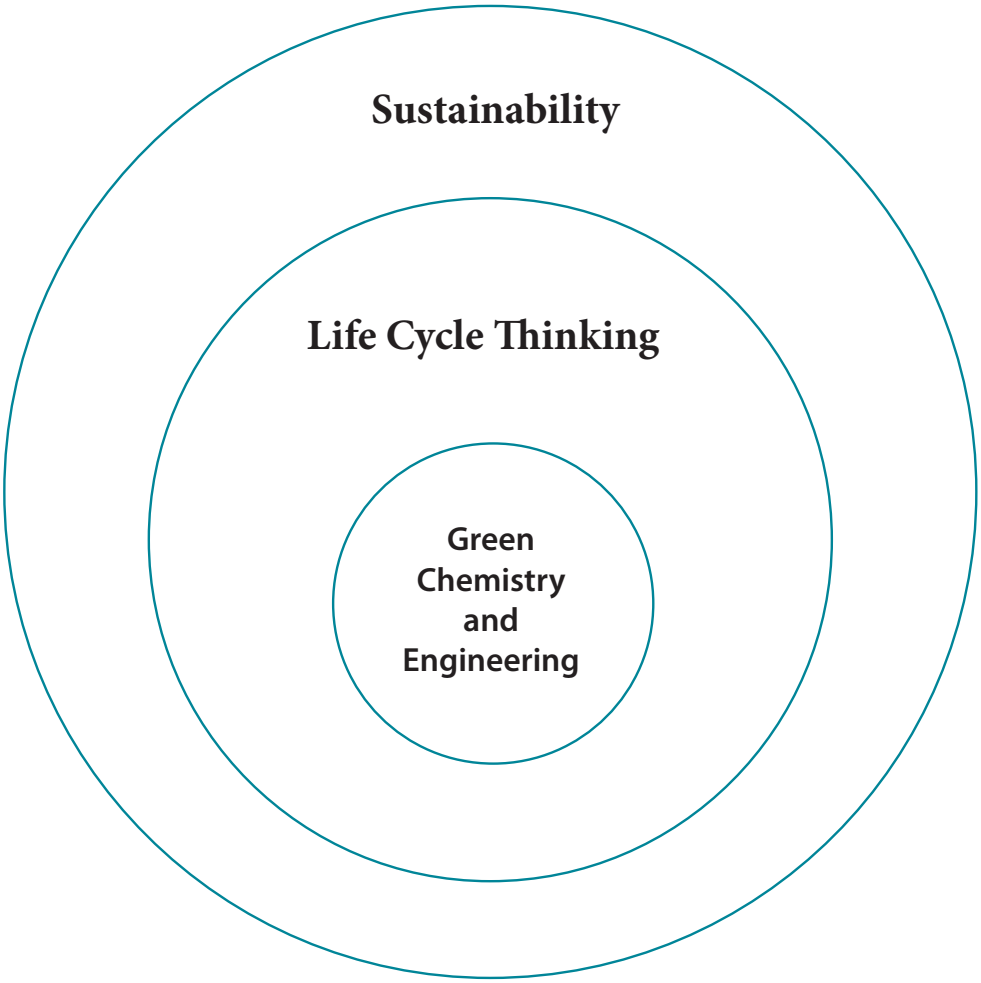
I. C. The Need for a Green Chemistry Initiative in California

Despite landmark environmental and occupational legislation in the 1970s, including passage of the federal Toxic Substances Control Act (TSCA) in 1976, many experts have concluded

Anastas' & Warner's 12 Principles of Green Chemistry

1. Prevent waste rather than treating it or cleaning it up.
2. Incorporate all materials used in the manufacturing process in the final product.
3. Use synthetic methods that generate substances with little or no toxicity to people or the environment.
4. Design chemical products to be effective, but reduce toxicity.
5. Phase out solvents and auxiliary substances when possible.
6. Use energy efficient processes, at ambient temperature and pressure, to reduce costs and environmental impacts.
7. Use renewable raw materials for feedstocks.
8. Reuse chemical intermediates and blocking agents to reduce or eliminate waste.
9. Select catalysts that carry out a single reaction many times instead of less efficient reagents.
10. Use chemicals that readily break down into innocuous substances in the environment.
11. Develop better analytical techniques for real-time monitoring to reduce hazardous substances.
12. Use chemicals with low risk for accidents, explosions, and fires.

A simple nested graphic describes the conceptual distinctions among these terms



that chemicals policy in the U.S. has not been sufficiently protective of human health or the environment, nor has it promoted innovation in the chemicals market[5]. There continue to be substantive gaps in understanding about the health and environmental effects for the great majority of the 83,000 chemical substances listed in the TSCA Inventory.[6] The U.S. EPA's voluntary High Production Volume Challenge[7] has made limited progress in improving information on chemicals produced or imported at more than one million pounds per year.[8] Since 1979, however, more than 20,000 new substances have been added to the TSCA Inventory, despite very little information about their health or environmental effects.[9] Global chemical production, meanwhile, continues to grow at about 3% per year, doubling every 25 years.[10]

Many of these substances come in contact with people – in the workplace, in homes, through the use of products, and through air, water, food and waste streams – and many of them enter the earth's finite ecosystems at some point during their lifecycle. The hazardous properties of industrial chemicals and chemical products are thus of great importance to policymakers, state regulators, and the public at large.

Policy Gaps

A 2006 University of California report commissioned by the California Legislature identified three overarching chemicals policy "gaps" that trace their roots to the weaknesses of TSCA and other state and federal laws: [11]

The Data Gap

Manufacturers and businesses can sell a chemical or product without generating or disclosing sufficient information about its potential health or environmental hazards.

The Safety Gap

In many cases, public agencies are unable to efficiently gather hazard or exposure information from producers of chemicals, proactively regulate known hazards in an integrated, comprehensive manner, or require producers to accept greater responsibility for the lifecycle impacts of their products.

The Technology Gap

Relative to the pace and scale of chemical production and use, there is insufficient private or public investment in green chemistry research, development, education, and technical assistance.

Department of Toxic Substances Control Director Maureen F. Gorsen addresses the Science Advisory Panel

The panel worked collaboratively to develop green chemistry options for California

Implications of the Gaps

In findings that are similar to those of other investigators, the 2006 UC report concluded that the Data, Safety and Technology Gaps have produced a flawed market for chemicals and products in the U.S. in which:

- The health effects of many chemical exposures are poorly understood,
- Hazardous chemicals and products are competitive in the market,
- The majority of the costs of health and environmental damage related to chemical exposures and pollution are carried by the public,
- Broad investment in green chemistry across the chemical industry sector is inconsistent, despite the efforts of leading companies,
- Government has limited authority and information with which to adequately assess the risks of most chemicals in commercial use or control those of greatest concern, and
- There is very little attention given to green chemistry in high school, college or university curricula.

In a 2008 report to the California Environmental Protection Agency, the University of California Centers for Occupational and Environmental Health (COEH) at Berkeley and UCLA described several ways in which the weaknesses of TSCA and other federal and state laws are affecting the people and environment of California, including the following:[12]

Workers

In 2004, preventable, chronic diseases resulting from workplace chemical exposures affected about 200,000 Californians; 4,400 died as a result. Safe workplace exposure levels have been established for only 193 (7%) of 3,000 High Production Volume Chemicals.

Children

Over one hundred industrial chemicals have been identified in breast milk and umbilical cord blood, some of which are known to be toxic at low levels; some are increasing in concentration in sampled tissues. Because of the potential health effects of these substances, many of which are incompletely understood, this evidence of exposure among fetuses and infants is of concern.

Environment

About 70% of California's largest hazardous waste sites are leaking toxic material into groundwater. Over 7 billion pounds of plastic waste entered California landfills in 2004, along with nearly one billion pounds of hazardous electronic waste. Plastic waste now outweighs plankton by 6:1 in a swath of the Pacific ocean about twice the size of Texas.

Economy

Occupational diseases attributable to chemical exposures cost $1.4 billion in direct medical costs and indirect costs in 2004, including lost wages and benefits and lost years of productive life. California government spent over $130 million in 2006-07 to manage hazardous waste; groundwater monitoring for toxic substances costs another $30 million annually.

The 2008 UC report concluded that to address these problems effectively, new policies are needed to close the data, safety and technology gaps. To do so, the report recommended a comprehensive approach that includes information-based strategies, direct regulation, extended producer responsibility, technical assistance, market-based incentives, and public support for research and education. These interventions can be applied in ways that affect either the supply of, or demand for, green chemistry.

I. D. Options for Government: Creating Supply and Demand for Green Chemistry

In identifying options to promote green chemistry in California, the Science Advisory Panel developed a framework for analysis that:

1. relates demand-side and supply-side interventions ("options") for carrying out core

policy functions so as to address data gaps, safety gaps and technology gaps (Gaps, Functions and Interventions), and

2. addresses Key Behavioral Factors and Interventions affecting changes in the government, private sector, and society/citizenry that could bring about the needed transformation of chemicals production and use.

As a first approach, the framework acknowledged that a range of government actions affecting both supply- and demand-side activities can and needs to be taken to promote green chemistry and sound chemicals policies:

- "supply" side options – initiatives in education, research, economic incentives, etc. that will help to facilitate the creation and dissemination of greener chemicals, processes and technologies, and

- "demand" side options – chemicals policy elements that will drive demand for these greener chemicals, processes and technologies, by better informing the market, providing a level playing field on which greener options can fairly compete, and creating a regulatory climate that drives both the development and the adoption of greener alternatives.

Matrix 1 (next page) represents this approach as a means of arraying the various supply- and demand-side options developed by the Science Advisory Panel for consideration by the state, and illustrating their complementarities and interdependency. The matrix itself seeks to integrate into a single framework the supply-demand concept and three other approaches that have been discussed by the Panel:

1. the data/safety/technology gaps analysis described in the University of California's green chemistry reports;[13]

2. the "core functions of a chemicals policy" identified in a recent analysis by Environmental Defense Fund of U.S., European Union and Canadian chemicals policies;[14] and

3. the subsections of sections II and III of this report used to group the options generated by the Science Advisory Panel.

The primary utility of the matrix is as a means to evaluate how the available options:

- address the various gaps, policy functions and types of interventions;
- relate to each other, i.e., are complementary or interdependent; and
- are best combined to advance a balanced portfolio of measures to promote green chemistry, including both supply and demand stimulants, regulatory and non-regulatory initiatives, etc.

Any individual option will not necessarily be confined to a single matrix cell. For example, creating a state office of technical assistance would potentially apply to many cells on the supply side. Any given row or column in the matrix would likely have multiple cells filled in, although some cells may be left blank where not relevant, such as the intersection between "control chemicals of concern" and "provide funding for green chemistry").

Michael P. Wilson, Ph.D., M.P.H

A second approach is represented by Matrix 2, which explores the behavioral changes among the key stakeholders that rely on individual and organizational learning,adaptation, and innovation to effectuate supply-and demand-side transformations. Key actors must have the willingness, opportunity/motivation, and capacity or capability to adapt or innovate. These three affect each other, of course, and each is determined by more fundamental factors such as the social and industrial networks the firm is embedded in and the incentives that are created by government. Specifically,

> ***Willingness*** is determined by [1] attitudes towards changes in production in general, [2] an understanding of the problem (i.e., what aspects of current technology need to be changed), [3] knowledge of possible options and solutions, and [4] the ability to evaluate alternatives. Improving [3] involves aspects of capacity building through the diffusion of information, through trade associations, government-sponsored education programs, inter-firm contacts, and the like. Changing attitudes towards changes in production [1] often depends on attitudes of managers and on the larger culture and structure of the organization, which may either stifle or encourage innovation and risk taking. Factors [2] and [4] depend on internal intellectual capacities.
>
> ***Opportunity and motivation*** involve both supply-side and demand-side factors. On the supply side, technological gaps can exist between the technology currently used in a particular firm and the already-available technology that could be adopted or adapted (known as diffusion or incremental innovation, respectively), or alternatively the technology that could be developed (i.e., innovation). Consciousness of these gaps could prompt firms to change their technology, as could the opportunity for cost savings. Regulatory requirements could also define the changes that would be necessary to remain in the market. On the demand side, three factors could induce firms or technology suppliers towards technological change - whether diffusion, incremental innovation, or major innovation. These are [1] opportunities for cost savings or expansion of sales, [2] regulatory requirements, and [3] consumer/worker/societal demand for more environmentally-sound, eco-efficient, and safer industry.
>
> ***Capability*** or capacity can be enhanced by [1] an understanding of the problem, [2] knowledge of possible options and solutions, [3] the ability to evaluate alternatives, [4] resident/available skills and capabilities to innovate, and [5] access to, and interaction with, outsiders. Knowledge enhancement/learning [2] could be facilitated through deliberate or serendipitous transfer of knowledge from suppliers, customers, trade associations, unions, workers, and other firms, as well from the available literature. The skill base of the firm [4]

Matrix 1: Gaps, Functions And Interventions

<–––––––––––Supply-side––––––––––––––––>

<–––––––––––Demand-side––––––––––>

Associated Gap	Types of Options / Core Policy Functions	Educate and Do Outreach	Conduct and Support Green Chemistry R&D	Pursue Voluntary and Other Supply-side initiatives	Evaluate Products, Problems and Solutions	Develop Policies and Practices to Prioritize Chemicals	Utilize Regulation to Collect and Act on Information	Use Incentives to Boost Demand for Green Chemistry
Data Gap	Identify/ Prioritize Chemicals of Concern	Section II.A.	Section II.B.	Section II.C.	Section II.D.	Section III.A.	Section III.B.	Section III.C.
	Track Chemical Production and Use							
	Collect and Develop Data							
	Share/Protect Information							
Safety Gap	Assess Chemical Hazards/ Exposures/ Risks							
	Control Chemicals of Concern							
	Assess Alternatives/ Options							
	Innovate Toward Safer Chemicals							

Matrix 2: Key Behavioral Factors and Interventions (Approach 2)

Determinants of Change -- Leverage points to encourage the needed (governmental, private-sector, and societal) changes through green chemistry and engineering

KEY CHANGE FACTOR	INTERVENTION TYPE	SPECIFIC ACTIVITIES
Willingness		
-towards changes in production (flexibility)	address static mind-sets/encourage risk-taking	
-influenced by an understanding of the problem (i.e., what aspects of the technology need to be changed)	information dissemination/ educational initiatives	
-influenced by knowledge of options or solutions (diffusion)	information dissemination/ educational initiatives/databases	
-influenced by the ability to evaluate alternatives	methodology development and capacity-building	
Opportunity/Motivation		
-gaps in technological/scientific capability (compared to others in existing markets)	databases and demonstration/ showcase projects	
-possibility of economic cost savings in existing markets or new/expanded market potential	perform and disseminate cost-benefit and market analysis	
-regulatory requirements necessitating technological changes	regulatory initiatives	
-consumer/worker/societal demand (making new markets)	enhance marketing/demand for greener technology	
Capacity		
- influenced by an understanding of the problem (i.e., what aspects of the technology need to be changed)	information dissemination/ educational initiatives	
- influenced by knowledge of options or solutions (diffusion)	information dissemination/ educational/initiatives/databases	
- influenced by the ability to evaluate alternatives	methodology development/technical assistance/capacity-building	
- resident/available skills and capabilities (for innovation)	capacity-building, education/training	
- outside assistance	state offices of technical assistance/ university-based projects	

> could be enhanced through educating and training operators, workers, and managers, on both a formal and informal basis, and by deliberate creation of networks and strategic alliances not necessarily confined to a geographical area, nation, or technological regime. Interaction with outsiders [5] could stimulate more radical and disrupting changes. (Ashford and Hall 2009)[15]

The approaches described in the two matrices are complementary, but not identical. The first approach is sharply focused on identifying options for closing the data, safety, and technology gaps (discussed above) through a variety of initiatives related to carrying out core functions of a chemicals policy, while the second approach focuses explicitly on changing the behavior of all relevant key actors to bring about transformations. The next two sections of the report discuss specific options in depth. In Section IV of this report, we return to a summary of those options in the context of their affecting supply- and demand-side behavior.

Endnotes

[1]Part of the Green Chemistry Initiative, the "Key Elements" are concepts that recurred throughout the array of options presented in Phase One. They are: disseminate information on toxic chemicals and empower consumers to make informed choices; account for chemical toxicity and impacts in state procurement decisions; train a new generation of scientists and engineers; include Green Chemistry principles in an Environmental Education Initiative; strengthen consumer protection laws; and expand California's pollution prevention program. See http://www.dtsc.ca.gov/PollutionPrevention/GreenChemistryInitiative/index.cfm

[2]P. T. Anastas and J. C. Warner. Green Chemistry: Theory and Practice. Oxford Science Publications, Oxford (1998).

[3]http://www.epa.gov/oppt/greenengineering/

[4]In this report, "greener" means "conforming to or derived from the principles of green chemistry and engineering."

[5]United States Government Accountability Office. Chemical Regulation: Options Exist to Improve EPA's Ability to Assess Health Risks and Manage its Chemicals Review Program. (http://www.gao.gov/new.items/d05458.pdf) Washington, D.C.: U.S. Government Printing Office, 2005
Goldman L. ***Preventing Pollution?*** U.S.Toxic Chemicals and Pesticides Policies and Sustainable Development. Environmental Law Review 32:11018-11041(2002).
Lempert et al. ***Next Generation Environmental Technologies***: Benefits and Barriers. http://www.rand.org/pubs/monograph_reports/MR1682 (accessed January 2008) Arlington, VA: RAND Corporation (2003)

[6]National Pollution Prevention and Toxics Advisory Committee (NPPTAC), Broader Issues Work Group. How can EPA more efficiently identify potential risks and facilitate risk reduction decision for non-HPV existing chemicals? (2005) (http://epa.gov/oppt/npptac/pubs/finaldraftnonhpvpaper051006.pdf)

[7]U.S. Environmental Protection Agency, Office of Pollution Prevention and Toxics, High Production Volume (HPV) Challenge (http://www.epa.gov/chemrtk/).

[8] Denison, R.A. (2007) ***High Hopes, Low Marks: A final report card on the HPV Challenge***, Environmental Defense Fund, Washington, DC (http://www.edf.org/HPVreportcard).

[9] United States Environmental Protection Agency. Overview: Office of Pollution Prevention and Toxics Programs. Overview, Draft Version 2.0. Washington, D.C. (http://www.chemicalspolicy.org/downloads/TSCA10112-24-03.pdf) pp. 8-11 "The information in PMNs is limited: 67% of PMNs include no test data and 85% include no health data" p. 8 (2003).

[10]The Organization for Economic Cooperation and Development (OECD), UK Chemicals Industry Association and the American Chemistry Council predict an annual growth rate ranging from 0.026 to 0.035 leading up to 2020. Organization for Economic Cooperation and Development (OECD). ***Environmental Outlook for the Chemicals Industry***

(http://www.oecd.org/dataoecd/7/45/2375538.pdf) p. 34-36 (2001). This is consistent with production trend data from 1992-2002 in American Chemistry Council, Guide to the Business of Chemistry, p 78 (2003).

[11]Wilson, Chia, Ehlers. ***Green Chemistry in California: A Framework for Leadership in Chemicals Policy and Innovation.*** Special Report to the Senate Environmental Quality Committee and Assembly Committee on Environmental Safety and Toxic Materials, California Legislature. University of California, California Policy Research Center, UC Office of the President. (http://coeh.berkeley.edu/docs/news/06_wilson_policy.pdf) (2006). Thirteen UC faculty provided technical oversight for this report.

[12]Wilson, Schwarzman, Malloy, Fanning, Sinsheimer. Green Chemistry: Cornerstone to a Sustainable California (2008). Report to the California Environmental Protection Agency. University of California, Centers for Occupational and Environmental Health (COEH) at Berkeley and UCLA (http://coeh.berkeley.edu/greenchemistry/briefing/) (2008). 127 UC faculty served as signatories to the final draft of this report.

[13] Green Chemistry: Cornerstone to a Sustainable California (2008) and Green Chemistry in California: A Framework for Leadership in Chemicals Policy and Innovation (2006), University of California, Center for Occupational and Environmental Health, at http://coeh.berkeley.edu/greenchemistry/briefing/default.htm.

[14] Denison, R.A. (2007) Not That Innocent: A Comparative Analysis of Canadian, European Union and United States Policies on Industrial Chemicals (Environmental Defense Fund, Washington, DC), at www.edf.org/chempolicyreport

[15]N. A. Ashford and R. P. Hall, Technology, Globalization and Sustainability: Co-optimizing Competitiveness, Employment, and Environmental through Technological Change and Trade, forthcoming MIT Press, 2009.

Drs. Neil Hawkins, Ken Geiser, Vistasp Karbhari and Michael Dourson

Dr. Gail Charnley and Panel Chair Dr. John Warner

II. Green Chemistry Options for California—the Supply Side

II. A. Green Chemistry and Engineering Education – The Needed Tools

Investing in green chemistry for the future in California requires special attention to the state's educational services. Teaching green chemistry concepts in primary and secondary schools could attract students to science by positioning chemistry as a tool to meet environmental and health challenges. Reformulating college curricula and offering fellowships and internships would prepare new scientists to be innovative in a critical field. Thus, as California businesses adopt green chemistry practices and strive for new green product development, the state will have prepared its workforce in advance to meet these needs.

Option 1: Train K-12 Science Educators

Develop a program to train K-12 science education teachers in the concepts of Green Chemistry

One of the key challenges to introducing green chemistry to the K-12 curriculum is that students are not introduced to chemistry until grade 10. Science, as taught in grades K through 9, is heavy on biology (including botany, zoology), geology (with meteorology), and ecology. Most students receive only the barest exposure to chemistry prior to their first formal chemistry course (typically sophomore or junior year in high school). Introductory chemistry concepts that appear before the first formal course take the form of simple descriptions of atoms and molecules with perhaps some physical chemistry fundamentals (states of matter, phase changes, etc). Further, the first (and often only) chemistry course typically includes a very limited amount of organic chemistry.

The large numbers of chemistry lesson plans and sample experiments that are designed for students in the K-8 grades are not reaching a significant fraction of the target audience. This is often due to the lack of training of K-8 teachers in these subjects, and a lack of appreciation of the great extent to which chemistry has permeated our economy and our lives. As such, one way in which green chemistry can be promoted at the K-12 level is to train K-12 teachers in the important concepts and create (or use off-the-shelf) relevant experiments to illustrate the concepts. Such training programs could be provided through a variety of mechanisms, including:

- in-service professional training programs offered through various professional associations,
- continuing education programs offered by college teacher training programs, and
- summer enrichment training programs tied to certification and accreditation requirements.

An alternative view is that the priority in K-12 education should be to ensure student proficiency in reading, mathematics, social studies and the basic concepts and tools of

science. Even under this view, some creative teaching materials on green chemistry may be an exciting way to help generate student enthusiasm for the concepts and tools of science. In this way, teaching green chemistry can be viewed as an innovative tool for teaching science.

Option 2: Develop K-12 Green Chemistry Teaching Materials

Expand California's science education materials programs to include training and laboratory materials for conveying concepts in green chemistry to K-12 classrooms suited to each grade level.

Regarding the teaching of green chemistry to K-12 students, there are some broad analogies that can be drawn to illustrate the basics. Clearly, chemistry can be rendered palatable to younger students in an informal sense via analogies to cooking, where the latter's various ingredients and techniques compare nicely to the conduct of chemical reactions. One of chemistry's most powerful applications is simply "making things around us," and hence relating chemistry to the creation of materials is a useful teaching tool.

In both cooking and materials synthesis, concepts of waste minimization are easy to illustrate. Concepts surrounding toxicity/hazard will be more difficult to convey, given that the conventional wisdom among children is likely that all chemicals are hazardous. Conveying concepts in green chemistry to K-12 (and more importantly, K-8) will therefore require relevant teaching materials suited to each grade level. This dovetails with the need for teacher training noted above. By developing a wide array of teaching and laboratory materials, the state of California could render the teaching of green chemistry principles more tractable. Because supply budgets at the K-12 level are so tight, California could provide the supplies needed to conduct green chemistry experiments to those teachers who complete the green chemistry science educators training program noted above.

Option 3: Develop Green Chemistry Interdisciplinary Education Courses

Develop programs to introduce interdisciplinary green chemistry into the general education curriculum for undergraduates in California colleges and universities.

Too often, non-chemistry majors avoid general chemistry courses because they are too abstract and quantitative. Introducing green chemistry into such courses creates new opportunities to demonstrate the social relevance and positive benefits of chemistry. The concepts of green chemistry can be taught through sets of interdisciplinary courses thereby making them available to a wider range of students, many of whom may not be chemistry or chemical engineering majors. Knowledge is necessarily less specific and is broadly defined often in terms of choices, assessments and impacts. The purpose here is to make a wider range of students aware of the issues and thereby cause the topic itself to be mainstreamed.

In the last thirty years, there has been a proliferation of interdisciplinary undergraduate majors that cover environmental protection. They may be called environmental science,

environmental policy, environmental studies, sustainability or other closely-related terms. It is critical that the science of green chemistry be integrated into the curricula of these interdisciplinary majors.

John Warner designed a model course called "Environmental Concerns and Chemical Solutions" that was presented as a "Gen Ed" environmental science elective for undergraduates at the University of Massachusetts Boston. Each section of the course was organized around three parts: 1) the description of an environmental issue (e.g. global warming, ozone depletion, water pollution, persistence, etc.) including the historical, political and social implications; 2) the chemical science behind the issue (e.g., thermodynamics, kinetics, acid/base, redox, etc.); and 3) the industrial processes linked to the issue and the green chemistry solutions that could be developed or were being used in practical applications.

Such green chemistry classes could be offered in diverse academic centers ranging from community colleges to the University system at levels that would make them open to students across various science disciplinary bounds. These courses would essentially serve to develop a more educated and illuminated student population, some of whom would take specialized courses covering green chemistry concepts in their specific disciplinary focus areas. The courses would thus be distinct or loosely aligned and would essentially serve as electives.

Option 4: Integrate Green Chemistry into Higher Education Chemistry and Chemical Engineering Curricula

Reformulate conventional graduate and undergraduate chemistry and chemical engineering curricula in California colleges and universities to emphasize green chemistry and to include aspects of toxicology, health related issues, ecology, environmental science and environmental law.

The concept of specialization is exemplified by the development of the world's first doctoral program in Green Chemistry at the University of Massachusetts. The establishment of this program enabled students to specialize in this new discipline. A number of other universities integrated green chemistry into existing advanced degree programs through specialized courses. Both approaches place tremendous emphasis on the treatment of aspects such as toxicity and downstream environmental impact as among the principle characteristics of a material, making these aspects to be routinely considered in the design of materials and processes.

Reformulating traditional chemistry and chemical engineering curricula in this way would emphasize green chemistry and include aspects of toxicology, health-related issues, risk assessment, ecology, environmental science and environmental law. Models of such courses have been developed and described in reports such as Real World Cases in Green Chemistry from the University of Scranton and Going Green: Integrating Green Chemistry into the Curriculum by the American Chemical Society.

Such an expansion of curricula could be accomplished in very much the same way as waste reduction and pollution prevention were introduced in the early to mid-90s. Typical scenarios and problems used in courses are intrinsically changed to reflect choices and selections

involving green chemistry and its implications. Students graduating from such programs would thus not only be qualified to enter professions with the requisite training as chemists or chemical engineers but would also have specific and specialized knowledge regarding assessments and improvements related to green materials, processes and products.

An example of the restructuring of a conventional laboratory course to emphasize green chemistry principles is seen in the undergraduate course on organic chemistry taught by Prof. James Hutchison at the University of Oregon and described in K. Doxsee and J. Hutchison, Green Organic Chemistry: Strategies, Tools, and Laboratory Experiments. An obvious area of discussion under this curricular construct is whether students would first need to master basic concepts in chemistry/chemical engineering before being exposed to the specific attributes of green chemistry/engineering, or whether the restructuring could itself take place at the very basic levels, thereby truly integrating these topics into the formal curriculum from the outset.

California essentially needs a combination of both models, with the latter serving to educate and inform its citizens, and the former serving to specifically develop a subset as topical experts in this area.

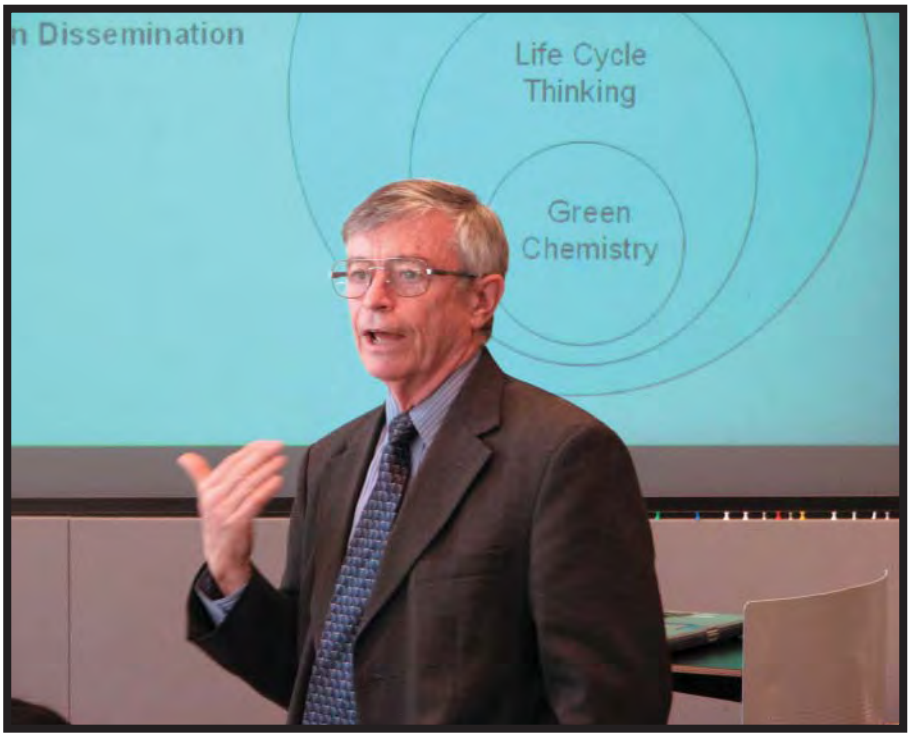
Option 5: Develop Fellowships and Internships in Green Chemistry

Develop a program to support graduate education fellowships and both undergraduate and graduate internships focused on green chemistry research and application.

One of the most important areas of training for chemists, engineers, molecular scientists, and those wishing to be scientifically informed citizens is the practical, hands-on laboratory experience. Research training is an essential element for practitioners of science and engineering and it is a great opportunity to expose students to the tools, techniques, methodologies, and principles of green chemistry. Currently, there are few mechanisms that support the opportunities for students to explore this important area of research in green chemistry. In order to advance green chemistry through education and research, the State of California could develop a program to support fellowships and internships focused on green chemistry research. Such a program would benefit from partnership with other interested parties including the federal government and national laboratories, industrial interests including individual companies and industrial sectors, and non-governmental organizations including philanthropic institutions. The program could include the following elements:

- Universities in California seeking to develop internship partnerships with industry to provide practical experience in green chemistry could apply for seed grants to launch the program.
- Twenty-five graduate student research fellowships in green chemistry would be offered competitively to students doing research on any area of green chemistry at the Ph.D. or Masters level. Funding would cover stipend and tuition.
- Twenty-five undergraduate research fellowships in green chemistry would be offered competitively to students doing research on any area of green chemistry.

- Ten post-doctoral research fellowships in green chemistry would be provided to outstanding candidates and would supply matching funds to the principal investigator at a university or national/state laboratory in California to cover the salary of the researcher.
- Five grants for two years would be awarded annually on a competitive basis for universities, four-year colleges, and community colleges in California to develop laboratory training modules undergraduates to have exposure to green chemistry in the teaching laboratory.



Dr. Ken Geiser

Option 6: Promote Green Chemistry in Business School Education

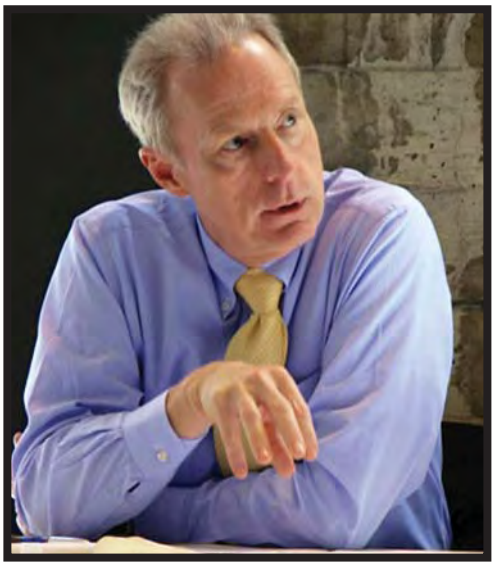
Commission the development of practical teaching cases in green chemistry that can be incorporated into the curricula of business schools through the university systems in California.

The future of green chemistry requires an informed and knowledgeable business community as well as trained technical and scientific staff. Awareness of green chemistry solutions can be aided by integration of the concept into the education of future business leaders. As green chemistry offers considerable business opportunities as well as some commercial risks, the training of future business leaders should include an introduction to green chemistry. The state of California could take a pioneering step by commissioning the development of practical teaching cases in green chemistry that can be incorporated into the curricula of business schools through the university systems in California. Such cases could cover subjects ranging from production management and investment decisions to product design and product marketing. If these cases are successful, they can serve as a model for innovation in business education elsewhere in the United States and around the world.

Option 7: Support New Faculty Positions in Green Chemistry

Encourage and financially support the hiring of faculty qualified in green chemistry throughout the state's colleges and universities

The training of college students in the various subjects necessary to develop well rounded capacity in green chemistry will require qualified faculty capable of teaching such subjects and organizing effective green chemistry research programs. Not only is there a need for faculty prepared to teach and conduct research in green chemistry, but there is a need for academic positions for those who are graduating from the state's higher education institutions where green chemistry is being taught.



Dr. William Carroll

The state of California can assure that there is sufficient teaching and research capacity by providing funding specifically directed towards new positions in green chemistry within the conventional disciplines of chemistry and chemical engineering. In addition, the state could encourage and support the hiring of other faculty capable of teaching the non-chemistry requirements in toxicology and health, risk assessment, environmental science and environmental law and policy.

This hiring program could be launched as a competitively-based program where various state colleges submit applications for three- to five-year faculty support grants that support new positions and new hires. While such specially targeted hiring programs may be needed in the early years of introducing green chemistry into the state colleges, this program might not be needed once green chemistry has been firmly established and the concepts and principles are taught routinely throughout the various curricula. Therefore, this specially targeted hiring program might best be established as a seed funding program that lasts no longer than a necessary period.

Option 8: Introduce Green Chemistry into Vocational and Workforce Development Training Programs

Support and fund a green chemistry program for vocational schools and other workforce development programs.

As California firms move to adopt and integrate green chemistry applications into existing production or open up new ventures based around green chemistry products and solutions, there will be a growing need for workers trained in new areas of production and product design. Indeed, a serious commitment to green chemistry has the potential to create

new green jobs that help lower-skilled and lower-income workers get into the workforce and move into meaningful careers.

To assist these opportunities to emerge and flourish, it is important that the state provide encouragement and support for vocational training and workforce development programs that integrate green chemistry concepts and principles into established skill development training programs. The state could set aside specific funding and target such funds to local, municipal and community-based programs that offer new training opportunities that prepare students for green chemistry and green product services.

Community-based organizations and non-profit economic development programs that offer services to lower skilled and disadvantaged workers should be made aware of opportunities emerging in firms adopting green chemistry technologies and practices. Such services can provide access for those seeking employment in new green jobs to get the training that will prepare them to handle new technologies and perform new services.

II. B. Research, Invention, and Innovation in the Context of Green Chemistry and Engineering

Science and technology is at the heart of green chemistry. It is what allows green chemistry to design, discover, and implement the new products and processes that perform better and are safer for human health and the environment. With a strong science and technology component, California's Green Chemistry Initiative process can be a leader in demonstrating the ability to design truly sustainable products, processes, and industry sectors. In the absence of robust support for this essential pillar of green chemistry, the benefits will be a pale reflection of the power and the potential of green chemistry to be an engine for California in building a strong, healthy economy and community.

Current Status:

- Currently, California has, in place, the building blocks for excellence and leadership in green chemistry. There is a significant amount of expertise that resides in both the public and private universities of the state, as well as in other research institutions. This expertise, however, is largely uncoordinated, unrecognized, and underutilized as a source of innovation in moving California forward in the area of green chemistry.
- There is a fundamental lack of support for research efforts at all levels. Current green chemistry efforts are largely the result of "bootstrap" efforts of academic entrepreneurs.
- There are examples of green chemistry awareness and notable accomplishment in industrial interests in California. However, there is tremendous untapped upside potential for the systematic adoption of green chemistry principles in the development of new products, processes, and markets.
- Partnerships and collaborations will be an essential piece of the successful implementation of the California Green Chemistry Initiative, and the science and technology component is an area where there is tremendous potential for partnerships

including industry/university, state/federal, and NGO/academic collaborations.

- Visibility and recognition of scientific and technological achievements in both industry and academia is needed to both allow for maximum benefit from the accomplishments and to provide model case studies for people to be emulated and built upon.
- Significant research and development tools are needed in order to allow green chemistry to grow and develop in California for maximum benefit. These tools can range from scientific equipment and instrumentation to new computational capabilities to access to demonstration and testing facilities.

The field of green chemistry is a well-established area of science that has been well-defined in the scientific literature for over fifteen years. The definition, scope, and principles are documented and have received years of rigorous peer-review from the scientific community. There are several scientific journals devoted to the topic, scores of conferences and symposia, national initiatives in dozens of countries in green chemistry, and legislation and other governmental policies that incorporate green chemistry.

It is essential that the integrity of this framework is preserved by the state of California and that it remains in alignment with the well-established foundation in the face of pressures that are natural with the establishment of a governmental initiative. There is a normal inclination to expand, adjust, redefine, or otherwise modify programs to fit constituencies or interests. While often well-intentioned, these efforts would have detrimental unintended consequences of dilution, distraction, and derailing the important goals of innovation for environmental, human, and economic benefit.

Drs. Ken Geiser, Vistasp Karbhari, Michael Dourson and Katy Wolf

In order to ensure the integrity of the Green Chemistry Initiative, the following steps are suggested as overarching principles:

Dr. Paul Anastas

1. Formally adopt the definition of green chemistry as "the design of chemical products and processes that reduce or eliminate the use and generation of hazardous substances." Further, the twelve principles of green chemistry, as they enable development and utilization of practically applicable materials, should be adopted as the guiding framework for the California Green Chemistry Initiative.

2. Establish a California Green Chemistry Science and Technology Council that has the participation of national and international leaders in the green chemistry community, in addition to the expertise in the state. This Council would be tasked with review and oversight of the science and technology programs of the California Green Chemistry Initiative, as well as those other elements of the Initiative that have an important scientific component.

Option 9: Implement a process to identify all on-going efforts in Green Chemistry Science and Technology in California, and use that to determine critical gaps in Green Chemistry Research and Technology

To build an effective green chemistry program, it is essential to identify the ongoing efforts in green chemistry science and technology currently taking place in California. The following actions would provide an understanding of current activities in California of green chemistry science and technology.

1. Identify an independent third-party group, external to California, to conduct a 9-month audit of green chemistry activities in California that would:

   a. Identify all research programs in green chemistry at public and private universities and colleges of California (in all departments, schools, and centers).

   b. Identify green chemistry research and development in industry that has led to commercialization of improved products.

   c. Identify all science- and technology-related programs in the state government and the federal government operations in the state of California (e.g., national laboratories)

   d. Identify any non-governmental, not-for-profit, philanthropic organizations, advocacy or research institutions with programs to advance green chemistry science and technology.

2. Compile any gathered data in a searchable database of maximum use in identifying opportunities and needs.

3. Conduct a gap analysis that reviews the current portfolio of green chemistry science

and technology in California and provides an analysis of where the state has strengths weaknesses, opportunities, and needs. This study should be augmented by a review of overall green chemistry research needs (including a review of previous key reports on green chemistry research challenges by the National Academy of Sciences, the U.K. Crystal Faraday Partnership) to identify those areas of most important research investment for California. This report should be provided to the Green Chemistry Leadership Council no later then one year following the adoption of a green chemistry process.

Option 10: Support Green Chemistry Research and Development Efforts in California

To advance genuine green chemistry in California, it is essential to have strong, sustained and robust support for the green chemistry research and development efforts in the state. The following actions, if taken by the state of California, would further this goal:

1. Establish a $10 million Green Chemistry Research Fund to provide a minimum of forty, $250,000 direct grants annually to faculty at universities and colleges in California. The fund would be overseen by the Green Chemistry Council and should be focused on those areas identified as being crucial to development of Green Chemistry Science and Technology through efforts undertaken following the audit discussed above.
2. Establish a policy at all California state institutions of higher learning that any research grants that are deemed to be supporting green chemistry science and technology will receive specific institutional support.
3. Establish supportive tax credit and other policies to encourage and reward corporate support of research and development activities at California Universities and Colleges in the area of green chemistry.
4. Establish a patent assistance program that will provide funding for academics, small businesses, and entrepreneurs to cover the costs of patenting innovation in green chemistry science and technology.
5. Establish an overall policy for intellectual property ownership for projects funded by the state of California and by public-private partnerships to ensure that the public receives the benefits of resources allocated to this enterprise, while maintaining a commercial incentive for private partners to collaborate with public actors.

Option 11: Promote, Encourage, and Facilitate the Development of Industry – University Partnerships

A key component of any plan for the state of California to establish a leadership position in green chemistry and engineering must include state university-based programs that encourage collaboration with the private sector. Academic institutions in California are extremely strong already in all aspects of green chemistry and engineering: chemistry, chemical engineering, business, public policy, natural resources, etc. However, the

resources of the universities are not linked together in a way that builds leverage across all the terrific resources in the system. As this university-based program is established, it will be critical to gain business partners to help build the necessary linkage to companies who can provide real-life inputs on the needs for new products and to advise concerning the commercialization of new products. Any green chemistry and engineering innovation must naturally grow into a successful commercial product for it to make a difference in the world. This partnership with the private sector is very important for that reason, in addition to assisting with the identification of challenges and opportunities for research.

Dr. Eric Beckman

Lastly, the state of California should consider setting up a university system-wide policy for intellectual property ownership for projects funded by the private sector with the proposed state university consortium. A common, fair intellectual property agreement would facilitate and hasten private sector research collaborations. The current myriad of school-by-school negotiations is a barrier to many established and emerging venture capital companies in working with the university system. Lowering this barrier to collaboration would help speed California to the forefront of research and commercialization of green chemistry and engineering solutions and products. In order to accomplish this, the state of California should consider the following actions:

1. Establish Green Chemistry Institutes within the University of California system that would enable focused research and development using strong public-private collaboration. The Institutes should be structured following the highly-successful California Institutes for Science and Innovation program implemented earlier by the state.
2. Establish an infrastructure within these institutes and other specially-established centers to not only focus on education and research, but also to aid implementation by providing the means for testing new products and solutions in a real-world context. The focus should be on accelerating innovation and product introduction, ultimately strengthening California's economy.
3. Establish a common, fair, intellectual property agreement that facilitates private-sector investment in research and university collaborations and ensures a public benefit from such collaborations. Agreements could be modeled on those established by the California Institute for Regenerative Medicine to promote public-private collaboration.

Option 12: Strengthen the Green Chemistry Infrastructure

The implementation of green chemistry will only be successful if an appropriate level of supporting infrastructure is established and supported. This includes aspects such as specially-established innovation centers that focus on the transformation of ideas into reality, support for entrepreneurs and small businesses, specially-designed test labs and sites for assessment of new chemical formulations and products, and a deliberate focus on further development of the science of toxicity testing. It is crucial that the state of California

put in place mechanisms that not only support and further encourage innovation and implementation, but also enable rapid testing and assessment of products and the continued development of methods of systematic assessment. In order to accomplish this, it is recommended that the following actions be considered by the state of California:

1. Establish unique Green Chemistry Science and Technology Innovation Centers across the state, charged with enabling and encouraging the development of innovative technology and products as well as the support of entrepreneurs and small businesses. These centers would not only serve as incubators but would also provide other assistance and support such as development of business plans, financing, teaming, legal and regulatory requirement support, etc.
2. Establish specialized laboratories and test sites operated by the state in conjunction with academic institutions to enable the rapid and timely testing and assessment of new chemical formulations, products and technologies. It is essential that these centers and test sites are, and are perceived to be, independent, and that all results are based on technical and scientific results.
3. Establish centers for the advancement of the science of toxicity testing.

II. C. Other Incentives to Boost Green Chemistry Supply

Other proposals not previously characterized fall into three categories: voluntary action by industry, incentives based on recognition, competition or targeted grant programs, and technical assistance programs.

Voluntary Action by Industry

This section includes two proposals that could be undertaken by forward-looking individual companies or trade associations

Option 13: Implement management system approaches for California Chemical Manufacturers

A management system is a recognized business management practice that allows an organization to strategically address its environmental, health and safety matters for processes and products. Systematic implementation of quality management principles based on the "Plan, Do, Check, Act" model forces companies to identify goals, implement them, determine progress, and modify systems to ensure continual improvement. Properly implemented, a management system not only improves performance, but also increases overall efficiency and accountability.[16,17] Two examples of such systems include Responsible Care® and ISO14001.

Included in the idea of a modern management system is the principle of greater transparency in decision-making. Responsible companies conduct systematic and rigorous evaluations of their chemical products to assure that these products deliver their intended benefits, while protecting public health and the environment. These evaluations should include characterizations of risk associated with the use of the chemical products and a determination of any risk management precautions and activities needed to address that risk. California public stakeholders would benefit from a greater understanding of how

product safety and management decisions are made. Stakeholders and California agencies would gain a greater understanding of those companies that have rigorous systems versus those that do not and may thus warrant greater scrutiny.

Chemical manufacturers and users in California would: (1) implement a management system that includes process and product safety elements; (2) arrange for third party certification by representatives of a nationally-recognized auditing board (e.g., Board of Environment, Health and Safety Auditor Certifications or ANSI-ASQ-National Accreditation Board); and (3) affirm to the state that the management systems are in place and that third party certification has occurred.

A company that manufactures chemicals in California would have a publicly-available overview of the approach it uses for chemical evaluation and assessment. Companies would affirm to the state that the chemical evaluation and assessment approach is publicly available. The state could maintain records of company statements/affirmations, and encourage non-participating companies to consider doing so.

Dr. Lauren Heine

Option 14: Promote Green Chemistry by Industry Associations

The chemical industry has a record of voluntary action that has allowed members to distinguish themselves in environmental performance. Ranging from programs in collaboration with U.S. EPA (such as "33/50") to the American Chemistry Council's Responsible Care® or the implementation of ISO14001, industry has taken action to address improved performance.

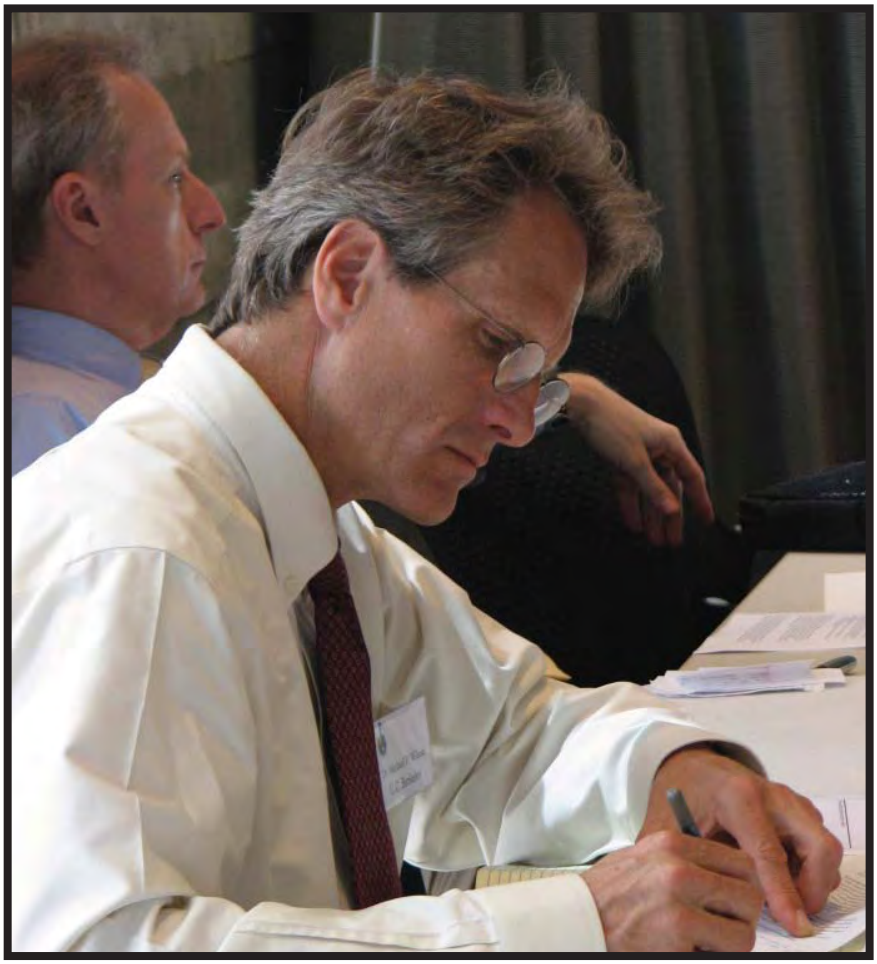
The state of California could challenge national and state associations to implement green chemistry in the spirit of continuous improvement and in consideration of the twelve principles. In return, the state might promote those companies showing exemplary results (see Option 37 "Green Chemistry Marketing, Option 18 "Governor's GC Innovation Award" and Option 36 "State Procurement of Green Products").

Option 15: Promote Value Chain Communications

This option is designed to encourage companies in important value chain sectors to identify information needs of the value chain's members (upstream and downstream companies) and to establish communication processes to meet those information needs. By facilitating the

flow of information regarding hazards, potential exposures and safe handling procedures along the value chain, California will enable companies within a value chain sector to access risk information and apply risk reduction measures for its own operations and for its own products. Reducing barriers in communication can help companies develop and market safer, more effective products.

The state could identify industry sectors of key importance and determine organizations/ businesses within that sector's value chain (upstream & downstream parties). The state would work with parties in that value chain sector to survey needs and expectations of value chain members. Industry would be encouraged to collect key information, such as: (a) availability of technical expertise to apply risk information provided for its own operations and products within company/ organization, (2) product stewardship programs/activities within company/ organization, (3) information provided to downstream users; and (4) information received from upstream suppliers.



Drs. William Carroll and Michael Wilson

The state would then compile information provided in the surveys. From this, the state, the public and companies could determine what, if any, information needs are unmet and to determine if there are gaps on technical expertise in risk management within value chain.

This option would apply to chemical suppliers, distributors, processors and consumer product manufacturers.

Incentives Based on Recognition, Competition or Targeted Grant Programs

Incentives for innovations described in the following options could include recognition alone, or financial rewards. The state could, working with appropriate stakeholders, identify the types of incentives it believes to be the most beneficial for encouraging and nurturing green chemistry products and processes.

Thus, California could make financial capital available to applicable companies at preferential terms, whether via grants or lower interest loans, to encourage green chemistry and green chemistry and engineering manufacturing process development. It could also offer a tax incentive for companies to develop and/or promote green chemistry and green engineering products and processes.

Option 16: Awards Programs and Competitions:

Establish Green Chemistry Innovation Awards, Governor's Green Chemistry Award, and/or Green Chemistry Business Plan Competition

The U.S. EPA established the Presidential Green Chemistry Challenge Awards13F program in 1995. In the intervening twelve years, professors, students and companies large and small have been awarded prizes for outstanding achievement in the use of greener synthetic pathways, the use of greener reaction conditions, and the design of greener chemicals. The success of the program is perhaps best measured by the increasing number of applicants each year, and the recognition of companies all along the supply chain, from basic materials to consumer products.[18]

Dr. Neil Hawkins

The state of California could consider establishing a similar recognition program, honoring innovation in national companies making a significant impact on consumer products in California, small companies based in California and California universities.

The awards would be presented every year at a California Green Chemistry Forum that would highlight technical and scientific achievements in California. Leading practitioners in California would be invited to present their work. This forum should be open to the public, business, investors, and philanthropic foundations.

A significant advance in awards programs that could be catalyzed by the state is a competition for the best business plan based on commercialization of green chemistry. This competition would depend on the three legs of green chemistry: efficacious, cost-effective products with reduced environmental impact. The state could partner with California venture capitalists to award an investment-based prize for commercialization of the best business plan. As with other competitions, there would be public recognition of attractive plans that did not win the prize but finished well in the competition. These plans might have a better chance of attracting funding as a result.

Option 17: Establish a "California Chemistry Research Challenge"

The state could address potential gaps in "green" alternatives by creating a challenge program targeted at a "top ten" list of materials and/or uses, then soliciting proposals for alternative design. Top ideas would be funded by the state, with the aim of including both technological success and commercialization.

The program would function much like a green, state-sponsored version of the business model used by companies like InnoCentive[19], NineSigma[20], or the Green Chemistry Institute's Pharmaceutical Roundtable innovation awards,[21] In each of these programs, problems are identified and solutions are solicited from researchers. Grants are awarded for solutions deemed the most promising.

Technical Assistance Programs

A supply-side approach to advancing Green Chemistry not only requires appropriate incentives and capacities, it may also often require special technical services that can assist California businesses in the transition to less-hazardous processes and products. Such technical assistance may come in the form of tailored information services, workshops and professional conferences or more conventional on-site professional services

Option 18: Develop a "Green Chemistry Web Portal"

The green chemistry community has grown significantly over the years, and journals, newsletters and communities of practice exist. However, there is not a definitive portal that serves to organize and connect this community with the variety of resources that could further the implementation of green chemistry into education, public policy and private sector practice. The state of California could undertake the development of a portal, largely electronic, which would enhance, accelerate and drive the implementation of green chemistry in the state and elsewhere.

Six main areas are proposed, but the concept could easily be utilized for other topics or grouped in different ways. These have been suggested because they are identified as areas which will increase the use of green chemistry. Several common threads pertain to all of the topic areas.

- The portal would compile and disseminate materials and case studies to educate and further best practices. Examples of policies which have furthered green chemistry and those which have suffered from unintended consequences would be helpful to advocates and elected officials.
- The portal would establish a community where topics can be debated, questions can be posed and interested parties can contribute as well as further their own knowledge using a variety of tools such as message boards, blogs, webinars, workshops, etc. For example, there is not consensus on the relevant social metrics to be considered in life cycle analysis and how they might be measured.

- The portal would compile syllabuses, textbooks (including the opportunity for online ratings to be posted), case studies, publications and other tools for educators promoting and incorporating green chemistry into their classrooms and labs. Many universities have developed portals targeting educators, but they have not been integrated into broader aspects of green chemistry, such as life cycle, private sector tools and public policy.
- Another feature of the portal could be the identification of grant programs and funding opportunities for green chemistry research, projects and program development.
- Along these lines, the portal could also highlight conferences and awards which focus on green chemistry and promote them within the community of practice.
- Because there are many commercial opportunities in this field the portal could be funded, partially or completely, by revenues from practitioners who wish to advertise their products and services.

Option 19: Add Green Chemistry to State Technical Assistance Programs

California has a long history of providing small business technical and financial services. The state economic development agencies provide training and on-site assistance to small businesses on subjects ranging from marketing to business planning. Since the 1980s the state has maintained a waste reduction and pollution prevention service to assist small- and medium-sized firms in reducing waste and pollution. In addition, there is an active state program providing on-site services to conserve energy and reduce greenhouse gases. The state of California could expand these state technical assistance services to include assistance in the adoption of green chemistry solutions. Indeed, some of the current waste and pollution reduction assistance may already include some green chemistry solutions.

Drs. Lauren Heine and Ken Geiser

In all of these cases, the expansion of services to cover green chemistry solutions will require more than mere platitudes. A well-directed program to advance green chemistry among small- and medium-sized firms will need to focus on capacity-building with specific initiatives including:

Organizational managers must be informed and the current portfolio of services must be adjusted or rewritten to include information and training resources that describe green chemistry and demonstrate its usefulness.

- Important to such efforts will be the direct training of the current technical assistance providers. Staff training and opportunities for staff to visit sites and see first-hand demonstrations of green chemistry will be important.
- Lastly, encouragement for promoting green chemistry in these technical services will be increased if small amounts of funding are made available to service providers to redraft curricula, attend courses, purchase textbooks and other curriculum resources and upgrade current facilities and equipment.

II. D. Evaluating Products, Problems and Potential New Solutions

There is a need for both (1) the development of methodologies for evaluating existing or new chemicals/products, processes, and approaches, and (2) strategies for developing new green technological and organizational solutions and approaches. Addressing these needs requires options to build both the capacity or capability of individual researchers and the establishment of institutional arrangements to fulfill these needs. Options 20 and 21 are relevant to these tasks.[22]

Option 20: Advance the Science of Alternatives Assessment

In the context of evaluation, the art and science of alternatives assessment needs to be advanced in order to provide clarity and consensus about what is indeed a greener alternative. Alternatives assessments should consider the full life cycle of a chemical, material or product including the associated chemical hazards, energy quantity and quality, and sustainable material flows. Processes for engaging stakeholders in alternatives assessments are also needed to scope out desirable and feasible options and to reveal the many dimensions of a green chemical/material/product, process, or approach.[23] Alternatives assessments may be narrow, comparing hazards associated with chemicals for the same functional use or they may be broad, comparing chemical technologies to non-chemical and entirely different processes or approaches. (Appendix D contains examples of various alternatives assessment approaches, including evaluations of the range of scope and applicability and a list of characteristics that can be used to describe and differentiate among the approaches.

Dr. Mary O'Brien

Advancing the science of alternatives assessment may be accomplished by:

- establishing one or more independent non-profit alternatives institutes that advance the science of alternatives assessment, in addition to developing and evaluating alternatives;
- including alternatives assessment as a key focus area in green chemistry education;
- providing funding for research and fellowships that focus on alternatives assessment at California universities; and
- allocating resources for further developing and gathering and disseminating alternative assessment frameworks and tools.

By advancing the science of alternatives assessment, California will be better positioned to provide needed guidance to industry and others who seek to provide greener chemicals/materials/products, processes or approaches.

Option 21: Establish one or more independent non-profit institutes to identify, develop, and test safer alternatives

Chemicals are widely used in industry and most user industries (including chemical users, suppliers and trade organizations) do not have the expertise or sufficient motivation to find, test, develop and optimize safer alternatives. An 'alternatives institute' could work with different industries/applications to identify and demonstrate safer alternatives focusing on a number of areas of widespread interest, such as solvents, metals, coatings, etc., or to develop these alternatives where they do not exist. In appropriate cases, regulations could be promulgated by DTSC or other state or local agencies to require the adoption of these alternatives.

Various air, wastewater, hazardous waste and worker exposure agencies would work with the institute to identify applications of high priority. The institute staff would include experts in problem sectors who would work with user industries, companies and consumers to test and optimize use of alternatives.

Endnotes

[16]See original 2004 resolution on environmental management systems developed by the Environmental Council of the States (ECOS) at http://www.ecos.org/files/1171_file_Copy_of_Resolution_97_4_REV_10_5_04.pdf and updated resolution at http://www.ecos.org/files/1171_file_CMC_EMS_Resolution_Number_97_4_FINAL.doc

[17]Implementation of Responsible Care® is a requirement for membership in the American Chemistry Council. ACC Responsible Care® Management System Certification http://www.responsiblecaretoolkit.com/cert_intro.asp
ISO 14001 at http://en.wikipedia.org/wiki/ISO_14000 American Chemistry Responsible Care® performance metrics http://www.americanchemistry.com/s_responsiblecare/sec_members.asp?CID=1320&DID=4863
At http://reporting.responsiblecare-us.com/reports/PrdctSfty_Cmpny_Rpt.aspx, one can access links to company's reporting to ACC on chemical evaluation process. For example, Dow Chemical Company at http://www.dow.com/productsafety/assess/

[18]http://www.epa.gov/greenchemistry/pubs/pgcc/presgcc.html

[19] http://www.innocentive.com/

[20]http://www.ninesigma.com/

[21]http://portal.acs.org/portal/acs/corg/content?_nfpb=true&_pageLabel=PP_TRANSITIONMAIN&node_id=1422&use_sec=false&sec_url_var=region1

[22] Options 12, 13, and 18 discussed in the regulatory options cluster in Section III are also relevant.

[23]As tools for assessment are developed, they must incorporate the best possible data on both existing alternatives and the anticipated nature of innovative technologies and approaches. The reader is referred to the discussion of Data Needs and Availability found in Appendix A, addressing what is available, what will be available, how currently unavailable information might be made public or generated while minimizing duplication and wasted effort, and what new information is needed related to innovative technologies and approaches. See also discussion in this section (II.C.) and section III.C. of this report for a discussion of the creation of incentives to generate and disseminate needed information.

III Green Chemistry – The Demand Side

Driving demand for green chemistry requires that public policies allow both state agencies and the chemicals market to clearly distinguish safer and environmentally preferable chemicals (and associated processes and technologies) from those that pose concerns for human and environmental health. As defined in this report, "demand" side options encompass chemicals policy elements that will drive demand for these greener chemicals, processes and technologies, by better informing the market, providing a level playing field on which greener alternatives can fairly compete, and creating a regulatory climate that encourages both the adoption and the development of green chemicals/products, processes, and approaches.

Taken together, demand-side options aim to:

- develop and disseminate sufficient information about chemicals (their hazards, uses, exposures, etc.) to facilitate their efficient and accurate assessment;
- send clear signals to policymakers and the market, by articulating and applying criteria to identify both chemicals of concern and those of low or no concern;
- influence and inform chemical design, production and selection decisions; and
- empower a range of actors – government, chemical producers and processors, business and institutional purchasers, users and sellers of chemicals and chemical products, workers, academics, consumers and the public – to advance knowledge and make informed decisions about chemicals.

III. A. Identifying and prioritizing chemicals of concern

This subsection describes three basic options intended to lay the foundation for a better-informed and more transparent public policy and chemicals marketplace that is able to identify and prioritize among chemicals of concern, as a means of facilitating their replacement with greener alternatives. The other subsections of this section describe additional means to drive demand for green chemistry, including regulatory measures and incentives.

Option 22: Adopt a policy to identify chemicals of concern, including, as appropriate, associated processes and approaches, and develop specific criteria for this purpose.

Articulation of an official policy by the state of California would establish a framework under which specific criteria that define the attributes of chemicals of particular concern to the state can be developed and communicated to the range of entities that make decisions about chemicals. Such a policy framework can then be used to direct and drive further needed efforts: development of information about chemicals produced and used in the state (focused on those attributes); efficient assessment and prioritization among chemicals sufficient to determine whether or to what extent they meet the criteria; and, as appropriate, initiation of actions to reduce production, use and release of chemicals of concern and to replace them with alternatives known to be of lesser or no concern.

While the policy itself would broadly describe the attributes of chemicals of concern, it could put in motion a process and timeline under which specific criteria are to be developed that can be used to determine these attributes. That process would be driven by government, but would also entail input by a range of stakeholders.

Drs. Nicholas Ashford and William Carroll

Attributes and their associated specific criteria can be hazard-based or exposure-based. Examples of chemicals displaying hazard-based attributes and criteria include PBTs (persistent, bioaccumulative and/or toxic chemicals) or chemicals known or suspected to be carcinogens or reproductive toxicants (the approach used under the state's Proposition 65). Examples of exposure-based attributes and criteria include chemicals detected through biomonitoring or environmental monitoring (e.g., of drinking water) or chemicals used in products with which children are likely to come into contact.

Criteria-driven policies have been developed by other countries as a core element in revising and updating their chemicals policies. For example, the 1999 amendments to the Canadian Environmental Protection Act (CEPA) mandated that Environment Canada and Health Canada categorize the roughly 23,000 chemicals on its Domestic Substances List (DSL). Categorization entailed identifying chemicals that possess the specific attributes specified in the statute: a) persistence, b) bioaccumulation potential, c) inherent toxicity to humans or nonhuman organisms, or d) of greatest potential for exposure to humans, based on available information[24] In applying these criteria, the government has used them both to identify all chemicals possessing one or more of these attributes, and to further prioritize among these.

The European Union's recently-adopted REACH Regulation is also attribute- and criteria-driven, using hazard-based criteria, surrogates for exposure, and other attributes to drive the registration, evaluation and authorization processes it establishes. Two sets of hazard criteria play pivotal roles in REACH. One is inherited from another EU regulation: classification of chemicals as "dangerous" using criteria for sixteen hazard endpoints specified under the EU's Directive on Dangerous Substances.[25] The second set of criteria under REACH defines "substances of very high concern" (SVHCs), which include:

- carcinogens, mutagens and reproductive toxicants (CMRs);
- persistent, bioaccumulative and toxic (PBT) or very persistent and very bioaccumulative (vPvB) substances; and
- "equivalent level of concern substances," such as those having endocrine-disrupting properties, which are to be identified on a case-by-case basis.

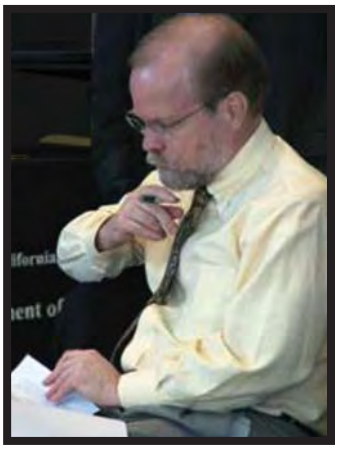
Some states have developed policies that focus on particular classes or uses of chemicals of concern. The state of Washington, for example, has established as a priority the identification and restriction of PBT chemicals, with an initial focus on mercury and brominated flame retardants.[26] As one response to the growing contamination of fish–a key state resource–with mercury, the state of Maine has adopted a product focus, prioritizing the identification and elimination of mercury-containing products.[27] The emphasis on eliminating uses of mercury has extended the state's actions down the supply chain to focus on companies that use mercury in their products, and has led it to join forces with other states, both in the region and nationally.

Option 23: Develop a comprehensive "map" of the flow of chemicals in California

California could oversee a process to compile and integrate existing information and develop new sources of information to determine which chemicals are produced, imported, sold, used and disposed of in the state, in what quantities and forms, by which entities and for what purposes. This concept of a "chemical map" was introduced into the

Conversation with California and is developed in substantial detail in Cal/EPA's Phase 1 Options Report of the Green Chemistry Initiative.[28] Such information would for the most part be made public, with appropriate provision for protection of legitimately confidential business information. While the state would mandate the process, it would also enlist various agencies, universities, local governments and industry.

California producers/importers, sellers and users of chemicals in the state would submit and periodically update information on production and processing (amounts, facility locations), uses (including in products), and post-use management. To improve efficiency and reduce the reporting burden on companies, they could be required to submit to the state any such information that they provide (whether voluntarily or under regulation) to other domestic or foreign jurisdictions. Such submissions would need to be supplemented, however, with additional or California-specific information identified by the state.



Dr. Richard Denison

Such information would serve a variety of purposes, both environmental and economic. It could help to:

- identify key production and use sectors and their importance to the state's economic base, as well as likely sectors and sources characterized by having either relatively high dependence on chemicals of concern or relatively high levels of innovation in developing or using safer chemicals;

- improve understanding of chemical supply chains and the nature of and impediments to the flow of information along such chains;
- identify leverage points within and among sectors and supply chains that could be utilized to introduce and promulgate green chemistry concepts and practices;
- identify sources of potential release of and exposure to chemicals;
- identify key points of leverage and intervention in order to address potential risks associated with various activities over the life cycles of hazardous chemicals in the state; and
- identify and prioritize both chemicals of potential concern and those that pose low or no concern (which could serve as alternatives to riskier ones).

All industrial sectors that produce/import, sell, use and dispose of chemicals in the state would need to be involved in order to develop a comprehensive map. Existing programs that collect relevant information would need to be included, such as local and county-level hazardous waste and hazardous materials programs, monitoring programs, etc. One example of existing information is that compiled under the state's Certified Unified Program Agencies (CUPA) program. This program operates at the county level and is currently focused on prevention of and emergency response to accidental releases of hazardous substances stored in the state. The program's scope would likely need to be expanded beyond its current inclusion of only hazardous waste generators, and its information would need to be electronically accessible. The state's pesticide use reporting program and its air toxics hotspots programs are other examples of existing programs that could provide useful information to this effort.

Drs. Lauren Heine, Daryl Ditz and Richard Denison

Information technology infrastructure (whether provided via the state, universities or private-sector parties) would need to be developed/expanded to enhance electronic submission capabilities, integrate information from various sources, and provide ready access.

The primary benefits of this option stem from developing a comprehensive picture of chemicals in California, and hence it should encompass essentially all chemicals in commerce in California. If necessary, implementation could proceed in phases, focusing initially, for example, on chemicals of concern identified by the state or other jurisdictions.

Option 24: Help advance the science of toxicology

Because of its size, history and culture, California likely has the most advanced infrastructure and capacity for testing and assessing chemical hazards and exposures of any state in the country. It is in a unique position, therefore, to address both longstanding and emerging

concerns about the science used to test and assess chemicals.

Dr. John D. Graham

Both the state of science and the state of knowledge about chemical hazards and exposures have evolved rapidly over the last decade. Demands for more and better information about chemicals have increased dramatically, even as traditional approaches to chemical testing and assessment are lamented in other quarters for being too costly and time-consuming, and too reliant on outdated methods and the sacrifice of laboratory animals. These dynamics introduce both new challenges and complexities, and new opportunities, to the fields of chemical toxicology and safety assessment. The challenges include the need to:

- integrate additional important health endpoints of concern into routine chemical testing, such as endocrine disruption and developmental neurotoxicity;
- consider emerging science, for example, new data that suggest that low-dose effects and the timing of exposure during development are important determinants of hazard;
- address longstanding concerns surrounding issues such as cumulative and aggregate exposures to multiple chemicals over extended periods of time; and
- account for the greater susceptibility, vulnerability or exposure of certain subpopulations (e.g., infants, the elderly, indigenous peoples).

Expansions in our understanding of the human genome and of cell biology have brought forth new methods that hold the promise of enhancing our ability to rapidly screen chemicals for adverse effects and cells for evidence of exposure to chemicals. Toxicogenomics, high-throughput in vitro screening assays and related approaches – once validated – could help to pave the way to faster, cheaper, less animal-intensive and potentially more accurate toxicology. In addition to further developing such methods, a critical remaining need is to "ground-truth" them – to ensure such methods yield accurate results reflective of actual effects in whole animals.

California is well-positioned to help move toxicology into the 21st century, given its long history and expertise in chemicals assessment. The state could play a critical role, in coordination with federal agencies, universities and private-sector initiatives, in both spurring and guiding the development, validation and application of new methods and testing strategies.

While this option is envisioned primarily as focused on toxicity testing, new science and approaches are also emerging for measuring and assessing exposure to chemicals. The state could consider an expansion of its efforts to develop biomonitoring data to include developing and implementing better methods for measuring dose and exposure.

Option 25: Target Chemical Uses of Concern Based on Hazard, Exposure and Risk

The same chemical (even a highly toxic or persistent one) may be used in different ways in various sectors of the economy. Some uses may trigger high concern; others little or no concern. This option calls for specific chemical uses to be subject to the science of green chemistry based on consideration of hazard, exposure and risk.

The degree of concern about a chemical use may be based on a consideration of both the intrinsic properties of the chemical (e.g., toxicity and persistence) and the use characteristics that are related to exposure and risk (e.g., the concentrations of toxic byproducts and waste generated in the manufacture or processing of a chemical, use of a chemical in closed versus open industrial processes, potential impacts of catastrophic release following accidents or terrorist attack, the likelihood of worker exposure and the extent of worker protections such as engineering systems and personal protective equipment, the potential for discharge into the environment, the concentrations of toxic residues in consumer products, and the concentrations of toxic waste streams from product manufacture and disposal). Where data of sufficient quality can be obtained, the tools of lifecycle analysis (e.g., the entire carbon "footprint" of a chemical product, from manufacture to disposal), exposure assessment (e.g., biomonitoring, personal exposure assessment, source attribution, multi-media ecological modeling, ADME[29] characteristics, and bioaccumulation/biomagnification in aquatic or terrestrial environments), and risk assessment (e.g., threshold versus non-threshold dose-response functions, probability of accidents, risks to susceptible populations, background exposures to a chemical from multiple sources, and cumulative risks from multiple chemicals that operate in the body through a similar biological mode of action) can be used to screen chemical uses and identify those of concern.

Dr. Michael Dourson

Use-specific analyses may also – indeed, typically do – inform regulatory decisions (e.g., the same chemical may be permitted for some uses but prohibited for other uses).

In summary, under this option, a focus on chemical uses of concern may help set priorities for the application of green chemistry, including technology options analysis and substitution.

III. B. Regulations

California already has a complex framework of environmental laws and regulations to address pollutants in the air, water, soil and food. Stringent and innovative policies on air quality and public right to know, for example, have led the nation and the world and rewarded companies that meet the state's high

standards. However, these laws were not intended to regulate, let alone transform, chemical production and use.

Some researchers and educators are concerned that generic standards and bureaucratic procedures could hamper green chemistry, rather than advance it. Many chemical manufacturers are skeptical of tighter rules and regulations – especially if they threaten existing markets or create a patchwork of differing state requirements without concomitant benefit.

On the other hand, a 2006 University of California report commissioned by the state legislature concluded that "weaknesses in the federal statute pertaining to industrial chemicals, the Toxic Substances Control Act of 1976, are a major obstacle to the emergence of green chemistry as a vibrant, viable economic activity"[30] While companies rarely advocate for regulation, mandatory requirements are not necessarily a burden for companies that are already ahead of the curve in managing chemicals and innovating safer ones. More importantly, regulations that improve the flow of information in the market and define and enforce minimum standards can remove the competitive advantage enjoyed today by companies that depend on hazardous chemicals.

This section presents several policy options that compel actions of this type, generally through the state's legal authority. The issues of information disclosure, alternatives assessment, and action on priority chemicals appear in other options of the Science Advisory Panel report. But the key distinction of the options below is that they rely on new or existing legal authority to drive changes. The following options build on experience, in California and elsewhere, with policies designed to spur technological innovation and transform markets. These include proposals to enable green chemistry to be recognized in the market, to promote the systematic assessment of alternatives, and to authorize Cal/EPA to set and enforce minimum standards. California could also play a constructive role in promoting major reform of federal chemicals policy.

Dr. Lynn Goldman

Mandatory Information Disclosure

Like businesses and consumers, state regulators cannot make sound decisions about chemicals without basic information on their potential hazards and uses. Yet such information is frequently not available to regulators in California. It is notable that many public comments on the California Green Chemistry Initiative called for variations of compulsory public disclosure by companies that make and use chemicals.[31]

Option 26. Require chemical manufacturers and importers in California to provide specific information about the hazards and uses of their products

One of the key elements of the European Union's REACH legislation is a legal obligation to register thousands of chemicals over the next decade or lose access to the world's largest market. California could borrow this "no data/no market" approach by requiring companies that make and import chemicals in the state to provide certain information to Cal/EPA, downstream users, and the public. This information-forcing option places the

duty of knowing and sharing information with chemical producers. Although the federal government also lacks an effective means for obtaining information and acting on industrial chemicals, this proposal is similar to the Cal/EPA's authority to require generation and disclosure of information on the toxicity and usage of pesticides as a condition of their application in California. While many details would need to be resolved, information on chemical properties such as persistence, bioaccumulation, and toxicity would be included. It would also include information on chemical uses and likely exposures. The process would take advantage of existing definitions of carcinogenicity, mutagenicity and reproductive toxicity and anticipate new information from endocrinology, ecotoxicology and other sciences. In addition, this proposal could require reporting of potentially confidential information about production, uses and trade in chemicals to be disclosed to appropriate parties, with appropriate protection for legitimate confidential business information.

Publicly-available information mandated under this option will help businesses, workers, communities and consumers to identify safer alternatives, and will support a variety of non-regulatory measures, such as procurement, targeted R&D, and voluntary management approaches. The information would also better inform California authorities in prioritizing and regulating chemical hazards, including potential restrictions and bans of chemicals in favor of safer alternatives.

Under this option, Cal/EPA would have broad authority to request additional information and to take action against companies that fail to comply. In addition to the compliance burden on chemical makers and importers in California, Cal/EPA would need to develop a process for receiving, assessing, and communicating this information with other authorities and the public. A standardized mechanism would be needed for the transmission of a reasonable set of information to downstream users. The program could be funded, in part, through fees paid by companies at the time the information is provided to Cal/EPA.

Option 27: Require companies to provide chemical information to Cal/EPA that they submit to other authorities

Companies that produce, use, sell, or distribute chemicals in California would be required to provide information to Cal/EPA that they have provided to other authorities. Like the mandatory reporting option above, this proposal is aimed at closing the data gap on chemical hazards and uses. But in contrast, this option does not force chemical manufacturers or importers to generate new data, only to provide Cal/EPA with relevant information that they have already reported to other authorities.

Dr. John Peterson Myers

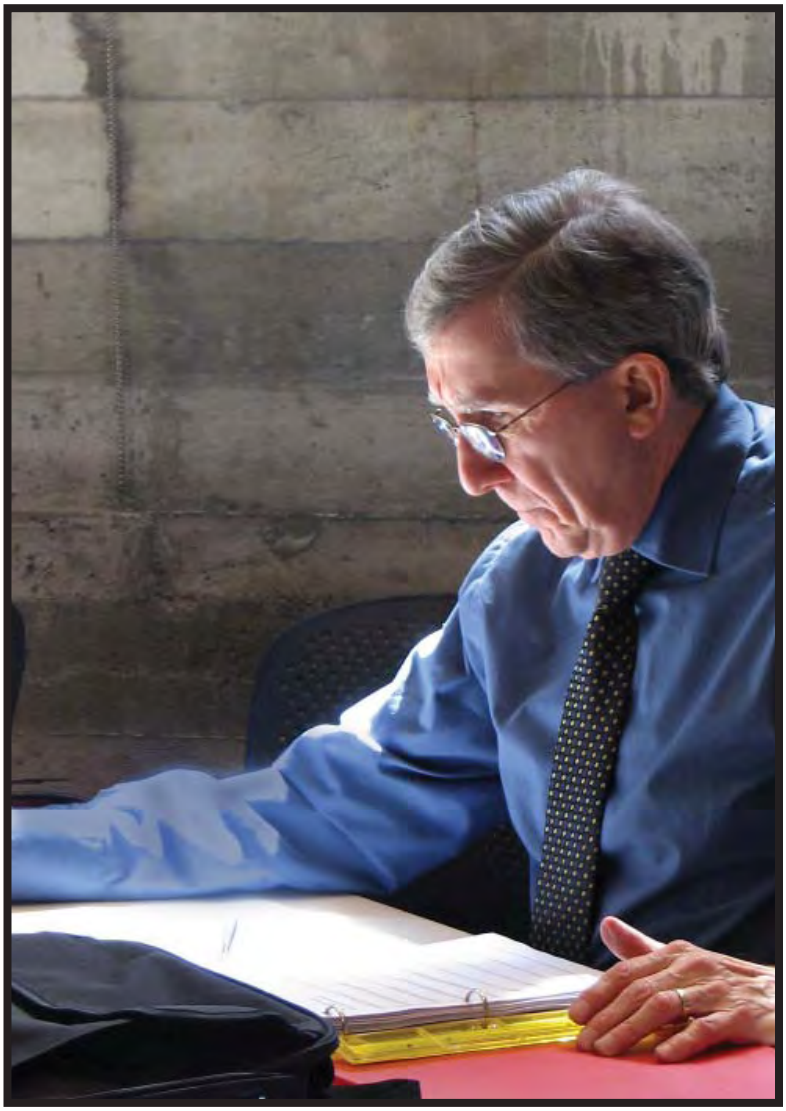
One of the most compelling reasons for this option is that many companies that manufacture chemicals used in California will soon submit information to the European Chemicals Agency as they register substances under REACH. In 2006, California exported $2.4 billion in chemicals to the EU, roughly ten percent of the state's $26 billion exports to the region.[32] Information submitted to national authorities in Canada and other countries could also be shared with

the state. If these companies (and others based outside California) shared comparable information about chemical hazards, along with California-specific use information, it would strengthen the state's regulatory and other efforts to promote green chemistry. In this way Cal/EPA could fairly quickly and economically improve its knowledge of chemical hazards and uses in the state. Companies that have not reported relevant data to other authorities would be not be affected.

This information would include relevant hazard designations, specific information on human and ecological hazards, environmental fate, uses in California, safety measures, and potential alternatives. As with other proposals, Cal/EPA would need to establish a process for gathering and organizing this information, for determining which information should be publicly available, and for protecting legitimate confidential business information.

Option 28: Require product manufacturers and importers in California to disclose chemical ingredients

As more chemicals are detected in human blood and breast milk, there is greater scrutiny of product use and disposal as important routes of human exposure. However, existing product labeling requirements and material safety data sheets (MSDSs) reveal very little about the chemical components of common products, whether in formulations (i.e., chemical mixtures) such as cosmetics or household cleaners, or in finished goods like toys, clothing, and automobiles.



Dr. Nicholas Ashford

California could address this data gap by requiring manufacturers to provide the state with a list of all ingredients in their products. The exact composition, such as ingredients by percentage, would not be required. The state would require a list of ingredients, updated annually, in retail products, possibly beginning with select categories, such as children's products, cleaning products, and office products. California's long experience with Proposition 65 provides a precedent for requiring business to discover

and disclose chemicals in their products or processes[33] However, this proposal would go beyond substances on the existing state list of carcinogens and reproductive toxics.

Mandatory disclosure of chemical ingredients enables wholesalers, retailers, consumers and others to differentiate products on the market that embody green chemistry approaches. However, it is not realistic to expect individual consumers to study detailed lists of ingredients; few people would attempt to decipher the chemical names or to distinguish greener chemicals from others. However, if this information is credible and easily accessible, it will attract the attention of third parties, such as consumer, environmental, and health organizations, that are capable of reviewing the information and providing practical guidance. Examples of existing product databases in the United States include the "Skin Deep" database, created by the nonprofit Environmental Working Group, with information on over 27,000 cosmetic products and more than 7,200 chemicals.[34] In 2007, a partnership led by the nonprofit Ecology Center, launched a database of 1,200 toys based on an analysis of specific ingredients.[35]

The state would need to establish a process for collecting and organizing this information and making it publicly available without divulging legitimate trade secrets. The utility of this effort would expand if other states coordinate efforts to gather, assess and disseminate ingredient information. This would be greatly facilitated by standardized electronic forms, to avoid re-entering information. It would be up to third parties to develop product-rating schemes and other consumer guides based on the state's ingredient database.

Mandatory Alternatives Assessment

In addition to reporting requirements, California could require producers and users of hazardous chemicals and processes to undertake assessments of alternatives (also known as technology options analyses) identifying greener chemistry and/or engineering practices that: (1) could be adopted to provide environmentally-sounder and inherently safer final products, intermediates, inputs, and processes; and, (2) could be developed by the producer, user, their suppliers, academia, research institutions, or national or state efforts.

Option 29: Require chemical makers and users to systematically identify and consider safer alternatives

While advancing the science and practice of alternatives assessment is featured in other options detailed in this report, this proposal is distinct in that it would create a legal obligation on chemical producers and users. States that require technology options have achieved faster adoption of environmentally cleaner and inherently safer technologies than states that do not[36] Massachusetts, for example, requires the reporting of state-of-the-art toxics use reduction plans from firms obligated to report under the Toxics Use Reduction Act of 1989. New Jersey has a similar statutory requirement. The costs of this regulatory option are financed, in part, through fees on chemical production and use, administered by the state.

Mandatory alternatives assessment would encourage chemical producers, users, and suppliers – and others in the supply chain – to consider more seriously adopting or developing alternative technologies. By requiring submission of results of the assessments

to Cal/EPA, the state can amass useful information and make it accessible to industry, government, and citizens. The results of alternatives assessments can also identify needs and opportunities for regulation, innovation, and development.

The requirement would be placed on producers and users of a designated set of hazardous chemicals. The state would monitor the reporting, collection and dissemination of the information, while protecting legitimate trade secrets. In addition, trade associations, state technical assistance offices, research centers and universities could assist companies in conducting alternatives assessments and guide them toward green chemistry, engineering and design solutions.

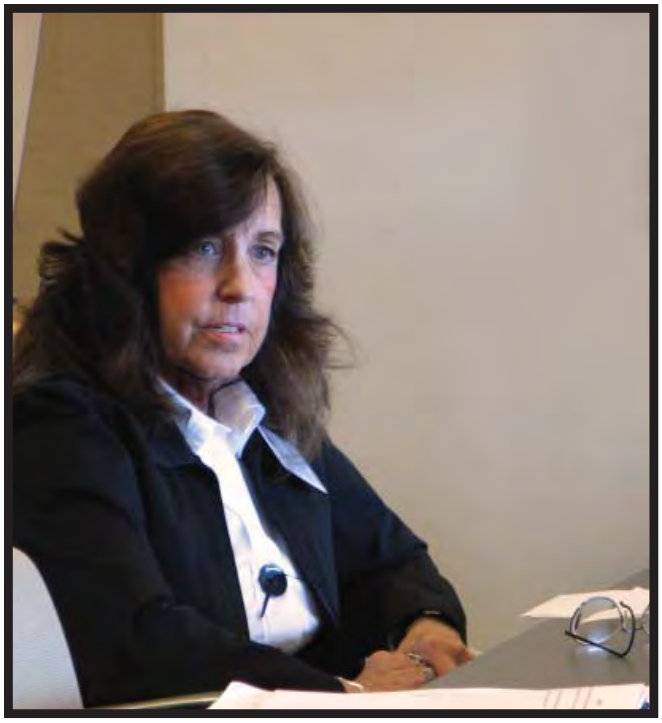
Dr. Daryl Ditz

Authorize Cal/EPA to adopt regulations to spur green chemistry

The decentralized boards, departments, and offices under Cal/EPA, including the Department of Toxic Substances Control, the California Air Resources Board, and the Office of Environmental Health Hazard Assessment, currently have some legal authority to act in ways that can increase demand for green chemistry. However, the hazards of most industrial chemicals permeate the legal and institutional silos for regulating air, water, waste, workplaces, and consumer products in California. As a result, the state faces practical challenges in advancing green chemistry through piecemeal legislation and programs.

Option 30: Authorize Cal/EPA to phase out hazardous chemicals

Because of its unique history, Cal/EPA is largely an oversight agency for state regulatory bodies that does not itself wield regulatory authority. Existing state regulatory agencies have separate authority over air, hazardous waste, solid waste, water, and worker exposure. But to be effective, green chemistry solutions should take into account the full chemical life cycle, including all environmental media and exposures among workers and communities. The state legislature could give Cal/EPA explicit authority to ensure that actions taken to address health and environmental problems at any one of these points in the life cycle do not inadvertently create new problems at other points. Though challenging to implement, this could produce a better-integrated regulatory approach for managing chemicals, products, and applications, and could reduce the likelihood of regrettable substitutions.



Dr. Katy Wolf

California has learned that it is difficult to use single-medium regulations to control or eliminate the use of dangerous chemicals. For example, the California Air Resources Board is able to regulate chemicals if they are volatile organic compounds (VOCs) or if they are already on lists of toxic air contaminants. However, potential substitutes for these substances can also be dangerous. In some cases, less toxicity information is available for substitute chemicals, so they do not appear on toxic substances lists. At present, emerging chemicals can be on the market for years before enough information is generated that triggers a listing as a hazardous air pollutant or hazardous waste.

California's experience with solvents is a case in point. Solvents are a diverse group of chemicals with multiple applications and significant potential for occupational and environmental exposure. Over the last decade many companies have introduced alternatives to ozone-depleting substances and chlorinated solvents. In many cases, these alternatives were not regulated but were later shown to be toxic. n-Propyl bromide, for example, is used in metal and electronics cleaning, adhesives, and aerosol products, yet emerging evidence suggests that it can damage the reproductive and neurological systems. Another emerging solvent, "D5," is used in cleaning and in consumer products and is being marketed for use in dry cleaning. Recent evidence indicates that it produces cancer in laboratory animals.[37]

Of course, the potential danger of replacing one problem with another is not unique to solvents. By authorizing Cal/EPA to regulate using a multi-media approach that includes occupational, community, consumer, and environmental exposures, California would more effectively promote the adoption of green chemistry solutions while addressing a broad set of existing problems.

Option 31: Phase out chlorinated solvents

The use of certain hazardous chemicals is inappropriate when the safety and feasibility of preferable alternatives has been demonstrated. In such cases, California should take prompt action, backed by enforceable regulations. The continued use of chlorinated organic solvents represents such a case. Taking coordinated action on this group of chemicals and applications can serve as a template for phasing out other dangerous chemical classes. Chlorinated solvents still in use in California include carcinogens such as trichloroethylene (TCE), perchloroethylene (PERC) and methylene chloride. These and related substances are used in numerous applications, including metal cleaning, paint stripping, film printing,

dry cleaning and consumer products. Efficiently phasing out such uses reduces risks to workers, communities and consumers – provided that the alternatives do not introduce new problems.

In some cases, California already has sufficient authority to take action on hazardous chemicals. One example is found in the regulation of cleaning products by the regional air quality management districts under the California Air Resources Board (ARB). The ARB has also adopted state-wide regulations to phase-out chlorinated solvents in aerosol products in the vehicle repair industry, and to phase out the use of PERC in dry cleaning. There are safer and cost-effective alternatives for most, if not all, of the other applications where chlorinated solvents are currently used. DTSC could develop more comprehensive regulations to phase out other chlorinated solvents. In addition, DTSC could sponsor independent research to develop and demonstrate alternatives for specific uses and conduct outreach to affected companies.

Option 32: Require all air quality management districts to adopt SCAQMD regulations on cleaning products

The South Coast Air Quality Management District (SCAQMD) has jurisdiction over stationary sources of criteria air pollutants, including reactive hydrocarbons such as volatile organic compounds (VOCs) in a region with a population of more than 15 million people. SCAQMD has established strict rules on cleaning products to prevent releases of reactive hydrocarbons that contribute to photochemical pollution, or smog.

SCAQMD regulations affecting thousands of Southern California facilities are already demonstrating the feasibility of low-VOC alternatives, including water-based, soy-based and acetone cleaners. These restrictions have affected an extensive range of cleaning operations used by thousands of facilities in southern California, including vapor degreasing, cold cleaning, hand-wipe cleaning, repair and maintenance cleaning, screen and lithographic equipment cleaning, and cleaning of adhesive and coating equipment. Nearly all auto repair facilities in Southern California, for example, have converted from mineral spirits to water-based cleaners; printers are also converting to safer alternatives. As previously noted, there is a continuing need for vigilance to ensure that alternatives do not pose new or unforeseen dangers, particularly for substances that have not been adequately assessed.

Extending these regulations across the state would substantially reduce VOC emissions, while also reducing exposures among workers and communities to toxic chemicals. Under this option, SCAQMD staff could provide guidance to the other air districts in implementing the regulations.

III. C. Incentives to Boost Demand for Green Chemistry

A 2002 report by the Organization for Economic Cooperation and Development (OECD), which includes the United States, noted: "It is essential that any sustainable chemistry technology or product be competitive in the marketplace, at least in the long term. However, some of those technologies, even if they are beneficial in the long term, will not be able to survive economically without incentives." [38]

The Science Advisory Panel identified a range of options that are intended to boost demand for greener chemicals, products, process and technologies. The first group (Information and Tools) aims to increase demand for green chemistry by providing access to information and developing tools that help producers, sellers, purchasers and consumers of chemical products and services to select greener alternatives. The second group (Market Promotion of Green Chemistry) aims to drive demand by promoting the adoption of greener products in the marketplace.

Information and Tools

Option 33: Provide retailers with access to guides for selecting greener alternatives to toxic products, via a retailer clearinghouse

This option recognizes that retailers can play a role in increasing demand for goods and services informed by green chemistry criteria. The first step, which could be undertaken by a group of retailers of green products and services, would require establishing and vetting criteria for comparing products or services in a given category. Additionally, references to supporting documentation and a process for airing and resolving disputes would be provided. Once established, the criteria would be made available to other organizations that rate and/or procure products/services (e.g., Consumer Reports, Kaiser Permanente) for their use in identifying qualifying products/services.

The association could then make such information available via a website along with links to:

- sites of reliable organizations that compare products/services (examples given include the Healthy Building Network's site on alternatives to PVC (2Hwww.healthybuilding.net/pvc/PVCFreeAlts.html) or the U.S. EPA's Energy Star Program (3Hwww.energystar.gov/); and
- procurement policies and programs that favor greener products, e.g., those of state government or company procurement policies (as an example, see description of Kaiser Permanente's approach at 4Hwww.purchasing.com/article/CA6511767.html).

Such a program could help advance green chemistry in California by enabling retailers to identify greener products/services. It would also provide retailers' buyers and sustainability specialists with access to the growing body of available research.

Option 34: Develop a "green scorecard" for chemical products that lets both producers and consumers know which products truly are greener than others

This option is motivated by the need for transparency and consistency in how "green" products are identified and marketed. This would benefit both producers and consumers by allowing more informed choices as to which products/services truly are greener than

others. The intent is to provide an incentive to drive demand for such products and services. Thus, producers could see how to make their products more attractive to those consumers (including the state) who have an interest in green procurement.

Dr. Nicholas Ashford

For a scorecard to be effective and credible, it would have to be prepared by a group with the appropriate expertise, who are not conflicted by other professional relationships. The scorecard preparation methodology would have to be transparent, rigorous and subject to independent peer review. A desirable attribute of any scorecard is that it not set a ceiling, but rather that it drive continuous improvement toward goals, which may be raised over time as needed.

The state could start the process of developing a scorecard and recruit participants. But it would need to take care to maintain the independence of the panel and its determinations and allow the work to proceed without political interference. Companies producing consumer products and services would be most directly and immediately affected. State or other organizations' purchasing practices that are subject to public pressure to move towards greener products would likely be shifted as well.

There are a number of scorecards that have been developed to focus on specific industry sectors or product categories.

For example, the U.S. Green Building Council's LEED rating system is an example of how specific criteria can serve the needs of producers and consumers of environmentally-preferable approaches in building construction and maintenance.[39]

Option 36: Incorporate green chemistry criteria into state procurement processes.

One of the most direct ways for California to support the adoption of green chemistry is through its powerful role as a consumer of goods and services. This proposal would leverage the collective purchasing power of the Department of General Services (DGS) and other state agencies. The Environmentally Preferable Purchasing program, co-sponsored by Cal/EPA and DGS, has already boosted the state's investment in green buildings.[40] Enlarging the scope of this and other such programs could enable green chemistry solutions to be recognized and considered in ongoing decisions, thereby expanding demand.

As an example, the City and County of San Francisco is already making progress in greening their procurement under the 2005 Precautionary Purchasing Ordinance.[41] In that effort, the city's Department of the Environment identified ten "targeted product categories" (e.g., computer equipment, lighting, cleaners, paints) and established a process for developing specifications for use in city contracts.

In drawing lessons from this municipal experience, the state could adopt complementary criteria and product categories based on the twelve principles of green chemistry to strengthen the signal to the California market. This proposal would be enhanced by training state procurement officers and publicizing new opportunities for vendors and service providers offering green chemistry solutions. These procurement efforts could benefit from

other proposals in this report concerning access to information, product scorecards, and other tools for assessing products.

Option 37: Provide marketing exposure for green chemistry products and processes.

California has had impressive success, both in-state and globally, in marketing specific products of the state. Millions of Americans are likely to recognize the high-profile advertising campaigns for California raisins or "Real California Cheese."[42] By developing a proactive marketing strategy for green chemistry processes and products, California would help educate businesses and consumers on the availability of products that embody genuine green chemistry solutions. This would also help these products succeed in the market and be sustained.

Once greener products and processes are identified, California would identify appropriate audiences (e.g., demographics) and the most effective marketing vehicles (e.g., television, print media, radio, Internet). The state could create the marketing tools directly or manage an independent consultant to do the same.

Option 38: Create a web-based marketplace for greener chemicals and products

California could facilitate the market for green chemistry solutions by contributing to the development of an Internet-accessible database. This could enable companies to identify less-hazardous substances while protecting legitimately proprietary information.

There are good existing models for web-based marketplaces such as online databases containing information on raw materials uses in industrial and institutional cleaners. For example, CleanGredientsSM was developed in partnership with the U.S. EPA's Design for the Environment Program and a group of stakeholders representing formulators, suppliers and independent experts.[43] This tool assesses the environmental and human health attributes of chemicals based on their functionality, such as with surfactants, solvents, and chelating agents. Third-party verification can provide a check on the validity of the data while maintaining legitimately confidential business information.

Dr. Gail Charnley

California could build on this experience by establishing technical criteria, possibly through a transparent

stakeholder process, and defining priority chemical functionalities or products for attention. The resulting web-based marketplace would help downstream users to identify chemicals and products that meet the criteria. At the same time, it would provide a means for suppliers of chemicals that meet the criteria to tout their advantages.

This proposal could involve new or existing institutions in California, such as are described in this report. Furthermore, California could cooperate with other states to make this web-based tool applicable over a wide geographic region. This could also be designed to reinforce state procurement policies, aligning the flow of raw materials in the supply chain with desired product attributes. By creating a publicly-available database containing positively-defined chemicals and materials, California would help to facilitate green chemicals in the supply chain and reduce cost.

Endnotes

[24] CEPA 1999, §73, available at www.ec.gc.ca/CEPARegistry/the_act/Contents.cfm.

[25] See a description of the Directive at http://ec.europa.eu/environment/dansub/home_en.htm. Annex VI of that Directive contains the actual classification criteria, available at http://ec.europa.eu/environment/dansub/pdfs/annex6_en.pdf.

[26] See Department of Ecology website, www.ecy.wa.gov/programs/eap/pbt/pbtfaq.html.

[27] See Department of Environmental Protection website at www.maine.gov/dep/mercury/products.htm

[28]See Option DC-7 on pp. 12-14, available at www.dtsc.ca.gov/PollutionPrevention/GreenChemistryInitiative/upload/Phase_1_Options_Report_Chapters.pdf. While some aspects of this option could entail providing the information in geospatially relevant formats, the term "map" here is used primarily in a figurative sense.

[29]ADME: absorption, distribution, metabolism, and excretion

[30]Michael P. Wilson, et al., California Policy Research Center, Green Chemistry in California: A Framework for Leadership in Chemicals Policy and Innovation (Mar. 2006), available at http://www.ucop.edu/cprc/documents/greenchemistryrpt.pdf

[31]California Green Chemistry Initiative, "Phase 1: A Compilation of Options," January 2008. Note especially detailed comments from Dr. Joseph H. Guth, Science and Environmental Health Network, http://californiagreenchemistry.squarespace.com/display/ShowPost?moduleId=1564667&postId=293396#post293396 and from Californians for a Healthy and Green Economy (CHANGE) http://www.dtsc.ca.gov/PollutionPrevention/GreenChemistryInitiative/upload/CHANGE.pdf

[34]Skin Deep: Cosmetics Safety Database, Environmental Working Group, Washington, DC. http://www.cosmeticsdatabase.com/

[35]The Consumer Action Guide to Toxics Chemicals in Toys. A Project of the Ecology Center. http://healthytoys.org

[32]US Census Bureau. Foreign Trade Statistics: State Exports for California, 2007.

[33]The Safe Drinking Water and Toxic Enforcement Act of 1986, is better known as Proposition 65.

[36]B. Karkkainen, "Information as Environmental Regulation: TRI and Performance Benchmarking, Precursor to a New

Paradigm?" Georgetown Law Journal 89 (2001): 257–370 and N. A. Ashford and Charles C. Caldart, Chapter 13: Policies to Promote Pollution Prevention and Inherent Safety in Environmental Law, Policy, and Economics:Reclaiming the Environmental Agenda, (2008) MIT Press; Cambridge.

[37]http://www.oehha.org/multimedia/green/index.html

[38]Organisation for Economic Co-operation and Development, "Need for Research and Development Programmes in Sustainable Chemistry," March, 2002. http://www.oecd.org/dataoecd/9/55/2079870.pdf

[39] See http://www.usgbc.org/DisplayPage.aspx?CategoryID=19

[40]http://www.ciwmb.ca.gov/epp/TaskForce/Charter.htm

[41]San Francisco Department of the Environment "Review on Implementation of San Francisco's Precautionary Purchasing Ordinance, July 2005 – July, 2007," July 24, 2007. See: http://www.sfenvironment.org/downloads/library/pporeviewjuly0507.pdf

[42]http://www.realcaliforniacheese.com

[43]See: http://cleangredients.org/home

IV. A Call for Action

IV. A. Revisiting the Options: Do they cover the range of identified needs?

In Section I.D., we described a framework (Matrix 1) for analyzing options along several dimensions:

- providing means to promote both supply of and demand for green chemistry;
- addressing data gaps, safety gaps and technology gaps in current policies;
- fulfilling core functions of a comprehensive chemicals policy; and
- together encompassing a balanced portfolio of options utilizing a broad range of policy instruments available to the state, from establishment of state policy to use of regulatory authorities to voluntary incentives and use of market incentives to support for green chemistry education and research.

While the originally anticipated exercise of mapping all of the Science Advisory Panel's several dozen options onto the matrix proved impracticable, this section provides a more qualitative description to demonstrate that, taken together, the options do address policy needs across all of these dimensions.

Mix of Supply- and Demand-side Options:

The Science Advisory Panel acknowledged from the outset that advancing green chemistry in California will require utilization of policy instruments to increase both supply of and demand for greener chemicals (and associated processes, technologies and approaches). Supply-side options – including initiatives in education and research and economic incentives – help to facilitate the creation and dissemination of greener chemicals, processes and technologies. Demand-side options help to ensure the economic viability of greener chemicals by better informing the market, leveling the playing field on which greener options compete, and creating a regulatory climate that drives both the development and the adoption of greener alternatives. Below, we summarize all of the Panel's options according to the supply-demand rubric, referring to the categories of options that correspond to this report's subsections from Sections II and III.

Supply-side Options. Science Advisory Panel options on the supply side include those aimed at:

- **instilling green chemistry into education** (Section II.A.), including through both general and specialized education curriculum development; science teacher training; establishment of and support for faculty positions and fellowships and internships in green chemistry; and introduction of green chemistry concepts into business school education and vocational and workforce training programs.
- **supporting research and innovation in green chemistry and engineering** (Section II.B.), by inventorying current efforts and identifying critical gaps; providing funding and institutional support for green chemistry in higher education institutions; targeting

tax incentives, patent assistance and intellectual property protection policies and programs to maximize both innovation and public benefit arising from public research dollars; facilitating appropriate industry-university partnerships; and aiding in the commercialization of green chemistry products through access to testing and assessment tools and facilities and the creation of innovation centers to assist entrepreneurs and small businesses.

- **building green chemistry capacity** through development of tools, methodologies and strategies for developing greener chemicals (Section II.C.), by advancing the science of alternatives assessment; and establishing an independent institute to conduct such assessments and develop and test safer alternatives to chemicals of concern.
- **providing incentives to industry and recognition of its efforts** (Section II.D.), through voluntary actions such as implementation by companies of chemical management systems, promotion of green chemistry by industry associations, improved value chain communications; establishment of green chemistry innovation awards and competitions and targeted research challenges; development of a green chemistry web portal to share innovations and resources; and adding green chemistry to state technical assistance programs.

Demand-side Options. Science Advisory Panel options on the demand side include those aimed at:

- **identifying and prioritizing chemicals or chemical uses of concern** (Section III.A.), through establishment of a state policy and a process to develop specific criteria to be used to identify such chemicals; gaining a thorough understanding of who chemicals are produced, used and disposed of in the state via chemical "mapping;" and advancing the science of toxicology testing to facilitate more effective and efficient identification of chemicals of concern and safer alternatives.
- **developing, improving and effectively employing regulations** (Section III.B.), including mandatory information disclosure on chemical hazards and uses and product ingredients, and provision to the state of information companies submit to other governments; requirements for companies to seek safer alternatives and conduct alternatives assessments for hazardous chemicals and processes; and granting broader regulatory authority to the state to drive green chemistry innovations, address the full life cycle and multimedia impacts of chemical products, phase out particularly hazardous chemicals such as chlorinated solvents, adopt statewide the most stringent standards for certain classes of products such as those releasing VOCs.
- **developing incentives to boost demand for green chemistry** (Section III.C.), including by providing tools and access to information via clearinghouses, chemical scorecards for ranking products, and screening of chemical product formulations and ingredients; and promoting markets for green chemistry products via state procurement programs, green product marketing campaigns, and web-based marketplaces.

Addressing All Three Gaps in Data, Safety and Technology:

Most options aimed at addressing the demand side target the data gap and safety gap, whereas supply-side options tend to focus more on addressing the technology gap.

Examples of options relevant to each of the three gaps are provided next.

Data gap: Options to identify and prioritize chemicals of concern directly address current gaps in data on chemical hazards, uses and exposures. Some of the regulatory options, especially those mandating information development and disclosure, also address this gap. Options designed to increase the utility of and access to chemical information – clearinghouses, scoring and screening methodologies, etc. can be used to bridge the data gap as well.

Drs. John Warner and Lynn Goldman

Safety gap: Mandating alternatives assessment to identify safer substitutes for hazardous chemicals and processes is an option that builds a foundation for bridging the safety gap. Application of regulatory authority to restrict the use of hazardous substances also directly addresses this gap. Direct promotion of chemicals and products identified as greener via procurement programs and marketing initiatives can help to close the safety gap.

Technology gap: By spurring the supply side of the green chemistry equation, efforts to foster and provide funding and institutional support for green chemistry education, research, and innovation, and to spur, support and reward industry for voluntary efforts, all seek to close the technology gap by making products of green chemistry more widely available.

Fulfilling Core Policy Functions:

Matrix 1 identifies a set of core policy functions, listed below, to each of which one or more of the Panel's options directly apply. Examples include the following:

- Identify/prioritize chemicals of concern: The options in Section III.A. directly help to meet this policy need.
- Track chemical production and use: The chemical mapping option and use reporting and disclosure options are among the means offered to more effectively track chemicals.
- Collect and develop data: Regulatory requirements to develop and disclose information, and options to advance research at universities and through appropriate industry-university partnerships can help to fulfill this function.
- Share/protect information: Regulatory (e.g., mandatory disclosure) and voluntary efforts (e.g., value chain communication facilitation) designed to increase access to information address the function of sharing information. Patent assistance and

intellectual property ownership policies address the need to protect certain types of information.

- Assess chemical hazards/ exposures/risks/uses: Examples of options addressing this function include the development of criteria to identify chemicals of concern and of better tools and methods for toxicity testing and for ranking and screening of chemicals and chemical products.
- Control chemicals of concern: This function can be met through options proposed to provide the state with broader authority to restrict the use of chemicals of concern, including by addressing specific types of chemicals or chemical products, specific sources of release or exposure, or the full product lifecycle.
- Assess alternatives/options: Options relevant to this need include mandatory alternatives assessment, the advancement of the science of such assessments, and the sharing of information on safer alternatives.
- Innovate toward safer chemicals: Improvements in education, support for public- and private-sector research and innovation, awards and competitions, and technical assistance for green chemistry are among the options that can facilitate innovation toward safer chemicals.

Relevance of the Identified Options for Behavioral Change:

In Section I.D., we emphasized the need to influence the behavior of industry, academia, government, and other stakeholders to advance green chemistry and engineering by affecting their willingness, motivation/opportunity and capacity for change. Matrix 3 below represents a 'mapping' of the options identified in this report to determinants of these three behavioral factors. As explained above, they address key gaps in knowledge from both supply- and demand-side interventions. What Matrix 3 reveals is that there are a large and varied number of interventions affecting willingness and capacity. However, the smaller number of motivation/opportunity interventions are crucial in achieving behavioral change, especially regulation requiring information generation and reporting, regulation requiring technological change, and demand creation. Without market (and regulatory) pull incentives, technology push interventions alone can be expected to have limited success.

Dr. Barry Trost

Yielding a balanced portfolio

As the descriptions above make clear, the Science Advisory Panel has identified a broad range of options that can work together to advance green chemistry in California. No single option or category of options is likely to suffice. Rather, the state needs to draw from all of the policy instruments available to it, and assemble and utilize a full and diverse set of options, if it is to create both supply and demand for green chemistry, bridge key gaps hindering current efforts, and effectively carry out the core functions of a comprehensive chemicals policy.

Matrix 3: Key Behavioral Factors and Interventions Plus Options Linked to Behavioral Factors

Determinants of Change -- Leverage points to encourage the needed (governmental, private-sector, and societal) changes through green chemistry and engineering

KEY CHANGE FACTOR	INTERVENTION TYPE	SPECIFIC ACTIVITIES
Willingness		
-towards changes in production (flexibility)	address static mind-sets/encourage risk-taking	6, 8, 15
-influenced by an understanding of the problem (i.e., what aspects of the technology need to be changed)	information dissemination/educational initiatives	1, 6, 13, 16, 17, 22, 23, 24
-influenced by knowledge of options or solutions (diffusion)	information dissemination/educational initiatives/databases	3, 4, 9, 13, 17, 19, 21, 33, 34, 35
-influenced by the ability to evaluate alternatives	methodology development and capacity-building	1, 3, 4, 14, 20
Opportunity/Motivation		
-gaps in technological/scientific capability (compared to others in existing markets)	databases and demonstration/showcase projects	33, 34, 38
-possibility of economic cost savings in existing markets or new/expanded market potential	perform and disseminate cost-benefit and market analysis	35, 34, 36, 38
-regulatory requirements necessitating technological changes	regulatory initiatives	30, 31, 32
-consumer/worker/societal demand (making new markets)	enhance marketing/demand for greener technology	35, 37, 38
Capacity		
- influenced by an understanding of the problem (i.e., what aspects of the technology need to be changed)	information dissemination/educational initiatives	1, 6, 13, 16, 17, 22, 23, 24
- influenced by knowledge of options or solutions (diffusion)	information dissemination/educational/ initiatives/databases	3, 4, 9, 13, 17, 19, 21, 33, 34
- influenced by the ability to evaluate alternatives	methodology development/technical assistance/capacity-building	1, 3, 4, 14, 20, 38
- resident/available skills and capabilities (for innovation)	capacity-building, education/training	3-8, 10, 12, 16, 18
- outside assistance	state offices of technical assistance/ university-based projects	1, 11, 12, 16

IV. B. Agents of Change

Agents of change are present throughout the state of California and include actors in government, industry, universities, and not-for-profits. Key conditions for behavior change are in place.

First, as evidenced by the process that resulted in this report, there is a willingness to change. California has worked to understand the problem of chemicals policy and the appropriate role of green chemistry and engineering in the evolution of its policies. It is engaging in a process to develop and evaluate new approaches and chemical policies that embody principles of green chemistry and engineering. At this point, the question is not whether but rather how the state will move forward with a green chemistry initiative.

Second, on a statewide basis, there are major opportunities that motivate the adoption of green chemistry initiatives. Strong regulation of air, waste and water in California over the last several decades has resulted in one of the most health-protective regulatory climates in the world. This regulatory environment creates a favorable environment for the development of alternative means of production that require fewer permits, inspections and controls on pollution and waste disposal. At the same time, California has an active and well-informed citizenry that has created demand for green chemistry and engineering at the grassroots level, among workers, and at the state's colleges and universities

Finally, the state of California intrinsically has the capacity to undertake a major green chemistry initiative. Through the convening of this Panel and other processes, it has developed a fundamental understanding of the problem and has identified a number of options for change. California possesses a wealth of skills and capacities that provide a foundation for building a major initiative in this area.

California is undertaking a thorough assessment of green chemistry and engineering in the state, one informed by the engagement of multiple stakeholders including industry, environmental groups, local government, and scientists, as well as by the input of external experts.

California can build the momentum for change based on a foundation of expertise and ability that is already present in the state. In terms of government, DTSC has much experience with providing expertise and consultation in pollution prevention, waste reduction, and energy conservation. It, along with other Cal/EPA entities (most notably the Office of Environmental Health Hazard Assessment), has strong expertise in toxicology, risk assessment and chemistry. Cal/EPA also has a strong reputation for bringing together university scientists, stakeholders and industry groups to achieve ambitious goals reasonably, effectively and in a timely fashion (for example, the Proposition 65 listing activities; development of regulations by the California Air Resources Board, and identification of hazardous waste priorities by DTSC). With training and refocusing of effort, these skills and abilities can be harnessed to the service of green chemistry. Likewise, California's local governments have an enormous pool of expertise and capacity to participate in new green chemistry efforts.

California's industrial sector is known for being innovative and embracing new technologies. The history is instructive: aerospace, newer agricultural technologies, petrochemical manufacturing, medical care, biotechnology, microprocessors, software development,

stem cell research and now climate mitigation technology. Again and again, California's economy has benefited from a willingness of industry to innovate and to adopt new ideas. It is likely that California's industry will respond positively to new opportunities to adopt green chemistry and engineering alternatives, for which there will be demand not only in California but also among informed consumers in the rest of the U.S., as well as markets in Canada and Europe that are under new, stricter chemical regulatory regimes. Once again, California will benefit economically through its willingness to innovate.

California has a world-class system for higher education, which also provides a foundation for a major initiative in this area. In particular, California has led in areas of science and social sciences that are important to green chemistry and engineering, not only chemistry and engineering but also in the environmental and health sciences that are closely related to this area. Academics in California have been thought leaders on chemicals policies issues worldwide, and their continued engagement will be critical not only to the development of educational programs but to providing scientific input to efforts by state government and industry.

Finally, California has an engaged and environmentally-conscious public that is willing to make environmental issues a priority. Participation in the green chemistry initiative by members of the public and stakeholder groups is proof of the ongoing commitment to the process and the priority that they give this issue. Only the continued engagement of stakeholders across a wide swath of the state will assure that an initiative is not only started but also sustained over time, and receives the support that will be required for its continued success.

IV. C. California's Opportunity for Green Chemistry Leadership

Reflecting the diversity of backgrounds, perspectives and expertise of the Science Advisory Panel itself, this report presents California with a broad range of options to consider as it endeavors to advance green chemistry. What is perhaps most striking about these options is that they provide means not only for government, but for each of the myriad stakeholders and actors to contribute to this ambitious enterprise. These options highlight critical roles and opportunities for chemical producers and users in diverse business sectors, technology developers, academic researchers, educators at all levels, purchasers and sellers of chemicals and chemical products, end consumers and the broader public.

The state can both act directly and help to empower and guide the actions of all of these other players. Its roles can include providing critical support for education, research and innovation in green chemistry; providing incentives and recognition for voluntary industry initiatives; driving the development of and access to more and better information, scientific methods and analytic tools; setting clear policy objectives; and effectively employing regulation where needed.

The field of chemistry itself provides a fitting metaphor for what is ultimately needed to advance Green Chemistry in California. The chemist's aim is to combine reagents to yield a desired end product as effectively and efficiently as possible, minimizing unwanted byproducts and waste. To do so, chemists often seek out and utilize catalysts to increase both the rate and yield of the desired chemical reaction. What makes a catalyst special is that, while it may be chemically transformed during the reaction, it is not consumed and is regenerated at the end of the reaction. Because of this, addition of only a small amount of a

catalyst can be enough to drive the desired reaction.

Consider both the range of players and the diversity of available options to be the mix of chemicals in a reaction vessel. The state of California has a golden opportunity to become the catalyst that draws together and creatively combines the various ingredients needed to advance Green Chemistry. The members of this Science Advisory Panel hope that our report provides a useful contribution to achieving this noble end.

Appendices

Appendix A: Science Advisory Panel Member Biographies

Chair: John Warner, Ph.D.
The Warner Babcock Institute for Green Chemistry

After establishing the world's first Green Chemistry Ph.D. program, Warner now directs a large research group working on a diverse set of projects involving green chemistry using principles of crystal engineering, molecular recognition and self-assembly. He is the editor of the Journal "Green Chemistry Letters and Reviews." He was awarded the American Institute of Chemistry's Northeast Division's Distinguished Chemist of the Year for 2002, and the Presidential Award for Excellence in Science, Mathematics and Engineering Mentoring in 2005. His recent patents in the fields of semiconductor design, biodegradable plastics, personal care products and polymeric photoresist films are examples of how green chemistry principles can be immediately incorporated into commercially relevant applications. Warner is co-author of "Green Chemistry: Theory and Practice."

Vice Chair: John R. Balmes, M.D.
University of California San Francisco and Berkeley

John Balmes is the Director of the Center for Occupational & Environmental Health at the University of California, San Francisco and University of California, Berkeley. He is a pulmonary physician by training, Professor of Medicine at UCSF, and Chief of the Divisions of Occupational and Environmental Medicine at San Francisco General Hospital. Balmes leads a group of investigators at UC Berkeley and UCLA to assist in developing a national program linking environmental hazards with health outcome data to track diseases that are potentially related to environmental exposures.

Paul Anastas, Ph.D.
Yale University

Anastas serves as the Director of the Center for Green Chemistry and Green Engineering at Yale University. He served as Chief of the Industrial Chemistry Branch at the U.S. Environmental Protection Agency and Director of the U.S. Green Chemistry Program, where he is credited with establishing the field of green chemistry.

Nicholas Ashford, J.D., Ph.D.
Massachusetts Institute of Technology

Ashford is the Director of the Technology & Law Program at the Center for Technology, Policy & Industrial Development at the Massachusetts Institute of Technology. He is an advisor to the United Nations Environment Programme and is the Legislation, Regulation and Policy Editor of the Journal of Cleaner Production. Ashford has developed methodologies for decision-making in chemical regulation and has extensively investigated the effects of regulation on technological innovation in the chemical, pharmaceutical and automobile industries.

Eric J. Beckman, Ph.D.
University of Pittsburgh

Beckman serves as Professor of Chemical Engineering and Bayer Professor and Chair at the University of Pittsburgh. He is also Co-Director of the Mascaro Sustainability Initiative. Prior to joining the University of Pittsburgh, he held positions at Monsanto Plastics & Resins, Union Carbide's Silicones and Urethanes Intermediates Division, and held a postdoctoral research appointment at Battelle's Pacific Northwest Laboratory. Beckman's research is in the use of carbon dioxide as either a solvent or raw material and polymer chemistry & processing.

William Carroll, Ph.D.
Occidental Chemical Corporation

Carroll is a Vice President of Occidental Chemical Corporation and an Adjunct Industrial Professor of Chemistry at Indiana University. He has served on expert groups commissioned by the states of Florida and Oregon. He contributed to the United Nations Environment Programme's Best Available Techniques/Best Environmental Practices Guidelines for implementation of the Stockholm Convention on Persistent Organic Pollutants. In 2005 he was President of the American Chemical Society.

Gail Charnley, Ph.D.
HealthRisk Strategies

Charnley is a Principal at Health Risk Strategies with over 30 years experience in the biological, chemical and social policy aspects of environmental and public health protection. She lectures frequently on science policy issues and is the author of numerous reports evaluating the toxicity of chemical exposures, the environmental impacts on public health, the management of risks to health and the environment, children's environmental health, and democratic science-based public policy and decision-making.

Richard Denison, Ph.D.
Environmental Defense

Denison serves as a Senior Scientist with the Environmental Defense. With nearly 25 years of experience in the environmental arena, he specializes in chemicals policy, hazard, risk assessment, and management of industrial chemicals, in addition to responsible development of nanotechnology. He has managed Environmental Defense's
participation in and oversight of the U.S. High Production Volume Chemical Challenge Program. He also serves on the Chemicals Committee and Working Party on Manufactured Nanomaterials of the Organization for Economic Cooperation and Development (OECD).

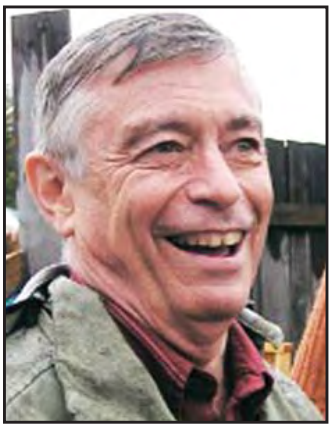
Daryl Ditz, Ph.D.
Center for International Environmental Law

Ditz is the Senior Policy Advisor at the Center for International Environmental Law, Chemicals Program, and Coordinator of the National Education Campaign for U.S. Persistent Organic Pollutants Ratification. He has 20 years of U.S. and international experience dealing with environmental health threats through effective public policy and corporate management. Ditz is co-author of "Frontiers of Sustainability, Green Ledgers: Case Studies in Corporate Environmental Accounting," and numerous reports and articles on environmental law, policy and management.

Michael Dourson, Ph.D.
Toxicology Excellence for Risk Assessment (TERA)

Dourson directs the non-profit organization Toxicology Excellence for Risk Assessment (TERA) whose mission is to protect public health. TERA develops partnerships among government, industry and other interest groups to address risk assessments of high visibility chemicals such as perchlorate, chloroform, formaldehyde and soluble nickel. The organization forms cooperative ventures such as the Voluntary Children's Chemical Exposure Program and the International Toxicity Estimates for Risk database. Prior to joining TERA, he worked for the U.S. EPA for 15 years on specific key projects such as the creation of the U.S. EPA's Integrated Risk Information System.

Kenneth Geiser, Ph.D.
Lowell Center for Sustainable Production, University of Massachusetts-Lowell



Geiser serves a Professor of Work Environment and as the Director of the Lowell Center for Sustainable Production at the University of Massachusetts, Lowell. He co-authored the Massachusetts Toxics Use Reduction Act and served as Director of the Massachusetts Toxics Use Reduction Institute from 1990 to 2003. Geiser's research and publications focus on pollution prevention and cleaner production, toxic chemicals management, chemicals policy, safer technologies, and green chemistry. In 2001, Geyser authored "Materials Matter: Towards a Sustainable Materials Policy."

Lynn Goldman, M.D., M.P.H.
Johns Hopkins Bloomberg School of Public Health

Goldman is a Professor at Johns Hopkins University Bloomberg School of Public Health, focusing on environmental health policy, public health, and children's environmental health. She served as Assistant Administrator for the U.S. Environmental Protection Agency's Office of Prevention, Pesticides and Toxic Substances. Prior to that, Goldman served in several positions at the California Department of Health Services, where she conducted public health investigations on pesticides, childhood lead poisoning and other environmental hazards.

John D. Graham, Ph.D.
Pardee RAND Graduate School

Graham serves as Dean of the Pardee RAND Graduate School and Distinguished Chair in Policy Analysis. He is the author or co-author of some 200 books, articles, and reports in the areas of risk estimation and management of health, safety, environment and energy. Graham founded and led the Harvard Center for Risk Analysis from 1990 to 2001. He served as the administrator of the Office of Information and Regulatory Affairs in the Office of Management and Budget and as Professor of Policy and Decision Sciences in the Department of Health Policy and Management, Harvard School of Public Health.

Neil C. Hawkins, Ph.D.
The Dow Chemical Company

Dr. Neil Hawkins currently serves as Vice President, Sustainability for The Dow Chemical Company. In this global role, he is responsible for driving Dow's sustainability performance, including implementation of Dow's landmark 2015 Sustainability Goals, including the transformational Sustainable Chemistry goal. He is also accountable for Product EH&S, Global Regulatory Affairs, Health Services, Remediation, and the regional EH&S implementation organizations. Hawkins has previously held a wide range of Environment, Health & Safety, and Public Affairs roles across Dow. Hawkins joined Dow in 1988, and is in his 20th year with the company. Hawkins holds masters and doctoral degrees from Harvard University, School of Public Health, and a bachelor's degree from Georgia Tech. Hawkins is an expert in environmental risk assessment and environmental policy.

Lauren G. Heine, Ph.D.
Lauren Heine Group LLC, Clean Production Action

Heine's experience and expertise lies in green chemistry, green engineering, sustainable business practices, and multi-stakeholder initiatives. As Principal for the Lauren Heine Group, and a Senior Science Advisor with Clean Production Action, she advises organizations seeking to integrate green chemistry and engineering into product and process design and development activities. Specific areas of expertise include the development of technical tools and strategies for product assessment, evaluation, design and market recognition; and facilitation of multi-stakeholder initiatives. Lauren was previously the Director of Applied Science at GreenBlue where she directed the development of CleanGredients™, a unique, web-based information platform, developed in partnership with the U.S. EPA Design for the Environment Program that promotes green chemistry and environmentally preferable product formulation by providing information on key human and environmental health, safety and sustainability attributes of cleaning product chemicals.

Vistasp M. Karbhari, Ph.D.
University of California, San Diego

Karbhari is a Professor of Structural Engineering and Professor of Materials Science and Engineering Program at the University of California, San Diego. He leads research groups in such areas as the processing and mechanics of composites, durability of polymers and composites, and bio-materials. He is the author/co-author of over 160 papers in archival journals. He is the American Editor for the International Journal of Materials and Product Technology and is an Editorial Board Member of Composite Structures.

John Peterson Myers, Ph.D.
Environmental Health Sciences

Myers is the founder, CEO, and Chief Scientist of Environmental Health Sciences based in Charlottesville, Virginia. He is also coauthor of "Our Stolen Future," which explores the threats posed by man-made chemical contaminants to fetal development and human health. Myers is Senior Advisor to the United Nations Foundation. From 1990-2002, he was director of the W. Alton Jones Foundation, a private foundation supporting efforts to protect the global environment and to prevent nuclear war. Myers is also senior advisor to Commonweal and to the Jenifer Altman Foundation on environmental threats to children's health.

Mary O'Brien, Ph.D.
Grand Canyon Trust

O'Brien has worked as a staff scientist and organizer for the past 26 years with toxics and conservation organizations, including Northwest Coalition for Alternatives to Pesticides, Environmental Research Foundation, Science and Environmental Health Network, and Hells Canyon Preservation Council. O'Brien taught (1992-1994) as Assistant Professor in the graduate U. of Montana Environmental Studies Program. O'Brien currently works for Grand Canyon Trust for conservation of wildlife habitat and native ecosystems in southern Utah's three national forests. Dr. O'Brien's book, Making Better Environmental Decisions: An Alternative to Risk Assessment (MIT Press 2000), focuses on the power of alternative assessments to leverage positive change.

Barry Trost, Ph.D.
Chemistry Department, Stanford University

Trost serves as a Professor of Chemistry at Stanford University and is the winner of the 1998 Presidential Green Chemistry Award in Academics. He developed the concept of atom economy, which involves reducing the use of nonrenewable resources, minimizing the amount of waste, and reducing the number of steps used to synthesize chemicals. Atom economy is one of the fundamental cornerstones of green chemistry, and is a concept widely used by those who are working to improve the efficiency of chemical reactions.

Michael P. Wilson, Ph.D.
University of California, Berkeley

Michael P. Wilson, PhD, MPH, is a research scientist with the Program in Green Chemistry and Chemicals Policy at the Center for Occupational and Environmental Health (COEH), School of Public Health, University of California, Berkeley. Dr. Wilson conducts research and practice in chemicals policy, green chemistry, exposure assessment, occupational safety and health, and sustainable production. He conducted his doctoral (PhD) and masters (MPH) research in environmental health sciences at the University of California, Berkeley, from 1996 to 2003. He earned a bachelors degree with thesis honors in biology from the University of California, Santa Cruz, in 1984.

Dr. Wilson is the chief author of a 2006 report to the California Legislature, ***Green Chemistry in California: A Framework for Leadership in Chemicals Policy and Innovation*** and a lead author of a January 2008 report, Green Chemistry: ***Cornerstone to a Sustainable California for California EPA.***

In addition to his appointment to the Green Chemistry Science Advisory Panel, Dr. Wilson was appointed in August by Assembly Speaker Fabian Núñez to the state's Biomonitoring Program Scientific Guidance Panel.

Katy Wolf, Ph.D.
Institute for Research and Technical Assistance

Wolf is Director of the Institute for Research and Technical Assistance (IRTA), a nonprofit organization established in 1989. IRTA conducts pollution prevention research, test and development projects that involve safer alternatives. IRTA identifies, develops, tests and demonstrates alternatives in a variety of applications including cleaning, dry cleaning, electronics, paint stripping, aerospace, coatings and adhesives. A heavy focus of the research is on alternatives to ozone depleting, VOC, toxic and global warming solvents. IRTA runs and operates the Pollution Prevention Center, a loose affiliation of federal, state and local government agencies and a large electric utility. The Pollution Prevention Center members collaborate on projects of mutual interest to find safer alternatives taking into account cross-media and worker exposure implications. Dr. Wolf spent fourteen years at the RAND Corporation where she performed research on alternatives to ozone-depleting substances and chlorinated solvents. She has authored more than 200 publications.

Appendix B: Green Chemistry Initiative Science Advisory Panel Subcommittee Membership

1. Advancing Green Chemistry Through Evaluation of Data Needs and Availability	2. Advancing Green Chemistry and Engineering through Alternatives Assessment	3. Advancing Green Chemistry Through Evaluation of Incentives and Barriers	4. Advancing Green Chemistry through Education and Information Dissemination	5. Science & Technology /Research Challenges & Opportunities
John Balmes William Carroll* Gail Charnley Richard Denison* Lauren Heine	Nicholas Ashford* Gail Charnley Richard Denison Mike Dourson* Lauren Heine Mary O'Brien Katy Wolf	Nicholas Ashford Eric Beckman William Carroll** Daryl Ditz* Mary O'Brien Mike Wilson Katy Wolf	Paul Anastas Eric Beckman Ken Geiser* John Graham Neil Hawkins Vistasp Karbhari	Paul Anastas* Eric Beckman Neil Hawkins Vistasp Karbhari Barry Trost
* = co-conveners	* = co-conveners	* = chair ** = vice-chair	* = chair	* = chair
John Warner: floating member	John Warner: floating member	John Warner: floating member	John Warner: floating member	John Warner: floating member

Appendix C: Report of Subcommittee 1 on Advancing Green Chemistry through Evaluation of Data Needs and Availability [44]

Introduction

This report consists of four sections. Section 1 provides an approach to evaluating the needs for data on chemicals, some thoughts on their use in decision-making, and options for developing them. In Section 2 is a case study on selectively generating and evaluating data to support decision making. This case study, related to surfactant properties, is an example of evaluation of existing information, collaborative collection and generation of supplemental information, and the decision-making process in identifying efficacious but less hazardous raw materials. Sections 3 and 4 are listings of databases and sources of information on chemical hazard properties; chemicals uses, releases and exposures; and tools and approaches to data analysis.

Section 1: Green Chemistry Data Needs and Availability[45]

Information is critical to sound decision-making, and chemicals policies are no exception. Indeed, a core function of a chemicals policy should be its ability to facilitate or require the generation of information that can be used to identify and characterize a chemical, understand its manufacturing and use, assess its hazards and exposure potential, and so forth.

In considering the role of information generation in chemicals policies, there are several basic questions:

- What is the importance of having good chemical information?
- What types of decisions are to be informed by the information?
- What types of information may need to be generated?
- What characteristics of the information determine its utility, adequacy, quality, and confidence level?
- What methods can be used to generate the information?
- What options can government use to facilitate or require information generation?
- How can the reliability of information be enhanced?

This chapter will explore each of these issues, highlighting important policy considerations and options.

Why Information on Chemical Hazard, Use, and Exposure Is Important

Having at least basic, reliable, and current information on how chemicals are produced and used as well as their potential hazards and exposures can help to identify and prioritize chemicals of concern for further assessment and risk reduction and management efforts. Equally important, generating a broad base of information about most if not all chemicals in commerce aids in identifying not only chemicals of concern, but also chemicals that pose little or no risk and hence may serve as potential alternatives or replacements for the riskier ones.

It is important to clearly and explicitly characterize the extent of information available on chemicals. In this regard, attention should be drawn to **data gaps** as well as available data on chemicals. Knowing what information is **not** available about a chemical can be important to assessing the level of confidence that can or should be placed in decisions concerning that chemical. And prominently identifying missing data can provide incentives to develop more and better data.

Finally, independent of the extent to which government itself acts on chemical information to identify and reduce or manage risks, the generation of such information – coupled with providing broad access to it – can empower a host of other actors to make better decisions about the chemicals they produce, use, sell, or purchase. Access to such information may well drive market demands for more information and migration away from chemicals known or suspected of being risky, even without direct government intervention.

While there is legitimate debate over how much information about chemicals is needed, there is growing recognition that current federal policy constrains government's ability both to generate and to provide access to chemical information.[46] Some of the major existing sources of information on chemicals' hazards, uses and exposures – and the limitations to this information – are described in Section 3.

Types of Decisions for Which Information Is Needed

Decisions clearly need to be informed by information, but how much is needed? What and how much information is needed depends in no small part on what type of decision is being made. A range of types of decisions requiring chemical information can be envisioned, for example:

- Review of chemicals prior or subsequent to their manufacture or use;
- Initial screening or prioritization of chemicals for further scrutiny or action;
- Determination of additional information needs;
- Assessment of a chemical's hazard, exposure, or risk;
- Chemical design and product development;
- Selecting among alternatives for a given use or function;
- Determination of needed controls by government or industry;
- Development of regulations; or
- Development of purchasing policies or criteria.

While there is no magic formula to determine information needs for a given decision, some general principles can be articulated:

- Some decisions require less or less certain information than others. Screening decisions
  - where a relatively high capture rate of "false positives" can be tolerated in exchange for minimizing the exclusion of "false negatives"
  - can sometimes be made using fewer data since initial capture decisions will typically be revisited and potentially revised using more and better information.
- Some decisions require only certain types of information. A decision to identify a chemical as sufficiently hazardous as to require the development of better exposure information – for example, to list a chemical on the TRI and require reporting of information on environmental releases – does require good hazard information but should not hinge on significant evidence of exposure (and hence risk), since the very purpose of the decision is to develop such information.
- Decisions being made at design or pre-commercial stages of a chemical's life – such as a company deciding whether to proceed with product development or which among several alternative substances to choose, or government deciding whether to allow manufacture to commence – may warrant, or may of necessity only be possible to be informed by, less information than decisions that affect more established chemicals.
- Decisions to collect or generate certain types of information may be triggered by what previously collected information reveals: For example, detection of a chemical in a biomonitoring program could lead to a decision to require more extensive testing for hazardous properties, or, conversely, evidence of hazard to humans or environmental persistence could trigger a requirement to conduct biomonitoring for a chemical.

In general, decisions of a more tentative nature or those made at an early stage in a process (be it in the course of product development or development of a regulation), and hence are likely to be revisited or reconsidered, may tolerate less information, while more definitive and impactful decisions demand more. Of course, mechanisms are needed to ensure that both the development and reconsideration of better information actually take place as the degree of confidence needed in a decision increases.

Types of Information that May Be Needed

Broadly speaking, several major types of information are typically needed to inform sound decisions concerning safe management of chemicals. They include:

- Information on a chemical's inherent characteristics:
  - identity, composition, properties, physical form, and so forth.
  - environmental fate and transport in various environmental media, including its persistence and susceptibility to degradation.
  - biological fate and behavior, including its extent of adsorption into an organism, its movement and distribution within; its biopersistence and potential to accumulate or be metabolized, and so forth.

- toxicity to living organisms.
- Information on production, handling, function/use, and lifecycle management:
- Information on concerning potential and actual releases and exposures:
  - to workers, consumers, the public (or subpopulations) or the environment;
  - presence in the environment and organisms, including humans.

Important Information Characteristics

Many other characteristics of the information will determine if, when, and where it is needed, useful, and appropriate to be used for a given decision. To be of use, the information must be sufficiently reliable (for example, current, accurate, viewed as credible) and timely (that is, collected or generated and made available at the right time to inform a decision).

The quality of and degree of confidence that can be placed in chemical information are important considerations, and need to be characterized and communicated as explicitly as possible. It is also critical to ensure that any resulting limitations with regard to appropriate and inappropriate uses of the information are understood and communicated. Measures and dimensions of quality[47] can include:

- Representativeness;
- Extent of adherence to established methods, including good laboratory practice;
- Extent of validation of methods, models, and results;
- Extent of documentation provided, including access to underlying raw data;
- Extent to which results have been replicated or independently verified;
- Extent to which data are empirically measured vs. estimated or modeled
- Extent of reliance on expert judgment assumptions;
- Characterization and communication of the associated confidence level;
- Publication, peer review.

As noted earlier, the extent to which data are complete – or alternatively, the extent of data gaps – can also be an important measure of data quality. Being able to identify such gaps requires, of course, an accepted benchmark for what constitutes sufficient or "complete" data – which can in turn depend on the purpose and use of the data. Minimum data sets have been developed and used in a number of regulatory and voluntary programs.[48] Perhaps equally needed but as yet not well developed would be an articulation of the desired amount of information that should be available for all chemicals, or for chemicals used in particular ways (for example, present in consumer products). Such data sets could serve effectively as both yardsticks and goals for measuring progress in closing the gap between what we know and what we should know about the chemicals we make and use.

Methods Available to Generate Information

Information on hazard and exposure can be developed by a variety of means:

- Empirically through measurement or testing, for example,
  - Through epidemiological studies or biomonitoring,
  - Using in vivo or in vitro toxicity test methods, or
  - Through sampling and analysis, e.g. of environmental media (air, water).
- By estimation through models or interpolation/extrapolation, for example,
  - Using a quantitative structure-activity relationship (QSAR) model to estimate toxicity,[49]
  - Using "read across" from structurally related chemicals,[50] or
  - Using an exposure model to estimate release or exposure.
- Exercising expert and experience-based judgment, for example, by
  - Applying weight-of-evidence (WOE) approaches to resolve conflicting information or combine pieces of information, none of which alone would be deemed sufficiently reliable but which together support a conclusion, or
  - Using assumptions deemed reasonable in the absence of hard information.[51]

Data generated using these different methods possess inherent differences that in turn affect their expected reliability and associated confidence level and hence delimit their appropriate use. This factor reinforces the need to align the degree of confidence needed for the decision being made to the degree of confidence that can be expected from the methods being used to generate information.

Hazard information:[52] Hazard data derived using alternatives to traditional chemical testing have been used or are allowed to be used to meet data requirements in both voluntary

programs[53] and many regulatory programs.[54] They also have been used by government authorities to screen or prioritize chemicals for further scrutiny or management. For example:

- U.S. EPA's New Chemicals Program has developed and made extensive use of QSARs and category read-across approaches to predict the hazards of chemicals it reviews that lack actual test data.[55]
- Under Canada's recently completed Domestic Substances List (DSL) Categorization process, Health Canada used many different types of data, assigning confidence levels to different data sources.[56]
- The State of Washington recently commissioned an assessment of alternatives to the flame retardant decabromodiphenyl ether (deca-BDE) that used QSAR model estimates to supplement the test data available to characterize the relative hazards of deca-BDE and the alternatives. The models employed were the same as those used by U.S. EPA's New Chemicals Program.[57]

Interest in promoting alternatives is motivated by a desire to: gain efficiencies in assessing new chemicals prior to market introduction as well as in addressing the huge backlog of un- or under-assessed chemicals already on the market; reduce the costs associated with traditional testing; and reduce unnecessary use of laboratory animals. They are all worthy objectives. At the same time, it is critical that an appropriate balance be struck

with other equally important objectives: assuring full protection of human health and the environment; basing decisions on scientifically sound and defensible information; ensuring that all assessment information used to make such decisions is independently verifiable and reproducible; and maximizing transparency in communicating the basis for decisions to stakeholders and the general public.

Exposure Information:[58] Three uses of information about chemical exposures are prevalent in existing practice. It is used directly, in combination with hazard information, to assess the risks posed by a chemical, typically under the rubric of risk assessment. It is used to identify chemicals to which there is significant exposure as a means to prioritize among chemicals and target them for further assessment or control. Third, and more controversial, exposure information can be used to "moderate" the extent of hazard testing required to be conducted or, for a chemical already identified to be hazardous, the priority given to further assessment or risk management.[59]

While both hazard and exposure are clearly relevant in determining chemical risks, there are critical differences between our ability to assess hazard and exposure:

- Hazard is largely inherent to a substance, while exposure changes with place, use, and time. Exposure assessment must therefore characterize variation in as well as magnitude of exposure.
- Mechanisms for generating and evaluating hazard data are far more advanced and accepted than for exposure data. While extensive international-consensus standards exist for generating hazard data, standardized and routine collection of exposure data is rare and infrequent, and public access to them even rarer.
- Differential access to both exposure data and the means to generate them can severely limit the "reproducibility" of such data. Most exposure data and the means to generate them (e.g., by gaining access to exposure "settings" such as workplaces) reside largely with ndustry. Having the ability to independently verify such information is therefore essential.
- Confidential business information (CBI) restrictions limit public access to much exposure data; in contrast, hazard data are typically ineligible for CBI protection.
- Finally, supply-chain impediments to sharing exposure-relevant information abound, where for competitive reasons both suppliers and their customers have only limited access to information in the possession of the other party.

These limitations need to be carefully considered in the development, use and communication of exposure information, especially in a public policy context. Even where exposure information is relatively reliable and complete, there is still the need to develop hazard information for a chemical, which has value independent of exposure and will virtually inevitably be needed as the exposure situation changes.

Government's Options for Generating Information

Sometimes chemical information already exists and can simply be collected and compiled, while in other cases it must be generated de novo. Some chemical information may be largely in the possession of those companies that produce and use the chemical, while

some may be independently accessible or able to be developed. Finally, such information may be published or otherwise publicly available, or it may be unpublished or publicly inaccessible (for example, confidential business information).

Government has several basic options when it comes to facilitating the reporting or generation of chemical information. It can:

- Itself collect or generate the information;
- Require commercial producers or users of chemicals to report existing or generate new information;
- Request that information be provided voluntarily or provide incentives for companies to do so;
- Help to develop and shape a market in which the collection or generation of the information has economic value.

Each option is discussed below, along with advantages and disadvantages of each.

1. Government can itself collect or generate the information.

This activity can be undertaken through research agencies, government laboratories or in some cases by regulatory agencies. Examples of federal government-developed chemical information include toxicological testing conducted by the National Toxicology Program, biomonitoring of human blood and urine conducted by the Centers for Disease Control, and workplace inspections and air sampling conducted by the Occupational Safety and Health Administration.

Advantages of direct government generation of information include the following:

- The information will be associated with a relatively high degree of public trust.
- Government has direct control over the methods used, the documentation provided, and other factors important to developing reliable data in a transparent and accountable manner.
- Government and the public have full access to the results and underlying data.

Among the disadvantages or limitations are the following:

- Government bears the cost of generating the information.
- For government to generate data on large number of chemicals could exceed available financial and human resources, including laboratory capacity.
- For new chemicals just being developed or yet to be commercialized, it is more difficult to see how government could intervene.
- Government conducting all testing could effectively undermine incentives for companies to maintain and enhance their expertise and capacity to consider risk in chemical design, that is, green chemistry, pollution prevention approaches.

2. Government can require commercial producers or users of chemicals to report existing or generate new information.

Government imposition of requirements for industry to report existing information or generate new information is probably the most common approach used by government to develop chemical information. This approach is used across all major types of chemicals, including pesticides, pharmaceuticals, and industrial chemicals. Testing requirements are most commonly imposed at the time of a chemical's first introduction. Examples of this approach include the registration of pesticides under the U.S. Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA); reporting and test rules and inventory update reporting requirements for existing chemicals under TSCA;[60] and the reporting, testing, assessment, and risk management requirements under the Registration provisions of the European Union's REACH Regulation.

Advantages of government compelling industry to report or generate information include the following:

- It places the burden of information development on the producers and users of chemicals, not government.
- Information can potentially be developed on many more chemicals than government would be able to generate by itself.
- Industry potentially has an incentive to develop and use safer chemicals, in order to avoid having to report information indicating potential hazard or risk and be required to take action to mitigate risk.

Disadvantages and limitations include the following:

- Industry has an incentive to downplay hazards or risks of its chemicals, which has the potential to compromise the reliability of the information it generates.
- Selective reporting is a concern, although requirements typically exist that compel
- industry to submit any information indicative of significant risk.
- Under TSCA, government must generally demonstrate that an existing chemical may pose a significant risk or has widespread exposure to compel any testing[61]
- Government resources required to review industry data for quality, accuracy and
- completeness are still substantial.
- Public trust in information from industry is typically lower than for government.

3. Government can request that information be provide voluntarily or provide incentives for companies to do so.

The most prominent example in the U.S. of this approach is the HPV Challenge. Another example where U.S. EPA has encouraged and provided an incentive to industry to develop and submit information is the Sustainable Futures Initiative, under which companies are trained and encouraged to employ the same suite of predictive tools U.S. EPA uses to assess new chemicals.[62]

Advantages, in addition to those listed above for regulatory approaches, of voluntary efforts through which industry reports or generates information include the following:

- They bypass statutory findings regarding risk that must be made in some jurisdictions to compel testing.
- They can often be implemented more quickly than can regulations.
- They are less likely to be contested by industry than regulations.

Disadvantages and limitations, in addition to those listed above for regulatory approaches, include the following:

- Government has little recourse if data quality is poor, data are incomplete, deadlines are not met, or agreed procedures are not followed, since there is no legally binding obligation imposed on companies.
- The extent of participation is difficult to predict.
- The ultimate incentive for companies to participate is likely the extent to which government can compel testing if extent of voluntary participation is deemed insufficient; hence, the very limitations and constraints government faces in seeking to develop regulations may also significantly influence the extent and quality of voluntary participation.

4. Government can help to develop and shape a market in which the collection or generation of the information has economic value.

Government's provision of broad public access to chemical information it acquires by whatever means can itself significantly affect market dynamics and other economic dimensions of decision-making about chemicals.[63] In this context, the "public" includes end consumers; governmental and non-governmental institutions (for example, hospitals), companies that purchase chemical products; and companies that make or sell such products. Access to chemical information may well drive market demands for more information and migration away from chemicals known or suspected of being risky, even without direct government intervention.

Registration requirements for pesticides under FIFRA and the EU's REACH Regulation establish that companies must demonstrate that they have rights to the information they submit to meet information requirements. If they did not themselves generate the information, they are generally required to compensate the owner of the information to gain the right to use it – thereby imparting monetary value to the information.

California's Proposition 65 requires companies that make products containing any chemical "known to the state of California" to be a carcinogen or reproductive toxicant to label the product – unless the chemical is present below an agreed-upon de minimus level. In addition to shifting the burden of proof of safety to companies, Proposition 65 arguably economically rewards companies that generate information about a chemical that allows a no-effect level to be set, because they can avoid negative labeling.

Government procurement policies toward products that contain or are made from chemicals can influence the value assigned to chemical information. As large purchasers of products and services, governments represent a significant increment of market demand. Development and communication of clear criteria that will govern governments' purchase of products and services involving chemicals can help drive markets toward production and use of safer and better characterized chemicals.[64]

Advantages of such approaches include the following:

- They work through, and hence are more likely to be aligned with rather than work against, market incentives and dynamics.
- They do not require direct government intervention to restrict use of a chemical.
- They potentially empower a much broader array of actors to make informed decisions about chemicals.

Among their limitations:

- It is difficult to predict the nature and extent or ensure the effectiveness of and track actions taken by entities outside government to reduce chemical risks.
- If market dynamics are not working satisfactorily, there is no direct means to compel or increase compliance.

Relevance to State-Level Policy-Making

States have a critical role to play in chemicals policy development and implementation, not only in affecting practice within their borders, but also in innovating new policy approaches and driving national policy forward. The information generation options discussed in this section differ, however, in the extent to which they can or should be pursued or implemented at a national versus state government level, as well as the extent to which any individual state has the capacity or authority to actually do so. A few examples of criteria or considerations that could be used to distinguish among the options with respect to state-national differences are provided here, but are not meant to be prescriptive or limit what options a state government may wish to pursue.

As discussed earlier, because information about a chemical's use and human or environmental exposure to it is often specific to a geographic region and may change over time, such information may be appropriately developed at the state level. States can and should take steps to understand which chemicals are produced in or imported into their states, as well as how they are transported, stored, processed, and used. Data on chemical releases and exposures within a state (for example, emissions information, concentrations in a state's environmental media or food supply, biomonitoring of state residents and wildlife, including unique or especially susceptible subpopulations) can provide important geospatial information and be essential to setting a state's priorities for action. Of course, the development and maintenance of databases of chemical information can be expensive and may entail specialized expertise. Coordination among states in developing and sharing such information may prove useful in extending expertise and resources and in avoiding duplication.

States can have particular policy priorities, which may arise from many different sources; they may, for example, have cultural or historic origins, signify economic conditions, or reflect geospatial distinctions, such as the extent of reliance on groundwater or features of the natural landscape (for instance, major watersheds).

Some states have decided to focus on particular classes or uses of chemicals of concern. Washington, for example, has established as a priority the identification and restriction of PBT chemicals, with an initial focus on mercury and brominated flame retardants. [65] As one response to the contamination of fish – a key state resource – with mercury, Maine has adopted a product focus, prioritizing the identification and elimination of mercury-containing products.[66] While different states will pursue different approaches, they can and should be communicating and coordinating their activities as much as possible, in order to learn from each others' experiences, share information, avoid duplication and exploit synergies and economies of scale.

Conclusion

The development of good information about chemicals underpins all other aspects of chemicals policy: Information is critical to the evaluation and prioritization of chemicals, to consideration of alternatives to chemicals of concern, and to research and innovation with respect to green chemistry, and to overall program administration and implementation. The development of more and better information will allow us not only to identify which chemicals pose risks, but also which ones pose little or no risk and could replace riskier ones. Indeed, one potentially enormous, but largely unsung, benefit of adopting a comprehensive approach that seeks to develop risk profiles for most or all chemicals would be the ability to select safer chemicals with confidence.

This section has explored the basic questions of what, how, by whom, for whom, and why chemical information is to be generated. In general, the section argues for taking a broad approach with respect to both the extent of information that should be developed and the range of actors and the ways by which that information can be used. Better information,

coupled with greater access to it, will empower a range of others besides government to act to control chemical risks. This includes companies that purchase and use chemicals in their products, retailers that sell chemical products, businesses and institutions (for example, hospitals, hotel chains) that buy chemical products, as well as workers, consumers, public interest groups, government and academic researchers, and the broader public.

Section 2. A Case Study on Selectively Generating and Evaluating Data to Support Chemical Decision-Making

Chemical data needs and data quality requirements can depend in part on how a chemical is used. It is possible in some cases to identify a limited set of data needs that will support decision making. For example, the U.S. EPA's Design for the Environment (DfE) Formulator Partnership Program identifies cleaning products that are best in their class with respect to human health and environmental fate and toxicity (environmental preferability).[67] Products that qualify are allowed to carry the DfE logo – a source of positive recognition the marketplace. DfE has reviewed hundreds of cleaning product formulations, and evaluates ingredients within categories based on chemical class (i.e., solvents, surfactants, fragrances, etc.) and functional use (i.e. cleaning).

DfE identifies both characteristics of concern and preferred or "sustainable" characteristics of ingredients based on their functional use. The Formulator Program was initially offered at no cost to product formulators and once word got out, interest increased rapidly beyond the capacity of the small DfE Program. In response, DfE did two things. While maintaining oversight of qualification for the logo (still at no cost for qualifying products), DfE outsourced the ingredient and product profiling to a 3rd party, which provides the service for a fee (currently NSF International). It also funded the CleanGredients™ project to address formulator requests for help identifying "greener" raw materials. CleanGredients™ is an online platform that helps:

- Manufacturers of cleaning product ingredients to showcase their chemicals with environmentally preferable human and environmental health attributes, and
- Cleaning product formulators to identify ingredients for use in their environmentally preferable products[68]

The CleanGredients™ platform is both a benchmarking tool and an information resource. Typically, ingredients must meet one set of criteria to be listed in CleanGredients™ and a more stringent set of criteria to meet the DfE Screen. Ingredients that meet the DfE screen are recommended for use in products for which the manufacturer sees DfE recognition. The CleanGredients™ criteria are defined by multi-stakeholder Technical Advisory Committees (TACs) composed of raw material suppliers, product formulators, and individuals from government and NGOs. DfE participates in all of the TAC meetings, and also defines the DfE Screen criteria – the higher bar – for each ingredient class. While the DfE Screen criteria are determined by DfE, they are designed to harmonize with attributes and criteria developed by the TAC.

The point of the DfE Screen is to define the key attributes and criteria for use in discriminating between chemical raw materials by chemical class or functional use, i.e., comparing solvents to solvents and chelating agents to chelating agents, in order to identify those within a category with the most preferable characteristics for use in cleaning products.

The TAC first defined information requirements and divided them into tiers. Tier I attributes require certain test data and third party review. Tier I attributes for surfactants include rapid and complete biodegradability and aquatic toxicity. Data may be drawn from the literature and read-across data may be used where appropriate. However for biodegradability, it was determined that read-across data often did not adequately consider the extent of branching, which affects the rate of biodegradation. Data on Tier 2 attributes for surfactants are to be submitted if known but do not require new testing or third party review. Tier 3 attributes, submission of which is entirely voluntary, include such information as whether or not there is a lifecycle assessment for the chemical and whether or not it is bio-based. The set of attributes selected for inclusion in CleanGredients and in the DfE Screen are as follows:

Tier 1 Surfactant Attributes
Acute Aquatic Toxicity (Fish, Daphnia, Algae)
Biodegradability
Consideration of degradation products

Tier 2 Surfactant Attributes
Sensitization
Irritancy
Acute Mammalian Toxicity (Oral, Dermal)
VOC Content
Presence of alkyl phenol ethoxylates (APEs)

Tier 3 Surfactant Attributes
Life Cycle Assessments
Risk Assessments
Endocrine Disruption test data
Additional Aquatic Toxicity (Microtox, Chronic)
Other Product Features
Origin of Feedstock

The CleanGredients™ platform presents both validated (Tier I) and non-validated (Tier II) test data, identifies whether or not an ingredient meets the DfE Screen, and provides a platform for presenting ingredient information that is relevant to green product formulation. The approach is notable for using a collaborative multi-stakeholder process to develop its attributes and criteria. It facilitates more efficient communication between raw material suppliers and product formulators and leverages market forces by linking to product recognition by DfE. Costs of product review are decreased because already reviewed ingredients are publicly listed with validated information on key attributes and hence there is no need for additional testing or ingredient review.

The DfE approach is effective because it clearly defines a set of desirable attributes and criteria and the associated data needs for ingredients based on chemical class and functional use. A specific DfE Screen is developed for each class of ingredients. For example, for solvents, there is a strong focus on human health endpoints, with the specific data needs varying with the chemical class, e.g., alcohols, ethers, esters, etc. In contrast, for surfactants, the key attributes focus on environmental fate and toxicity. With key attributes and criteria to be considered in the review designated up front, raw material suppliers can prioritize data needs and avoid unnecessary costs associated with testing and validation for non-key test endpoints. This in turn helps product formulators who need the data for green product formulation. The program is also based on continual improvement, so that as more and more ingredients are successfully developed to meet the DfE Screen criteria, additional requirements may be set – raising the bar and helping to drive further development of greener chemicals.

Section 3: Some Current Sources of Chemical Hazard, Use and Exposure Information, and their Limitations

Data on Industrial Chemical Hazards: Current U.S. policy toward industrial chemicals,[69] embodied in the Toxic Substances Control Act of 1976 (TSCA), creates a number of significant barriers to the development of better information about chemical hazards. First, U.S. EPA is required under TSCA to review new chemicals prior to their manufacture. However – unlike virtually all other developed countries – TSCA does not require (or allow U.S. EPA to require) a minimum base set of data on a chemical's environmental fate and behavior, toxicity or ecotoxicity. Although U.S. EPA encourages such data to be included in the PMN, the great majority of PMNs do not.[70]

Second, government's ability to compel the generation of hazard information for chemicals already in commerce is also constrained: to require a company to test a chemical, U.S. EPA faces a classic Catch-22: it must already have substantial evidence of potential risk or high exposure to direct a company to develop information needed to determine whether there is actual risk.[71] These burdens are sufficiently high that, in the 30 years since TSCA was enacted, U.S. EPA has required testing for fewer than 200 chemicals.[72]

The magnitude of the hazard data gap for industrial chemicals was illuminated in a 1998 U.S. EPA report that found that 43 percent of the roughly 3,000 chemicals produced in annual quantities of one million pounds or more (so-called high production volume, or HPV, chemicals) had no publicly available screening-level hazard data, and only seven percent had a complete screening-level base set when measured against an internationally agreed minimum data set.[73]

These circumstances – large data gaps and limited regulatory authority – led U.S. EPA to launch the U.S. High Production Volume (HPV) Chemicals Challenge in 1998,[74] which enlists producers of HPV chemicals to voluntarily develop and make publicly available a "base set" of screening-level hazard information on their chemicals. The HPV Challenge is the only systematic effort by U.S. EPA to call for basic hazard data on a relatively large number of existing chemicals. Because it is voluntary, it also sidesteps the regulatory findings U.S. EPA must make to compel data development. However, for the same reason, U.S. EPA also has had limited recourse to ensure full participation by manufacturers or the timely submission and high quality of hazard data sets developed for HPV chemicals.[76]

Limitations to Data on Chemical Uses and Exposures: While the federal government does have a number of programs to collect information related to chemical uses, releases, and exposures, each has a number of significant limitations that preclude such programs from providing a comprehensive set of information to inform policy and regulation. This section describes several examples of current programs along with their limitations.

Reporting of chemical use information: For chemicals already in commerce, U.S. EPA requires reporting of limited information on how chemicals are used and the extent to which environmental releases or exposures to workers, consumers, or the environment may occur, and it does so infrequently. Under TSCA, such reporting can be required only of chemical manufacturers (and in some cases, processors), but not of companies that use chemicals, whether directly or as ingredients in products.

Routine but limited reporting of use and exposure information by manufacturers has just been initiated under U.S. EPA's Inventory Update Rule (IUR).[77] Beginning in the 2006 reporting cycle, "known or reasonably ascertainable" information is required of all manufacturers of non-exempt[78] chemicals in amounts of 25,000 pounds or more per year per site pertaining to the number of workers reasonably likely to be exposed to the chemical substance at the site, and the physical form(s) and the maximum concentration of the chemical substance as it leaves the submitter's possession.

For chemicals manufactured in amounts of 300,000 pounds or more per year per site,[79] additional information must be reported, to the extent it is "readily obtainable," on the number of downstream processing and use sites, numbers of workers reasonably likely

to be exposed to the chemical substance across all such sites, types of commercial and consumer uses, amounts in each use category, and maximum concentrations in commercial and consumer products.

Fewer than 10,000 chemicals are now covered by any reporting requirements and only a few thousand of them will be subject to the more extensive reporting that extends to downstream processing and use information. Reporting is required only once every five years and then only for a single reporting year. U.S. EPA's experience with past IUR reporting of production data (which used to occur every four years) shows that there is enormous fluctuation from one reporting cycle to the next that must reflect underlying changes in chemical use patterns,[80] which calls into question how accurate a picture U.S. EPA has as to actual manufacturing, use and exposure for industrial chemicals.

For new chemicals, Premanufacture Notifications (PMNs) that are required to be filed at least 90 days before commencing manufacture must include basic information on anticipated use, production volume, exposure and release – to the extent it is known or reasonably foreseeable by the submitter at the premanufacture stage. TSCA does not provide for any updating of that information once manufacture actually begins, outside of any IUR reporting to which the chemical may become subject.

Environmental release information: Generation or calculation of data on direct environmental releases and exposures takes place under a few programs at the federal level. Under the U.S. EPA's Toxics Release Inventory (TRI) Program, certain types of facilities are required to annually report measured or calculated quantities of each of about 650 designated chemicals that they release to air or water or manage in the form of wastes (including through disposal, treatment, recycling, or burning for energy recovery, either on- or off-site).[81] These facility-specific data are then made public. As with IUR reporting, however, the reporting thresholds have recently been raised; for most TRI chemicals, full reports detailing amounts and means of release or waste management, previously required for facilities releasing or handling more than 500 pounds annually, are now required only if more than 5,000 pounds are released or managed, as long as 2,000 pounds or less is released. Below the thresholds, only a certification is required, devoid of quantities or release/management information.[82]

Environmental monitoring: the federal government also conducts limited monitoring of chemicals in environmental media. For example, in recent years the U.S. Geological Survey's (USGS) Toxic Substances Hydrology Program[83] has pioneered the analysis of selected U.S. surface and ground waters for the presence of various types of chemicals, including industrial and agricultural chemicals, human pharmaceuticals, and ingredients used in personal care and formulated consumer products. USGS data show that dozens of such chemicals can routinely be detected in such watersheds, and are found in highest concentrations just downstream of wastewater treatment plants but are also present in more pristine waters.[84] As USGS points out, however, these data are often hard to interpret as water quality standards do not exist for most such chemicals and the nature and extent of their biological significance for both aquatic organisms and humans (through food chain and drinking water exposures) has yet to be determined.

Biomonitoring: Since 1999, through the Centers for Disease Control's National Health and Nutrition Examination Survey (NHANES), the federal government has measured the levels of a limited number of chemicals and their metabolites in samples of human blood

and urine every two years. The latest survey was published in 2005 and tested samples collected in 2001 and 2002 for 148 chemicals. While many of the chemicals included are either "historical" (for example, banned pesticides, PCBs) or unintentionally produced substances (for example, polycyclic aromatic hydrocarbons, dioxins), human biomonitoring for substances still in commerce (for example, phthalate esters, cadmium, mercury, a variety of pesticides) has increased in the more recent survey. Such biomonitoring represents the most direct evidence for, and a means of measuring, human exposure, but to date has focused on chemicals already. known to be hazardous and on chemicals that tend to bioaccumulate, which are only a subset of chemicals of potential health concern.

Section 4. More Databases and Sources of Information on Chemicals[85]

A. Resources to Identify Chemicals with Hazardous Characteristics

CA Proposition 65
www.oehha.ca.gov/prop65.html
"Prop 65" is a list of chemical that have been confirmed by the state of California to be carcinogens and or reproductive toxins. Chemicals are listed by name and by CAS #.

CA Toxic Air Contaminants List
www.arb.ca.gov/toxics/id/taclist.htm
California maintains a list of Toxic Air Contaminants (TACs) and a program for adding additional TACs.

National Toxicology Program Report on Carcinogens
ntp.niehs.nih.gov/ntp/roc/toc11.html
NTP maintains a list of chemicals that are carcinogens, likely carcinogens or probable carcinogens.

Toxics Release Inventory Resources (TRI).
www.epa.gov/tri/index.htm
TRI is a publicly available U.S. EPA database that contains information on toxic chemical releases and other waste management activities reported annually by certain covered industry groups as well as federal facilities.

Clean Air Act: Hazardous Air Pollutant List
www.epa.gov/ttn/atw/188polls.html and www.epa.gov/ttn/atw/pollutants/atwsmod.html
U.S. Congress amended the federal Clean Air Act in 1990 to address a large number of air pollutants that are known to cause or may reasonably be anticipated to cause adverse effects to human health or adverse environmental effects. 188 specific pollutants and chemical groups were initially identified as hazardous air pollutants (HAPs), and the list has been modified over time.

SARA/EPCRA 313 List (TRI)
www.epa.gov/tri/chemical/index.htm
Section 313 of the Emergency Planning and Community Right to Know Act (EPCRA) of 1986 was enacted to facilitate emergency planning, to minimize the effects of potential toxic chemical accidents, and to provide the public with information on releases of toxic chemicals in their communities. The current list contains 581 individually listed chemicals and 30 chemical categories.

Clean Water Act Priority Pollutants List
oaspub.epa.gov/wqsdatabase/wqsi_epa_criteria.rep_parameter
Section 307 of the CWA defines a list of 126 priority pollutants for which the U.S. EPA must establish ambient water- quality criteria and effluent limitations

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)
www.epa.gov/ceppo/pubs/title3.pdf
List of over 800 chemicals from, Section 102 of CERCLA, Clean Water Act list of hazardous substances and priority pollutants (Section 211(b)(2)(a) or 307(a)), Any hazardous waste as defined under section 3001 of Resource Conservation and Recovery Act ; Clean Air Act list of hazardous air pollutants (HAPs) (section 112); Toxic Substances Control Act list of imminent hazards (Section 7)

Canadian Environmental Protection Act, 1999 (CEPA)
www.ec.gc.ca/CEPARegistry/subs_list/Toxicupdate.cfm
Under CEPA substances that are determined to be "toxic" are recommended for addition to the List of Toxic Substances (Schedule 1) of the Act.

EU Risk Phrase
ec.europa.eu/environment/dansub/consolidated_en.htm
Council Directive 67/548/EEC of 27 June 1967 on the approximation of laws, regulations and administrative provisions relating to the classification, packaging and labeling of dangerous substances. Annex I of the directive assigns Risk Phrases to chemical substances.

European Commission's Community Strategy for Endocrine Disrupters
http://ec.europa.eu/environment/endocrine/strategy/substances_en.htm#priority_list
The European Commission (EC) has sponsored 4 reports that evaluate a set of 553 substances selected by experts and stakeholders for assessment for endocrine disruption. Each report addresses a subset of the total set based on priorities such as whether the chemicals are persistent, bioaccumulating or High Production Volume chemicals and/or whether or not there is already regulatory control of the chemical.

WHO Water Quality Guidelines
www.who.int/water_sanitation_health/dwq/gdwq3/en/
International standards for selected chemical, microbiology and other parameters.

The Danish List of Undesirable Substances (LOUS)
www.mst.dk/homepage/default.asp?Sub=http://glwww.mst.dk/udgiv/publications/2004/87-7614-477-1/html/kolofon_eng.htm
The Danish List of Undesirable Substances is a list of chemicals of concern that the government believes should be avoided to the extent feasible in commerce. Using a systematic analysis, substances are selected automatically if they meet some clear and defined criteria, eg. problematic classifications, because they are under suspicion for being PBT/vPvB (Persistent, Bioaccumulative, Toxic/very Persistent, very Bioaccumulative) or endocrine-disrupting.

International Agency for Research on Cancer (IARC)
monographs.iarc.fr/index.php
IARC Monographs are the result of interdisciplinary working groups of expert scientists who review published studies and evaluate the weight of the evidence that an agent can increase the risk of cancer. Since 1971, more than 900 agents have been evaluated, of which approximately 400 have been identified as carcinogenic or potentially carcinogenic to humans.

National Institute for Occupational Safety and Health (NIOSH) Carcinogen List
www.cdc.gov/niosh/npotocca.html
NIOSH maintains a list of substances considered to be potential occupational carcinogens.

Occupational Safety and Health Administration (OSHA)
www.osha.gov
OSHA maintains a list of potential carcinogens. In addition OSHA sets enforceable permissible exposure limits (PELS) to protect workers against the health effects of exposure to hazardous substances.

U.S. EPA Water Disinfection By-Products with Carcinogenicity Estimates (DBPCAN)
www.epa.gov/ncct/dsstox/sdf_dbpcan.html
The DBPCAN database contains predicted estimates of carcinogenic potential for 209 chemicals detected in finished drinking water samples having undergone water disinfection treatment.

PBT Profiler
www.pbtprofiler.net/
U.S. EPA has developed an evaluation tool, the PBT Profiler, which predicts PBT potential of chemicals. The PBT Profiler estimates environmental persistence (P), bioconcentration potential (B), and aquatic toxicity (T) of discrete chemicals based on their molecular structure. It is Internet-based and there is no cost for use.

Health & Safety Executive (HSE) Direct
www.hse.gov.uk/legislation/services.htm
The Health and Safety Commission is responsible for health and safety regulation in Great Britain. hsedirect is a subscription service providing full-text access to the full range of HSE guidance publications as well as the consolidated and annotated text of health and safety legislation and recent legislative changes. It includes a 'Stop- Press' feature which informs the user of very recent legislative changes. hsedirect provides full-text versions of: HSE Legal Services material (Approved Codes of Practice, 'L' series, Codes of Practice and HSR series); HSE forms; European Directives; Safety, Health and Environment cases; and summaries of British Standards. Users can choose from either 'day ticket' access or regular subscription options.

B. Chemical Toxicity Data

Ecological Structure Activity Relationships (EcoSAR)
http://www.epa.gov/oppt/newchems/tools/21ecosar.htm
EcoSAR is a personal computer software program that is used to estimate the toxicity of chemicals that may enter surface waters. The program predicts the toxicity of industrial chemicals to aquatic organisms such as fish, invertebrates, and algae by using Structure Activity Relationships (SARs). The program estimates a chemical's acute (short-term) toxicity and, when available, chronic (long-term or delayed) toxicity.

Ecotox Database
http://cfpub.epa.gov/ecotox/
The Ecotox database provides single chemical toxicity information for aquatic and terrestial life. This is a useful tool for evaluating the impact of chemicals on the environment.

U.S. EPA Triage Database
http://www.epa.gov/8e_triag/
Triage is a searchable database of scientific studies on the health and environmental effects of toxic chemicals related to Section 8(e) of TSCA.

Integrated Risk Information System (IRIS) Database
http://www.epa.gov/iris/
IRIS is a database of human health effects that may result from exposure to various substances found in the environment. IRIS was initially developed for U.S. EPA staff in response to a growing demand for consistent information on chemical substances for use in risk assessments, decision-making and regulatory activities.

Toxic Substances Control Act Test Submissions (TSCATS)
http://www.rtknet.org/tsc/
TSCATS is an online index to unpublished, nonconfidential studies covering chemical testing results and adverse effects of chemicals on health and ecological systems. The studies are submitted by U.S. industry to U.S. EPA under several sections of the Toxic Substance Control Act (TSCA). There are four types of documents in the database: Section 4 chemical testing results, Section 8(d) health and safety studies, Section 8(e) substantial risk of injury to health or the environment notices, and voluntary documents submitted to U.S. EPA known as a For Your Information (FYI) notice.

High Production Volume Information System (HPVIS)
www.epa.gov/hpvis/index.html
HPVIS provides access to technical health and environmental effect information on chemicals that are manufactured or imported to US in volumes greater than 1MM lbs per year. Information in this database are submitted through HPV Challenge Program. HPVIS allows users to search for summary information, test plans, and data on high production volume chemicals.

Chemical Fact Sheets
www.epa.gov/chemfact/
The U.S. EPA's Office of Pollution Prevention and Toxics developed Chemical Fact sheets to summarize information on a particular chemical including exposure, environment and human health hazard, environmental fate, regulatory information, and whom to contact for additional information.

TOXNET
toxnet.nlm.nih.gov/
TOXNET is a series of databases on chemical toxicity hosted by the National Institutes of Medicine, which allows multiple searching options. The databases include: ChemIDplus, HSDB, Toxline, CCRIS, DART, GENETOX, IRIS, ITER, LactMed, Multi-Database, TRI, Haz-Map, Household Products, and TOXMAP.

Enhanced ToxSeek Meta-Search Engine and Clustering Tool
toxseek.nlm.nih.gov
ToxSeek is an NLM metasearch engine and clustering tool that enables the simultaneous searching of many different toxicology and environmental health information databases and web sites. This tool includes 59 databases including the TOXNET Search tool, as well as information sources from NLM, NIH, U.S. Government, International and other sources.

Library of Chemical Information
www.cfsan.fda.gov/~dms/chemist.html
The Library of Chemical information is maintained by the US Food and Drug Administration's Center for Food Safety and Applied Nutrition and is an excellent database for multiple classes of chemicals including food additives, cosmetics, color additives, pesticides and other chemicals.

Fragrance or Flavor Components Database
rifm.org/nd/Login.cfm
The Research Institute on Fragrance Materials maintains the most comprehensive worldwide source database on fragrance/flavor components including acute aquatic toxicity, biodegradation data, human health issues, e.g. carcinogenesis, sensitization. A password is required to access the database.

The Scorecard Database
www.scorecard.org/
The Scorecard Database provides information on chemical releases, risk prioritization of substances and other relevant information for chemicals and facilities.

International Chemical Safety Cards (ICSCs)
http://www.cdc.gov/niosh/ipcs/icstart.html
ICSCs are made available by the National Institute for Occupational Safety and Health. They summarize safety information in 8 languages and indexed in a variety of ways.

CleanGredients™ Database
www.cleangredients.org/
CleanGredients™ is being developed as an online database of cleaning product ingredients "A one–stop–shop for green formulation". The database contains physical chemical data, MSDSs, technical datasheets, and environmental and human health hazard data.

Cefas Building, Assessing and Standardising Information on the Atlantic Coasts (BASIC) Toxicity database
www.cefas.co.uk/basic/toxdata.htm
The BASIC toxicity database contains information on the aquatic toxicity of a number of hazardous substances. In many cases, the information is given as some sort of "safe" level such as UK Environmental Quality Standards (EQS's) or the national/international equivalent. For substances for which no such levels have been set, a brief literature review was performed in order to produce an environmental hazard/risk assessment.

PubMed®Medline®
www.pubmed.gov
MEDLINE contains bibliographic citations and author abstracts from more than 5,000 biomedical journals published in the United States and 80 other countries. The database contains over 15 million citations dating back to the mid-1950's.

Chemical Backgrounders
www.nsc.org/library/chemical/index.htm
Chemical Backgrounders is maintained by the National Safety Council and contains chemical descriptors including properties, health effects, exposure and regulatory information.

Managerial Technologies Corp (MTC) Safety Library
www.mtclibraries.com/lib/resource_locate.php?id=sl26949
The safety professional's online library, covering topics related to safety, safety management, ergonomics, fleet and environment. The Safety Library contains over 40 environmental databases and over 70 databases of chemical profiles. Subscription is required.

Chemistry Links for Chemists
www.liv.ac.uk/Chemistry/Links/refdatabases.html
This website contains a list of 105 different databases from US and around the world.

Environmental Health and Safety Freeware
www.ehsfreeware.com/cheminfo.htm
This website contains a list of almost 100 different EH&S databases that are all freeware plus several commercial databases.

Ariel™ WebInsight
www.3ecompany.com/ariel_webinsight.com
Ariel™ WebInsight is a subscription-based online compliance management tool with an easy-to-use interface and robust search, query, reporting and analysis features. The tool provides access to current, accurate, comprehensive global regulatory content containing more than 700 searchable regulatory lists covering more than 75 countries; full-text repositories of legislation, international transportation data, as well as chemical property and hazard data.

Infochems Database
www.infochems.com/main/default.asp
Commercial service that provides chemical information for US and Global regulations; contains chemical, physical and toxicity information. The database includes generic chemical names and commercial chemical names.

American Conference of Governmental Industrial Hygienists (ACGIH)
www.acgih.org
ACGIH maintains annual editions of the TLVs® and BEIs® which are used worldwide as a guide for evaluation and control of workplace exposures to chemical substances and physical agents. Threshold Limit Value (TLV®) occupational exposure guidelines are recommended for more than 700 chemical substances and physical agents. There are more than 50 Biological Exposure Indices (BEIs®) that cover more than 80 chemical substances.

The Canadian Centre for Occupational Health and Safety (CCOHS's Databases)
10Hccinfoweb.ccohs.ca/
CCOHS's Web Information, a paid service, provides simple, one-step searching across many database collections, including:

- MSDS is a comprehensive database of more than 310,000 Material Safety Data Sheets, obtained directly from 2,000 North American manufacturers and suppliers.
- Management Service is designed to help you manage your occupational health and safety responsibilities relating to MSDSs and WHMIS requirements.
- CHEMINFO provides chemical health and safety information for more than 1,300 important workplace chemicals.
- CHEMpendium™ regularly updated information on the transport of hazardous materials, chemical toxicity, industrial chemicals and environmental contaminants, workplace safety, regulatory compliance, WHMIS and Right-to-Know, Canada's DLS and NDSL, Emergency response.
- RTECS® helps you find critical toxicological information with citations on over 160,000 chemical substances from more than 2,500 sources. This database is also available in French and Spanish.
- OSH References allows you to search over 300,000 summaries. This collection of bibliographic databases provides you with convenient access to international sources of OSH-related information including OSHline®, NIOSHTIC®, NIOSHTIC-2, HSELINE, CISILO, and Canadiana.
- Canadian enviroOSH Legislation plus Standards is a comprehensive, easy to search compilation of the full text of the Canadian health, safety and environmental legislation, critical guidelines and codes of practice from all jurisdictions and regular updates, with amendments highlighted.

CrossFire Beilstein
www.mdl.com/products/knowledge/crossfire_beilstein/
The CrossFire Beilstein database is the world's largest compilation of chemical facts. This database indexes three primary data domains: substances, reactions and literature. The substance domain stores structural information with all associated facts and literature references, including chemical, physical and bioactivity data. The reaction domain details the preparation of substances, enabling scientists to investigate specific reaction pathways with reaction search queries. The literature domain includes citations, titles and abstracts, which are hyperlinked to the substance and reaction domain entries. It contains over 320 million experimental data, over 10 million reactions and data indexed from over 175 journals.

European Chemical Substances Information System (ESIS)
ecb.jrc.it/esis/

ESIS is an IT system which provides you with information on chemicals including:

- EINECS (European Inventory of Existing Commercial chemical Substances),
- ELINCS (European List of Notified Chemical Substances),
- NLP (No-Longer Polymers),
- HPVCs (High Production Volume Chemicals) and LPVCs (Low Production Volume Chemicals), including EU Producers/Importers lists,
- C&L (Classification and Labelling), Risk and Safety Phrases, Danger etc...,
- IUCLID (International Uniform ChemicaL Information Database) Chemical Data Sheets, IUCLID Export Files, OECD-IUCLID Export Files, EUSES Export Files,
- Priority Lists, Risk Assessment process and tracking system in relation to Council Regulation (EEC) 793/93 also known as Existing Substances Regulation (ESR).

eChemPortal
webnet3.oecd.org/eChemPortal/Home.aspx
The eChemPortal is an effort of the Organisation for Economic Co-operation and Development (OECD) in collaboration with the European Commission, the United States, Canada, Japan, the International Council of Chemical Associations, the Business and Industry Advisory Committee, the World Health Organization's International Program on Chemical Safety, the United Nations Environment Programme on Chemicals and environmental non-governmental organizations.

eChemPortal offers free public access to information on properties and effects of chemical substances. It is an integrated system that allows users to simultaneously search multiple databases prepared for government chemical and review programs around the world.

The current version of eChemPortal offers the possibility to retrieve information by searching on chemical names or CAS Registry numbers. The second phase will incorporate additional search options to retrieve and compile specific hazard or other effects data (for example, toxicity endpoints) from the participating databases.

At this time, the following data bases participate in eChemPortalTM * European chemical Substances Information System (ESIS, European Commission), * CHRIP (Japan's Information on Biodegradation and Bioconcentration of the Existing Chemical Substances in the Chemical Risk information platform), * OECD HPV Database (OECD), * Screening Information Datasets for High Volume Production Chemicals (UNEP Chemicals), * HPVIS (U.S. Environmental Protection Agency), * INCHEM (IPCS).

C. Exposure Assessment Tools

Environmental Fate Database (EFDB)
www.syrres.com/eSc/efdb.htm
EFDB has been developed in support of U.S. EPA. It is comprised of DATALOG and BIOLOG, which contain environmental fate, microbial toxicity and biodegradation data.

U.S. EPA's Envirgreen Chemistry Fate Database For Actives
cfpub.epa.gov/pfate/home.cfm
This database includes information on the environmental fate of pesticide actives.
U.S. EPA's OPPT Exposure Assessment Tools and Models
www.epa.gov/opptintr/exposure/index.htm
The Office of Pollution Prevention and Toxics (OPPT) has developed a series of methods, databases, and predictive models to help in evaluating what happens to chemicals when they are used and released into the environment. These tools are intended to be used by scientists and engineers familiar with exposure assessment principles.

Greatest Potential for Human Exposure Report
http://www.hc-sc.gc.ca/ewh-semt/pubs/contaminants/existsub/exposure/index_e.html
Health Canada Proposal for Priority Setting for Existing Substances on the Domestic Substances List under the Canadian Environmental Protection Act, 1999: Greatest Potential for Human Exposure. This report describes a proposed priority setting process of existing substances in Canada. A stakeholder meeting was convened to discuss the Complex Exposure Model (comET).

D. Hazard and Risk Assessment Tools

International Uniform Chemical Information Database (IUCLID5)
ecb.jrc.it/iuclid5/
IUCLID5 is a software tool for entering and storing information on chemicals, as well as for preparing and submitting dossiers to fulfill legislation requirements. For the EU Chemicals Agency and Member States, it is the central data repository for all dossiers submitted, the basis for evaluating the risks of substances and requiring new information and the basis for restricting and authorizing the use of chemicals to manage risks. IUCLID data will comply with REACH, OECD, EU HPV Chemicals Program, US HPV Challenge Program, Japan Challenge Program, and EU Biocides.

Massachusetts Toxics Use Reduction Institute Pollution Prevention Options Analysis Tool (p2oasys).
www.turi.org/content/content/view/full/1125/
The Institute has developed P2OaSys to helps companies determine whether the Toxic Use Reduction (TUR) options they are considering may have unforeseen negative environmental, worker or public health impacts. P2OASys allows companies to assess the potential environmental, worker, and public health impacts of alternative technologies aimed at reducing toxics use. The goal is more comprehensive and systematic thinking about the potential hazards posed by current and alternative processes identified during the TUR planning process.

Report on the Advisory List for Self Classification of Dangerous Substances.
www.mst.dk/homepage/default.asp?Sub=http://www.mst.dk/udgiv/publications/2004/87-7614-477-1/html/default_eng.htm
The Danish EPA has developed an advisory list for self-classification of dangerous substances including 20,624 substances. The substances have been identified by means of QSAR models (Quantitative Structure-Activity Relationship) as having acute oral toxicity, sensitization, mutagenicity, carcinogenicity, and/or danger to the aquatic environment.

E. Safer Chemistry Design Tools

Sustainable Futures Program (SF)
www.epa.gov/oppt/newchems/pubs/sustainablefutures.htm
The SF program is an approach that encourages pollution prevention in new chemical development through the transfer of OPPT's chemical risk screening methodologies.

The Green Chemistry Expert System (GCES)
www.epa.gov/opptintr/greenchemistry/tools.html
GCES allows users to build a green chemical process, design a green chemical, or survey the field of green chemistry. The system is equally useful for new and existing chemicals and their synthetic processes. The GCES features are contained in five modules:

- Synthetic Methodology Assessment for Reduction Techniques (SMART)
- Green Synthetic Reactions
- Designing Safer Chemicals
- Green Solvents/Reaction Conditions
- Green Chemistry References

The Green Screen for Safer Chemicals (Green Screen)
http://www.cleanproduction.org/library/Green%20Screen%20Report.pdf
The Green Screen for Safer Chemicals is a method for assessing and benchmarking chemical alternatives based on their hazard characteristics developed by Clean Production Action. The Green Screen builds on the new chemicals assessment protocols developed by the U.S. EPA and adapted for comparing alternatives by the U.S. EPA Design for the Environment Program.

Alternatives Assessment Methodologies
www.turi.org
The Massachusetts Toxics Use Reduction Institute has developed an Alternatives Assessment Process Guidance for its analysis of substitutes to five chemicals in Massachusetts.

Safer Solvent Alternatives
www.irta.us
The Institute for Research and Technical Assistance (IRTA) identifies, develops, tests and demonstrates safer alternatives in cleaning applications, dry cleaning, paint stripping, coatings, adhesives, and lubricants.

Swedish Chemicals Inspectorate PRIO Program
www.kemi.se/templates/PRIOEngframes____4144.aspx
PRIO is a web-based tool intended to be used to preventively reduce risks to human health and the environment from chemicals. The aim of PRIO is to facilitate in the assessment of health and environmental risks of chemicals so that people who work as environmental managers, purchasers and product developers can identify the need for risk reduction.
To achieve this PRIO provides a guide for decision-making that can be used in setting risk reduction priorities.

Endnotes

[44]Note, the Science Advisory Panel Subcommittee reports are products of the Subcommittee that authored the report , not the entire Panel.

[45]This discussion is adapted and abridged from Denison, R.A. (2008) "Policy Options for Generating Information for Sound Chemicals Management," in Options for State Chemicals Policy Reform: A Resource Guide, Lowell Center for Sustainable Production, University of Massachusetts at Lowell, January 2008, pp. 35-68, available at www.chemicalspolicy.org/downloads/ OptionsforStateChemicalsPolicyReform.pdf

[46]For a more in-depth discussion of U.S. chemicals policy under the Toxic Substances Control Act (TSCA) and how it compares to that of the European Union (under its new REACH Regulation) and Canada under the Canadian Environmental Protection Act (CEPA), see Denison, R.A. (2007) Not That Innocent: A Comparative Analysis of Canadian, European Union and United States Policies on Industrial Chemicals (Environmental Defense Fund, Washington, DC), at www.environmentaldefense.org/go/chempolicyreport

[47]For a fuller discussion of data quality issues, including for data generated by industry and through the use of alternatives methods, see Appendix A of Denison, 2008, op. cit.
[48]Examples include new chemical notification regulatory requirements in Canada and the Organization for Economic Co-operation and Development's (OECD) Screening Information Date Set (SIDS) used in the voluntary HPV Challenge.

[49]A QSAR is a mathematical model that yields a quantitative estimate for a specific toxicological endpoint or other biological property for an untested chemical. QSARs are developed using a body of empirical data (termed a "training set") derived from analyzing or testing multiple chemicals for both a) physical-chemical properties that correlate to specific structural features, and b) toxicological endpoints or other biological properties of interest. The quantitative relationship between these two sets of properties for the tested chemicals is then expressed in the form of an algorithm. The algorithm can in turn be used to estimate values for toxicological or other biological properties of an untested chemical, based on the extent of similarity in its chemical structure and/or physical-chemical properties relative to those chemicals in the training set.

[50]"Read-across" (often also known as qualitative SAR) refers to methods in which values for an untested chemical are derived from tested chemicals, based on the extent of structural or functional similarity. The read across method is usually applied in either of two ways:

- Within a category of structurally and/or functionally related chemicals, only some of which have been tested. An example of such a category is a group of fatty acids that differ only in the length of an attached carbon chain (e.g., C2, C4, C6, etc.). If, for
- a given endpoint, empirical values are available for the C2 and C6 category members but not for the C4 member, reading
- across can be done across these three chemicals to estimate that the value for C4 falls between the values for C2 and C6.
- Used to provide an endpoint value for an untested chemical by simply adopting the value for a tested "analog" (also known as a "surrogate") chemical considered to be sufficiently closely related to it.

In both cases, testing-derived data for some chemicals are used to extrapolate, estimate or provide data for "related" chemicals that have not been directly tested.

[51]While expert judgment and the use of assumptions are not strictly to be viewed as sources of actual information, they effectively act as such and represent means of compensating for the lack of "hard" information. And they are widely used in practice where other information is not available, is considered too time-consuming, difficult or expensive to develop, etc. "Reasonable worst-case assumptions," for example, are frequently used by government in assessing chemicals for which few data are available.

[52]For a fuller discussion of principles that need to be applied to the use of alternative methods to traditional chemical testing, and a discussion of specific limitations of each method or approach, see Denison, R.A. and Balbus, J.M. "Environmental Defense Perspective on Integrated Approaches to Chemical Testing and Assessment," presented at the 39th Joint Meeting of the Chemicals Committee and the Working Party on Chemicals, Pesticides and Biotechnology, Organization for Economic Cooperation and Development, 15-17 February 2006, available at www.oecd.org/dataoecd/19/34/36286018.pdf.

[53]See EPA's guidance documents for the U.S. High Production Volume (HPV) Chemical Challenge, at www.epa.gov/chemrtk/pubs/general/guidocs.htm; and OECD's Manual for Investigation of HPV Chemicals for its SIDS Program, at www.oecd.org/document/7/0,2340,en_2649_34379_1947463_1_1_1_1,00.html.

[54]See Canada's New Substances Notification Regulations, Guidelines for the Notification and Testing of New Substances: Chemicals and Polymers, Pursuant to Section 69 of the Canadian Environmental Protection Act, 1999. Co-published by Environment Canada and Health Canada. Version 2005 – EPS M-688, Section 8, at www.ec.gc.ca/substances/nsb/pdf/cpguidem688.pdf; and the European Union's REACH Regulation, Annex XI, p. 371, at eur-lex.europa.eu/LexUriServ/site/en/oj/2006/l_396/l_39620061230en00010849.pdf. REACH stands for Registration, Evaluation, Authorization and Restriction of Chemicals.

[55]U.S. Environmental Protection Agency, Overview: Office of Pollution Prevention and Toxics Programs, January 2007, prepared by OPPT ("OPPT Overview, 2007"), pp. 7-8, at www.epa.gov/oppt/pubs/oppt101c2.pdf.

[56]In order of highest to lowest confidence, the sources included: 1) acceptable assessments of international or national agencies and secondary reviews; 2) original study accounts of empirical tests; 3) predictions of QSAR models, information on chemical substructures of concern, and analogue or surrogate chemicals. See Health Canada, Proposed Integrated Framework for the Health-related Components of Categorization of the Domestic Substances List under CEPA 1999, June 2005, Part C, p. 24, at www.hc-sc.gc.ca/ewh-semt/contaminants/existsub/categor/publi-comment/index_e.html.

[57]Syracuse Research Corporation, "Flame Retardant Alternatives," study conducted for the Washington State Departments of Ecology and Health, February 2006, available at www.ecy.wa.gov/programs/eap/pbt/pbde/docs/flameRetard.pdf.

[58]For a fuller discussion of the limitations of exposure information and their policy implications, see Denison, R.A. "Environmental Defense's perspective on policy issues related to exposure assessment," in OECD Series On Testing And Assessment, No. 51, Approaches to Exposure Assessment in OECD Member Countries: Report from the Policy Dialogue on Exposure Assessment in June 2005, Chemicals Committee, Organization for Economic Cooperation and Development, p. 109, available at http://appli1.oecd.org/olis/2006doc.nsf/linkto/ENV-JM-MONO(2006)5.

[59]An example of the former is REACH, under which "substance-tailored exposure-driven testing" is available for tests involved the use of laboratory animals; the waiver is available to any registrant that can demonstrate that exposure to a chemical is low. See REACH, op. cit., Article 13(1) and Annex XI, Section 3. An example of the latter is the OECD SIDS Program, under which even a hazardous chemical can be deemed a "low priority for further work," based on consideration of minimal information that suggests exposure is "anticipated to be low." See Denison, R.A. "Environmental Defense's perspective on policy issues related to exposure assessment," in OECD Series On Testing And Assessment, No. 51, Approaches to Exposure Assessment in OECD Member Countries: Report from the Policy Dialogue on Exposure Assessment in June 2005, Chemicals Committee, Organization for Economic Cooperation and Development, p. 109, at appli1.oecd.org/olis/2006doc.nsf/linkto/ENV-JM-MONO(2006)5.

[60]Under TSCA, full notice-and-comment rulemaking is usually required to impose reporting or testing requirements. Testing rules – in contrast to rules requiring the reporting of already existing information – require that government makes certain findings that a chemical poses significant potential risk or high exposure. EPA has indicated that a rule can take between 2 – 10 years to promulgate and requires significant resources. See Government Accountability Office, Report GAO-05-458, Chemical Regulation—Options Exist to Improve EPA's Ability to Assess Health Risks and Manage Its Chemical Review Program, 2005, p. 26, at www.gao.gov/new.items/d061032t.pdf. In the 30 years since TSCA was enacted, EPA has required testing

for fewer than 200 chemicals. Where EPA determines that additional data are needed to assess a new chemical, rather than promulgate a regulation, it typically negotiates with notifiers an agreement to conduct testing, which is known as a Voluntary Testing Action; about 300 such actions have been developed. See EPA, OPPT Overview, 2007, op. cit., p. 11.

[61]TSCA, Section 4; and CEPA, Sections 71 and 72.

[62]See www.epa.gov/oppt/newchems/pubs/sustainablefutures.htm.

[63]A field of specialization within economics known as information economics has demonstrated that access to information is a critical need if markets are to operate properly, and, conversely, that the lack of robust information can adversely affect market economies. See, e.g., papers by J.E. Stiglitz cited in Guth, J., Denison, R.A. and Sass, J. (2006) "Background Paper #5, Require Comprehensive Safety Data for All Chemicals," at www.louisvillecharter.org/paper.safetydata.shtml.

[64]See, for example, EPA's Environmentally Preferable Purchasing (EPP) website at http://www.epa.gov/epp/pubs/about/about.htm

[65]See Department of Ecology website, www.ecy.wa.gov/programs/eap/pbt/pbtfaq.html.

[66]See Department of Environmental Protection website at www.maine.gov/dep/mercury/products.htm.

[67]http://www.epa.gov/dfe/pubs/projects/formulat/index.htm

[68]http://www.cleangredients.org

[69]Industrial chemicals, regulated under TSCA, typically exclude chemicals used only as pharmaceuticals, cosmetic ingredients, pesticides or food additives, which are regulated under other statutes. The term is not intended to mean that such chemicals are used only in industry; many "industrial chemicals" are also present in consumer products. Except where otherwise noted, this section's use of the term "chemical" will typically refer to industrial chemicals.

[70]According to EPA: 67% of PMNs contain no test data; 85% of PMNs contain no health data; and more than 95% of PMNs contain no ecotoxicity data.
The first two statistics are from U.S. Environmental Protection Agency, Overview: Office of Pollution Prevention and Toxics Programs, January 2007, prepared by OPPT ("OPPT Overview, 2007"), p. 8, at www.epa.gov/oppt/pubs/oppt101c2.pdf. The third statistic is from EPA, OPPT, Draft Q&A for the New Chemicals Program, undated, answer to Question 118-5, at www.epa.gov/opptintr/newchems/pubs/qanda-newchems.pdf.

[71]EPA must also affirmatively demonstrate that insufficient data exist and that testing is needed to provide the data. To make the requisite findings, EPA often must first issue information reporting regulations under §§8(a) and 8(d) to determine whether sufficient data exist, whether substantial production is occurring and whether significant exposure is likely. To develop and issue such rules can take several years or more and place significant strain on limited EPA resources.

[72]EPA, OPPT Overview, 2007, op. cit., p. 4

[73]EPA's 1998 Data Availability Study is at www.epa.gov/chemrtk/pubs/general/hazchem.htm. The undertaking of that study and the launch of the HPV Challenge were spurred by a 1997 report, Toxic Ignorance, published by Environmental Defense Fund, which examined 100 HPV chemicals and found that more than 70% of them lacked publicly available data sufficient to conduct even a screening-level hazard assessment. Toxic Ignorance and other Environmental Defense Fund reports and information on the HPV Challenge is at www.environmentaldefense.org/subissue.cfm?subissue=14. The benchmark used to measure how "complete" available data are is the OECD's SIDS – see endnote 12.

[74]See EPA's HPV Challenge web site, at www.epa.gov/chemrtk/index.htm.

[75]The base set selected for the HPV Challenge is based on the SIDS, or Screening Information Data Set, developed by the Chemicals Committee of the Organization for Economic Cooperation and Development (OECD). For a list of the data elements, see EPA's program guidance document, "Determining the Adequacy of Existing Data," Appendix A, at www.epa.gov/chemrtk/pubs/general/datadfin.htm.

[76]For a full description of the HPV Challenge and what it has and has not accomplished, see Denison, R.A., High Hopes, Low Marks: A final report card on the High Production Volume Chemical Challenge, July 2007, at www.environmentaldefense.org/hpvreportcard

[77]See EPA, TSCA Inventory Update Rule Amendments, Federal Register, 7 January 2003, Vol. 68, No. 4, pp. 847-906, at www.epa.gov/fedrgstr/EPA-TOX/2003/January/Day-07/t32909.htm.

[78]Certain chemicals on the TSCA Inventory are fully or partially exempted from IUR reporting. Full exemptions apply to most polymers, and also to chemicals that are: produced in small quantities for research and development; imported as part of an article; impurities, byproducts (under certain circumstances), or non-isolated intermediates; and manufactured by a small manufacturer as defined in the regulations. Partial reporting exemptions apply to certain petroleum processing streams, other chemicals deemed to be of "low current interest" and specifically listed in the regulations, and inorganic chemicals (the latter will be subject to full reporting starting in 2011). See EPA, "Questions and Answers for Reporting for the 2006 Partial Updating of the TSCA Chemical Inventory Database," answers to questions 30-37, at www.epa.gov/opptintr/iur/pubs/guidance_qanda.pdf.

[79]This quantity was chosen to cover HPV chemicals, which are produced in amounts, aggregated across all manufacturers, of one million pounds per year or more

[80]USEPA, National Pollution Prevention and Toxics Advisory Committee (NPPTAC), Broader Issues Work Group, "Initial Thought-Starter: How can EPA more efficiently identify potential risks and facilitate risk reduction decisions for non-HPV existing chemicals?" Draft dated October 6, 2005, pp. 3-4, at www.epa.gov/oppt/npptac/pubs/finaldraftnonhpvpaper051006.pdf; and Environmental Defense's comments on Proposed Rule, TSCA Inventory Update Reporting Revisions (70 Fed. Reg. 3658, 26 January 2005), Docket ID No. EPA-HQ-OPPT-2004-0106, accessible at www.regulations.gov (search for docket number).

[81]See USEPA, "Toxics Release Inventory Reporting, Year 2005 Public Data Release, Summary of Key Findings," pp. 1-2, at www.epa.gov/tri/tridata/tri05/pdfs/Key_Findings.pdf.

[82]For 20 PBT chemicals, full reporting was previously required at any quantity of release or waste management; now, only the certification is required for facilities that manage up to 500 pounds annually of such PBTs as long as there is no environmental release. See 71 Federal Register 76937 (December 22, 2006), at www.epa.gov/fedrgstr/EPA-TRI/2006/December/Day-22/tri21958.htm; and OMBWatch, Against the Public's Will, December 2006, p. 3, at www.ombwatch.org/info/TRICommentsReport.pdf. More recently, President Bush signed an Executive Order that would likely have the effect of exempting federal facilities from TRI reporting. While federal facility reporting is not required by the law that established the TRI, Clinton-era Executive Orders extended the requirement to such facilities. On January 26, 2007, President Bush signed a new Executive Order that has the effect of rescinding this requirement, although final resolution is awaiting clarifying guidance to be issued by the Council on Environmental Quality. See OMBWatch, "Congress, White House Going in Opposite Directions on TRI," February 21, 2007, at www.ombwatch.org/article/articleview/3729/1/1?TopicID=1

[83]See http://toxics.usgs.gov/about.html.

[84]See http://toxics.usgs.gov/highlights/pharm_watershed/ for examples of recent USGS studies.

[85]This summary of databases and sources of information was adapted from a book chapter by Heine. L.G. and McGrath, T. 2008 (in press), "Tools and Strategies for Greening Chemical Inventories in Small Businesses," in Green Chemistry Metrics, edited by A. Lapkin and D. Constable. Blackwell Publishing. Oxford, UK.

Appendix D: Advancing Green Chemistry and Engineering through Alternatives Assessment[86]

Introduction

The goal of alternatives assessment is to identify a variety of possible alternatives to an existing process or product and to choose among them with the idea that the ultimate choice will be "greener" (i.e., more health- and environmentally protective) than the other choices or current practice. Alternatives assessment is thus a comparative process intended to generate safer or less-toxic products and practices. Achieving relatively greater safety depends on judgments about a variety of factors, which may include: relative exposures, relative toxicities, relative environmental impacts, as well as life cycle, social and economic considerations.

Goals of this Subcommittee

This subcommittee will address the role of "technology alternatives assessment" in advancing the contributions of green chemistry and engineering to the following key public policy questions:

1. How can green chemistry and engineering be used to develop products, processes, and approaches that are safer than those associated with the manufacturing, use, and disposal of existing technologies?

2. What effective alternatives to existing technologies could be adopted or developed to achieve equal or better functionality at lower risk, and possibly lower costs, representing a more socially-optimal balance of risks, benefits, and costs?

3. What incentives could be used to promote the development and/or adoption of alternative technologies?

In addressing environmental and public health risks, the subcommittee will depart from the traditional practice of undertaking a detailed risk assessment,[87] followed by risk management decisions – used in many regulatory contexts – in which the risk of a specific chemical or technology is often characterized to the fullest degree possible before risk management decisions are made about the introduction or continued use of that chemical or technology.

With a focus on green chemistry and engineering, the analysis typically includes one or more of the components of a traditional risk assessment, but the focus is on comparing technology-based alternatives/options that (1) are available or (2) could be developed. That is, what is assessed are the relative utility/functionality (benefits), costs, hazards, exposures and/or risks of the alternatives, in order to discover or identify situations that provide win-win or win-win-win opportunities. Examples are (1) flame retarding fabrics in which not only alternative flame-retarding chemicals are considered, but also non-coated fabric using new weaving methods, which are more fire resistant or slow-burning, and (2) non-fibrous alternatives to asbestos.

The emphasis is to re-frame the public-policy question from "what are the definitive risks, benefits, and costs of an existing hazardous product, process or approach" to "what are alternative ways that exist or could be developed to achieve equal or better functionality, at lower risk and possibly cost, reflecting a more socially-optimal balance of risks, benefits and costs". This reframing would be informed by advances in green chemistry and engineering, and would more easily allow the assessment of the relative risks, relative benefits and relative costs of alternative technological options.

Risk Analysis and Alternatives Assessment

Risk analysis is viewed by some as a competing paradigm to alternatives assessment. This view reflects discontent relating to, among other things, the slow pace, limited scope and "paralysis by analysis" of traditional risk assessment as it has been institutionalized in the regulatory application of setting standards limiting exposure to individual chemicals.[88] Those who take exception to a risk-based approach believe the appropriate focus of alternatives assessment should be on reducing inherent hazard, a cornerstone of the principles of green chemistry. From this perspective, the primary goal of alternatives assessment should be to identify and use an alternative chemical or non-chemical approach that is less hazardous to begin with.

Proponents of risk analysis as an intellectual discipline argue that it includes a variety of tools – data-based, expert judgment-based, both qualitative and quantitative – that can assist in the decision-making process of alternatives assessment. Risk analysis, they argue, can add scientific rigor to the alternatives assessment.

In this appendix, we discuss a variety of approaches to alternatives assessment that differ not only in the extent to which they focus on hazard or risk, but also with regard to their purpose, scope and other features. The aim is to illustrate through real-world examples a range of alternatives assessments that has been undertaken.

Examples of Programs that Use Alternatives Assessment to Advance Green Chemistry and Engineering

Table 1 compares a number of alternatives assessment programs against potential government intervention options associated with either supply or demand. Demand side interventions include government policy, regulations and other mandated activities that result in the generation of information or assessment of alternatives. Supply side interventions include education, institutional funding and economic or other incentives. While some supply side incentives such as purchasing preferences by government agencies can be mandated, they typically do not involve enforced compliance by companies who manufacture products. As such, laying out examples of alternatives assessment programs against the type of interventions that enabled them allows us to better understand how the various interventions function and what gaps are filled through different program models.

Of the seven program examples, six of them are weighted toward the supply side and are based on voluntary initiatives to identify safer and "greener" alternatives for selection by informed users. These include the U.S. EPA Design for the Environment (DfE) Flame Retardancy Partnership, the DfE Formulator Program, the Green Screen for Safer Chemicals (which builds on the DfE Partnership work), SC Johnson's GreenList®, CleanGredients™

(which builds on DfE's Formulator program), and the City of San Francisco's procurement program. The one example of a regulatory-focused technology option analysis is the demonstration of viable alternatives to solvent cleaners containing volatile organic compounds (VOCs). A brief summary of each program is provided below.

Example 1

The U.S. EPA's Design for the Environment Program (DfE) is one of its most valued partnership programs. DfE compares human health and environmental risks, and considers the performance and cost of existing and alternative products, processes and practices. The DfE Program promotes pollution prevention and other risk reduction activities in industrial sectors. To accomplish this mission:

- DfE forms partnerships with industry and other interested parties to develop information on environmental and human health impacts, performance, and cost of cleaner technologies and approaches.
- DfE disseminates information to help businesses design and redesign cost-effective products and processes that are cleaner and safer for workers and the public[89] .

Through partnerships U.S. EPA's DfE supports organizations in gathering and assessing information that they may not be able to gather independently – whether due to cost or because the information is considered proprietary. Chemical manufacturers share proprietary formulations with DfE through these voluntary partnerships because of the way the hazard information is handled and presented. DfE receives full ingredient disclosure and makes the results of the hazard assessments publicly accessible but protects proprietary formulation information by not revealing exact percentages of constituents and masking the identity of certain proprietary chemicals.

A good example of a successful DfE Partnership is the Furniture Flame Retardancy Partnership.[90] Penta-Bromo Diphenyl Ether (pentaBDE) was the primary flame retardant used in low density, flexible polyurethane furniture foam. Due to concerns over its use and the fact that the chemical was found widespread in the environment and in human tissue and breast milk, pentaBDE was voluntarily phased out of production by U.S. manufacturers in January 2004. The industry needed alternatives in order to meet furniture flame retardancy requirements, but did not have the human and environmental health and safety information needed in order to compare the alternatives. DfE worked with the furniture manufacturers, foam manufacturers, and flame retardant chemical suppliers along with governmental and environmental groups to evaluate possible alternatives.

Fourteen formulations of chemical alternatives were submitted to U.S. EPA under confidentiality and they were assessed based on numerous human health and ecotoxicity endpoints in addition to bioaccumulation potential and environmental persistence. They were also screened for potential exposure to workers, users and the aquatic environment and a distinction was made between flame retardants that are reactive and those that are added to the foam. Where data gaps existed, U.S. EPA experts used models and chemical analogs to estimate the hazard for a particular endpoint. The literature and test data reviews were published in the final report, "Environmentally Preferable Options for Furniture Fire Safety: Low Density Furniture Foam". In addition, each hazard endpoint was ranked with a concern level (High, Moderate, or Low) based on the criteria used by the U.S. EPA's New

Chemicals Program to rate the concern level of new chemicals submitted under the Toxic Substance Control Act (TSCA). DfE notes where values are based on experimental data and where values are estimated based on models or chemical analogs. A section of the table summarizing the screening results is presented below.

L = Low hazard concern
M[1] = Moderate hazard concern
H = High hazard concern
L, *M*[1], or *H* = Endpoint assigned using estimated values and professional judgment (Structure Activity Relationships)

N = No
Y = Yes
P = Yes for pure chemical

*Ongoing studies may result in a change in this endpoint
▲Persistent degradation products expected[2]

Company	Chemical	% in Formulation[3]	Human Health Effects							Ecotoxicity		Environmental		Potential Routes of Exposure							Reactive or Additive?
														Worker			General Population				
			Cancer Hazard	Skin Sensitizer	Reproductive	Developmental	Neurological	Systemic	Genotoxicity	Acute	Chronic	Persistence	Bioaccumulation	Inhalation	Dermal	Ingestion	Inhalation	Dermal	Ingestion	Aquatic	
Supresta	ABD53																				
	Tris(1,3-dichloro-2-propyl)Phosphate CAS # 13674-87-8		M	L	M	M	L	M	M	M	M	M	*L*	N	Y	Y	N	Y	Y	Y	Additive
Supresta	AC003																				
	Proprietary I Organic phosphate ester	92-99%	*L*	L	L	L	*L*	*M*	L	H	H	H	L	P	Y	Y	N	Y	Y	Y	Additive
	Triphenyl Phosphate CAS # 115-86-6	1-8%	*L*	L	L	L	L	M	L	H	*H*	L	L	Y	Y	Y	Y	Y	Y	Y	Additive
Supresta	AC073																				
	Triphenyl Phosphate CAS # 115-86-6	38-48%	*L*	L	L	L	L	M	L	H	*H*	L	L	Y	Y	Y	Y	Y	Y	Y	Additive
	Proprietary J Aryl phosphate	40-46%	*L*	*L*	L	*L*	L	M	M▲	*L*	*H*	L	*L*	Y	Y	Y	Y	Y	Y	Y	Additive
	Proprietary K Aryl phosphate	12-18%	*L*	*L*	*L*	*L*	*L*	*M*	*L*	*L*	*L*	*L*	*L*	P	Y	Y	N	Y	N	N	Additive
	Proprietary L Aryl phosphate	1-3%	*L*	*L*	*L*	*L*	*L*	*M*	*L*	*L*	*L*	*L*	*L*	P	Y	Y	N	Y	N	N	Additive
Supresta	Fyrol FR-2																				
	Tris(1,3-dichloro-2-propyl)phosphate CAS # 13674-87-8	99%	M	L	M	M	L	M	M	M	M	M	*L*	N	Y	Y	N	Y	Y	Y	Additive

[1] The moderate designation captures a broad range of concerns for hazard.
[2] More information on degradation products can be found in sections 4.1.1 and 5.1.
[3] Chemical concentrations are listed in descending order; only chemicals with concentrations greater than one percent in the formulation were evaluated.

U.S. EPA Furniture Flame Retardants Hazard Assessment Matrix

Example 2

The DfE Formulator Program encourages and assists product formulators in designing products with more positive environmental and health profiles than conventional products[91] . Manufacturers provide full ingredient disclosure to DfE and the DfE review team screens every ingredient in the product for potential human health and environmental effects based on currently available information, predictive models, and expert judgment. Chemicals are assessed for hazard overall and compared to other chemicals in their class (i.e. solvents to solvents). The product formulator is informed when hazards are identified and recommendations for alternatives are made. The formulator may then reformulate the product and submit the reformulation for review. If the product then contains only those ingredients that pose the least concern among chemicals in their class, the formulator is awarded recognition and is permitted to use the DfE logo on their product which affords the formulators positive market recognition. The program ensures that only the safest functional ingredients in each class are used.

DfE uses a continuum approach, pushing toward the ideal and raising the bar after each innovation. For example, once effective floor finishes were made without zinc, this expectation was applied to all floor finishes reviewed from that time forward. More information about the DfE review criteria, current Partners and recognized products is available on the DfE website[92] . By comparing chemicals based on functionality, the variable

of exposure is held constant and it is possible to use hazard assessment and continual improvement pressure to advance green chemistry.

Example 3

The Green Screen for Safer Chemicals (Green Screen) is a project of Clean Production Action, a non-governmental advocacy organization, and builds on the work of the DfE Flame Retardancy Partnership[93]. The DfE process did not rank the overall risk of the flame retardants; but rather provided the industry with screening information needed for comparing feasible alternatives for a particular functional use. However, there were many questions raised about how to compare and prioritize hazards in order to identify safer alternatives. None of the alternatives were determined to be perfectly "green" and therefore decision making involved considering tradeoffs between hazards. The Green Screen was designed to support decision making by businesses, governments, and individuals concerned with the risks posed by chemicals, to advance the development of green chemistry and to be a building block on the path to sustainable product design and sustainable material flows. The Green Screen defines four benchmarks on a path to safer chemicals, helping to provide perspective and to prioritize chemical alternatives based on hazards and combinations of hazards.

Benchmark 1 characterizes chemical products as "Avoid – Chemical of High Concern"; Benchmark 2 characterizes chemical products as "Use but Search for Safer Substitutes"; Benchmark 3 characterizes chemicals as "Use but Still Opportunity for Improvement"; and Benchmark 4 characterizes chemicals as "Prefer – Safer Chemical.

Each benchmark consists of a set of hazard criteria that encompass a combination of hazards and threshold values that a chemical along with its known and predicted breakdown products (environmental degradation products and metabolites) must pass in order to progress to the next benchmark. The criteria for each benchmark become increasingly more demanding for environmental and human health and safety, with Benchmark 4 representing the chemical with the least hazard. A publicly available case study was prepared describing the method and using the Green Screen to compare three flame retardants commonly used in television casings[94] .

Example 4

SC Johnson & Son, Inc. (SC Johnson) won a Presidential Green Chemistry Award in 2006 for their GreenList™ raw material evaluation system. The voluntary, patented system was developed to help SC Johnson reduce the environment and human health impact of their products beyond regulatory requirements, to set internal goals and to track their progress[95] . GreenList™ is a leading example of how hazard assessment can be tied to metrics for product and inventory evaluation.

GreenList™ was developed by SC Johnson by first dividing their chemical inventory into chemical classes, which include over 90% of their raw materials including surfactants, solvents, propellants, insecticides, resins, chelants, preservatives, waxes, fragrances, inorganic acids and bases, non-woven fabrics, and packaging. For each chemical class, a set of 4-7 key attributes were identified that can be used to differentiate a chemical from others in the same class. These may include biodegradability, aquatic toxicity, sensitization potential, renewable resource derived, etc. Criteria were then developed for each of the 4-7 key attributes in

order to rate a chemical as Best (3), Better (2), Acceptable (1) or as a Restricted Use Material (RUM) (0). For example, for the attribute, acute oral toxicity, an LD50>2000mg/kg will earn a chemical a 3, while an LD50 of 500-2000 mg/kg a 2, and LD50<500mg/kg a 1. The scores of the different attributes are then averaged to give an overall rating for a chemical within a chemical class.

The GreenList™ system also includes a "wild card". When a chemical is found on a regulatory list or is banned in a country, it is considered to have "Other Significant Concerns" (OSCs). OSCs are applied to the overall rating of a chemical – not its individual attributes – to reduce the overall score by one point.

Using this system, SC Johnson scores both raw materials and formulated products, tracks the score of all raw material purchases and measures the overall percentage of materials that fall into each rating category, i.e., considered "Best" or "RUM". The scores are used to set company goals, for public reporting and to reward formulators and chemists who use the system to improve the environmental and human health profiles of individual products and product lines.[96] Typically, individual product scores are not shared publicly.

Example 5

CleanGredients™ is an online database of institutional and industrial (I&I) raw materials appropriate for green product formulation that builds on the DfE Formulator Program[97]. CleanGredients™ aligns environmental and human health goals with the cleaning product industry's business objectives to support the formulation of products with human and environmental health benefits. CleanGredients™ is designed to:

- help formulators identify ingredients that have potential environmental and human health and safety benefits, and
- provide opportunity for manufacturers and producers of cleaning ingredients to showcase their ingredients with potential environmental and human health and safety benefits.

CleanGredients was launched with funding from the U.S. EPA DfE Program and aligns with the Formulator Program approach. The most common question asked by Formulator Partners was "where can I find a list of green ingredients that I can use to meet the DfE requirements". CleanGredients was developed in response to that question. It supports the identification of greener raw materials for use in greener product formulations which are tied to market recognition. DfE provides a set of screening criteria called the DfE Screen for each ingredient and/or chemical class (surfactants, solvents further divided into alcohols, esters, etc.) By listing raw materials on a publicly available platform and by identifying those that meet the DfE Screen, data acquisition and verification are leveraged and the cost of product review and verification is reduced. The first CleanGredients™ module was developed in 2006 for surfactants for hard surface and carpet cleaners, laundry and hand dish soap. As of April 2008, over 225 companies currently subscribe. Modules for solvents, chelating agents and fragrances are under development.

In order to list ingredients on CleanGredients™, full ingredient formulation information along with data for key attributes is submitted to a third party for review. There are two benchmarks associated with listing – the first benchmark qualifies ingredients for

listing. The second, higher benchmark is the DfE Screen. The reviews are carried out under confidentiality, providing verification of claims for the key ingredient attributes without compromising proprietary formulations. If valid data are not available in the literature, then test data must be provided.

Example 6

The San Francisco Department of the Environment employs two types of alternatives assessment for green procurement:

- Developing an in-depth alternatives assessment for a particular type of product (see Attachment #1: 2003 alternatives assessment for wood preservatives for various wood preservation needs)
- Identifying criteria to be used for City procurement of a particular type of product (see Attachment #2: General procurement criteria and Attachment #3: procurement award to vendor for janitorial cleaning products).

The San Francisco Department of the Environment has developed a set of general criteria for green procurement but specific criteria are developed for specific groups or types of products (see Attachment #4: General criteria for procurement categories 2006-2008).

In order to develop criteria for vendors to bid for City procurement for a particular product, the Department:

1. First finds what has been done to assess that type of product by third party green certifiers (e.g., Energy Star and Green Seal). Another useful site is GreenerChoices.org of Consumer Reports.
2. Next, Dept. employees, end users, and a volunteer consulting team consider if they can feasibly raise the bar on the criteria the certifiers have developed
3. The Department lists the final criteria for vendors to submit evidence their product(s) meet the criteria. Sometimes the company merely signs a letter verifying that the information in the submission is true (e.g., that their light bulbs don't contain mercury). Sometimes there are multiple criteria (e.g., for cleaning products) and the company has a third party certifier authenticate their claims.

This process is described in more detail at 20Hhttp://www.sfenvironment.org/downloads/library/ppoguidelines.pdf

Example 7

Another approach to Green Chemistry, listed in the table as California Regulatory Agencies, has been used in California is to identify, develop, test and demonstrate safer alternatives in industrial settings. This approach involves finding existing alternatives or developing alternatives and comparing the performance in the field and cost of the alternative with the performance and cost of the chemical, product or process used currently. The Institute for Research and Technical Assistance (IRTA), a technical nonprofit organization, has used

this approach to find effective and cost effective alternatives in a variety of applications including:

- repair and maintenance cleaning
- automotive aerosol cleaning
- printing application equipment cleaning
- coating and adhesive application equipment cleaning
- consumer product paint strippers
- spotting chemicals used by the dry cleaning industry
- consumer product thinners
- lubricants

California air regulatory agencies have used the results of the demonstrations to develop regulations that restrict the VOC and toxic air contaminant content of products used in these applications. The regulations have led to the use of safer chemicals, processes and products in thousands of California firms.

Table 1. Gaps, Functions and Interventions[97]

Demand-side ← → Supply-side

Types of Options / Programs/ Options	Develop Policy	Require to Generate & Submit Data	Regulate/ Control Production or Use	Ensure Compliance/ Enforce	Pursue Voluntary Initiatives	Collect and Share Information	Develop Economic Incentives	Conduct New Testing, Research or R&D	Provide Funding for GC	Educate and Do Outreach
U.S. EPA DfE Partnership Projects (TOAs of flame retardants)			pentaBDE phase-out was trigger		multi-stakeholder partnership to asses alternatives	lit search, company data submissions, framework for data presentation		SAR analysis		reports, presentations
U.S. EPA DfE Formulator Program review of individual cleaning and other formulated products					program for product formulators	full ingredient disclosure; ingredients profiled using test data, lit reviews, SAR and expert judgment; recommend-ations made to ensure chemicals are "best in class"	provides technical assistance and recognition (logo) for products that qualify (market advantage)	SAR analysis		website; presenta-tions; logo
Green Screen	screen out chemicals of concern or identify and adopt safer alternatives in the market-place					lit search; engage chem/tox experts to profile chemicals using U.S. EPA DfE approach	Green Screen label may lead to market advantage	SAR analysis		reports, website

The completion of this table was done using an earlier iteration of Matrix 1 that appears in the main body of the SAP report. For this reason, the names of the column do not match those of Matrix 1.

Table 1. (Continued)

Demand-side ← → Supply-side

Types of Options / Programs/ Options	Develop Policy	Require to Generate & Submit Data	Regulate/ Control Production or Use	Ensure Compliance/ Enforce	Pursue Voluntary Initiatives	Collect and Share Information	Develop Economic Incentives	Conduct New Testing, Research or R&D	Provide Funding for GC	Educate and Do Outreach
SCJ Green List	Reduce environ-mental footprint; establish "green" criteria for different categories of substances	Obtain data from literature or suppliers		company restricts use of chemicals of concern	Developed voluntarily by com-pany	identify and collect data for relevant attributes by functional use; use to assign envi-ron-mental class catego-ries for raw materials & packaging	reports goals & results annually to public; received recognition by winning Presiden-tial Green Chemistry Award	need data for relevant attributes – may test if data are not currently available	Company supports program imple-menta-tion	used inter-nally to assess overall chemi-cal perform-ance and for sustain-abil-ity reports; license tool to others
Clean- Gredients					companies voluntary submit ingredients for evalua-tion, listing as having prefer-able human health/env profiles	data on selected attributes – key attri-butes require 3rd party verification	approved ingredients are fast-tracked for DfE Formulator Program at reduced cost	testing required for key attributes if data not already available		website available by subscrip-tion; presentations
City of San Francisco	TOAs to support procure-ment, education	submission of informa-tion by vendors sufficient to win con-tract				lit search, request for public input, public web-site	procure-ment policy provides financial incentive to produce green	may con-tract out for assess-ment		public web-site; outreach to vendors for input, submission of products
CA Regulatory Agencies	TOAs to support VOC regulation		regulation of VOC content of solvent cleaners			sharing of demo results		actual demo of viable use of alterna-tives		sharing of demo results

CA=California DFE=Design for the Environment TOA=Technology Options Analysis VOC=Volatile Organic Chemical

Table 2 (which follows) provides a suggested list of characteristics is intended to allow a comparison and differentiation among various approaches to alternatives assessment and identify what the unique or special aspects.

The table includes entries for each of the examples of an alternatives assessment considered by our subcommittee. Each example is in its own column, providing a side-by-side snapshot.

The list of criteria and assignments for the examples are not intended to be rigorous or exhaustive, nor to imply that all or any particular subset of elements should or must be included in an alternatives assessment, but rather to facilitate comparison and serve as a potential checklist of elements to consider.

Categories used in Column Headings in Table 2 include:

- **SF: Examples associated with City of San Francisco initiatives**
- **CA: Examples associated with the State of California agencies' initiatives**
- **DfE FR: Example associated with U.S. EPA's Design for Environment Program Flame Retardancy Partnership**
- **GS: Example associated with the Green Screen for Safer Chemicals**
- **SCJ: Example associated with SC Johnson's Green Screen**
- **CG: Example associated with the CleanGredients initiative**
- **IS: Example from a 1997 paper published in Industrial Ecology**[99]

Table 2: Characteristics Useful in Describing and Differentiating Among Various Approaches to Alternatives Assessment

Name/Description Of Alternatives Assessment Example	SF	CA	DfE FR	GS	SCJ	CG	IS
Overall scope: Does the approach assess alternatives against health/environmental criteria only, or also extend to other factors such as the following?							
· Cost	x	x					x
· Performance/functionality	x	x	x	x			x
· Customer/consumer acceptance		x	x	x			
· Benefits		x				x	
· Other socio-economic parameters	x						
Health/environmental scope: Which of the following parameters does the health/environmental aspect of the approach consider when assessing and comparing alternatives?							
· Human health							
o Occupational		x	x	x	x	x	x
o Consumer		x	x	x	x	x	
o General public	x	x	x	x	x	x	x
· Environmental health							
o Ecotoxicity	x	x	x	x	x	x	
o Environmental fate/behavior		x	x	x	x	x	
· Hazard (may include dose-response)	x	x	x	x	x	x	x
· Exposure	x	x					x
· Risk (characterization and/or assessment)	x						x
· Safety (e.g., flammability, explosivity)		x	x	x			x
· Accidental release							x
Extent and nature of information available or required: Does the approach:							
· Rely on existing information to compare alternatives	x	x	x	x	x	x	
· Seek or require development of additional information?		x	x		x	x	

Table 2: Characteristics Useful in Describing and Differentiating Among Various Approaches to Alternatives Assessment, Continued

Name/Description Of Alternatives Assessment Example	SF	CA	DfE FR	GS	SCJ	CG	IS
Broader health/environmental issues: Does the approach assess alternatives against health- or environmentally-related criteria that are broader than those used to identify a chemical/ product/process/technology as one of sufficient concern to warrant alternatives assessment? For example:							
· Energy, water, or other resource consumption	x	x					x
· Contribution to climate change	x	x					
· Sourcing from sustainable/ renewable resources						x	x
· Other							
Lifecycle considerations: Which stages/activities across the lifecycle of the chemical/ product/process/technology are included in the assessment?							
· Material sourcing	x					x	
· Production/processing	x	x					x
· Transport/storage		x					x
· Use	x	x	x	x		x	x
· Post-use waste management or recycling	x	x	x	x		x	x
Demonstration: Does the approach:							
· Include a direct demonstration of alternative(s)?		x					
· Use information from others' testing/demonstrations?	x						
· Limit itself to a "paper analysis"?			x	x	x	x	
Who performs the assessment? Does the approach specify or suggest who is expected to actually conduct the alternatives assessment?							
· Government	x		x			x	
· Industry		x			x	x	x
· Third party expert	x	x	x	x		x	
· Stakeholder process	x		x				
· Other							

Table 2: Characteristics Useful in Describing and Differentiating Among Various Approaches to Alternatives Assessment, Continued

Name/Description Of Alternatives Assessment Example	SF	CA	DfE FR	GS	SCJ	CG	IS
Audience/decision-maker: Who is the intended audience or user of the assessment?							
· Government, e.g., to set policy regulatory requirements		x		x			x
· Industry			x	x	x	x	x
o Producer of chemical/ product/process		x	x	x	x	x	
o User of chemical/product/ process		x	x	x	x	x	
o Business/government/institutional purchaser	x		x	x		x	
· Consumers/public	x	x	x	x	x		
· Other							
To what extent or how does the approach take into account or consider/weigh the level of confidence or uncertainty in information derived from various sources, methods and expert judgments, especially when these factors may differ among the alternatives being compared? For example, does the method address differences such as the following?							
· More information about, or experience with, anestablished chemical already in commerce may be available than for newly emerging alternatives			x	x	?		
· Some information may be provided or validated by government or independent third parties, while other information may come from a company producing an alternative.					?	x	
· Some alternatives may have empirical toxicity. Data, while others have only been characterized using estimation models.			x	x	?	x	
· Some information may have been derived using established, validated methods, while other information may be developed using emerging or not-widely-accepted methods.			x	x	?		
· Some decisions may be derived through some Reliance on expert judgment or weight-of-evidence approaches to compensate for lack of "hard" data.			x	x	?	x	
· Other							

Appendix D, Attachment 1: Guidelines for Selecting Wood Preservatives

Philip Dickey
Staff Scientist
Washington Toxics Coalition

For
The San Francisco Department of the Environment

February 1, 2002

Summary

The primary wood treatments have been reviewed for their toxicity and other hazards. It is recognized that a distinction must be made between the wood preservative itself and the treated wood. However, all studies reviewed indicated that preservative chemicals do leach from treated wood and are picked up on hands from contact with the wood. Thus, the same health effects associated with the chemicals can also be caused by contact with the wood or contaminated environmental media such as soil or water.

The primary human health concerns are associated with PCP, creosote, and arsenical preservatives. All contain carcinogens, and some risk assessments have identified unacceptably high risk levels for certain exposure scenarios. In addition, PCP is contaminated with several highly toxic compounds, including dioxins.

Copper is the treatment most toxic to aquatic organisms, and copper levels are already an important issue in parts of San Francisco Bay. Although the amount of copper (or other chemicals) that leach from wood structures in or around water may in many cases be less than that expected to impact aquatic life, the same may not be true when background levels of these and other chemicals or other stressors are included. The prudent course is to minimize the use of copper in aquatic environments or where runoff is expected to occur.

PCP, some components of creosote, and some contaminants of PCP display the characteristics of persistence, bioaccumulation, and toxicity that have identified these materials as PBTs by some agency criteria. Metals such as arsenic, copper, chromium, and zinc are not considered PBTs because they do not bioaccumulate.

Some types of treated wood appear to qualify as hazardous waste in California and if discarded (except by utilities) would not legally be allowed in municipal landfills. Wood treated with arsenic is the most likely to fail state standards, but some copper treated wood may also be a disposal concern. This issue deserves more study.

Based on the information presented in this report and in consultation with the San Francisco Department of the Environment, a set of eight selection criteria were proposed for identifying acceptable wood treatments:

1. If a pressure treatment, product must be standardized by AWPA for the intended use.
2. Product must not be used in ways that EPA prohibits or recommends against.
3. Product or use must not violate state or local law, policy, or published best
4. management practices.
5. Product may not be contaminated with dioxins.
6. Product, constituents, or contaminants may not have a score of 17 or higher as
7. evaluated by the EPA Waste Minimization Tool.
8. Product (or components) should not contain known, likely, or probable human carcinogens.

9. For structures built in or over water, or where significant runoff is likely to occur, the use of copper should be minimized.

10. Material must not be designated as a hazardous waste.

When applied to the wood treatments for which AWPA standards exits, these criteria can select the acceptable treatments, as shown in Table 21 below.

Table 21
Summary of Acceptable Materials by Use

Description of Use	Acceptable Materials
Decks, railings, stairways, tables, benches, playground equipment, garden structures	Recycled plastic, untreated wood, painted wood, Cu8, CuN, ACC, AAC, ACQ, CC, ZnN, CBA
Piers or walkways over water or wetlands or where runoff may be significant	Recycled plastic, untreated wood, painted wood, AAC, ZnN. Copper not preferred, but if used should be material with minimum copper content: CuN 0.5-2%, ACC 35.4%, CBA 39.1%, CC 49.8%, ACQ 53.3%
Pilings/piers fresh water	Metal, plastic, concrete; CuN
Pilings/piers salt water	Metal, plastic, concrete; CC (sawn lumber only)
Utility poles (in soil)	Metal, fiberglass, concrete; CuN, ACQ
Utility poles (in impervious surface)	Metal, fiberglass, concrete; CuN (butt treatment preferred)
Building framing, interior, above ground, dry	Untreated wood, borates
Building framing, interior, ground contact	ACQ-B, CBA
Plywood, interior, above ground, damp	Cu8, ACC, ACQ-D, CC, CBA
Plywood, exterior, above ground	Cu8, ACC, ACQ-D, CC, CBA
Plywood, exterior, ground contact	ACC, ACQ, CBA
Plywood, exterior, ground contact, foundations	None. Use of wood discouraged for foundations.

Appendix D, Attachment 2

PPO/TPC - Product Category Score Sheet

Category: Office Supplies

Sub-Category:

[ ] Chemicals
[ ] Consumables, Materials, etc.
[ ] Equipment, Hard Goods, etc.

Typical Products:

Status of Review:	Date
Primary review by	
Secondary review by	

General Comments:

	Health & Environmental Scoring	Probability that products in category display characteristic					Notes
	Points =	3	2	1	0	2	
1	Product Contains Carcinogen/Reproductive Toxin/Endocrine Disrup	High	Medium	Low	None	Unk	
2	Product Has Other Human Health Effects/IIAQ incl. Asthma /Safety	High	Medium	Low	None	Unk	
3	Product Contains Persistent, Bioaccum, Toxic Ingredients (PBTs)	High	Medium	Low	None	Unk	
4	Product Creates Non-Recyclable Wastes	High	Medium	Low	None	Unk	
5	Product Use Involves Inefficient Resource Consumption	High	Medium	Low	None	Unk	
6	Product Has User Community Effects (EJ/Children/Women/Sensitives)	High	Medium	Low	None	Unk	
7	Product Use Has Air Qual/Global Enviro Effects (ozone depl/climate/smog)	High	Medium	Low	None	Unk	
8	Manufacture & Use Involve Animal Effects (Aquatic Tox, Habitat & Other)	High	Medium	Low	None	Unk	
9	Manufacture Consumes Non-Renewable Resources	High	Medium	Low	None	Unk	
10	Manufacture Involves Agrichemicals / GMOs	High	Medium	Low	None	Unk	
11	Manufacture Has Source Community Effects / Trade Issues	High	Medium	Low	None	Unk	
	Point Totals =						0

Comments on Health & Environmental Scoring

	Implementation Issues	Probability that products in category display characteristic					Notes
a	High Annual City Purchase Amount ($)	High	Medium	Low	None	Unk	
b	High Potential For Cost Savings ($)	High	Medium	Low	None	Unk	
c	Satisfies City Policy / Ordinance Requirements	High	Medium	Low	None	Unk	
d	Ease of Implementation / Existing Standards	High	Medium	Low	None	Unk	
e	Potential for National Impact / Leadership	High	Medium	Low	None	Unk	
f	CCSF has not Already Addressed Products in the Category	High	Medium	Low	None	Unk	
g	Other Issues:	High	Medium	Low	None	Unk	

Comments on Implementation Issues

City of San Francisco • Precautionary Purchasing Ordinance • Revised 3/28/06 • PPO-TPC_final_scoresheet.xls

Appendix D, Attachment 3

San Francisco Green Purchasing Program

Janitorial Chemicals, Soaps and Cleaners Contract Summary

San Francisco Green Purchasing Program

Janitorial Chemicals, Soaps and Cleaners Contract Summary

CONTRACT CONTENT: Janitorial Cleaners, Soaps, Tools, and Consumables	
AWARD DATE: June 1, 2007 - May 31, 2010	CONTRACT NUMBER: #83436
PREVIOUS CONTRACT: #83434 11/1/97 – 5/31/07	LAST EXTENSION:
OCA PURCHASER: Stuart Keeler	SFE LEAD: Chris Geiger

Environmental/Worker Health Goals:

Where practicable, shift to janitorial products that contain ingredients posing less hazard to the user, building occupants, and the environment in general. Specific factors addressed include: Acute toxicity, carcinogens & reproductive toxin content, eye and skin irritation, skin sensitization, combustibility, volatile organic compound content, aquatic toxicity, aquatic biodegradability, eutrophication potential, packaging, availability as a concentrate, use of fragrances, use of specific prohibited ingredients, availability of training, use of animal testing in development, labeling, skin absorption potential, and use of aerosol containers (see technical specifications below). Using EP products can reduce exposure to hazardous janitorial chemicals by about 20% (EPP Pilot Project estimate)

Performance Goals:

Obtain environmentally preferable products (EPP) proven effective by City of San Francisco or other government agencies.

Summary & Rationale

Technical specifications: Specifications were originally developed by the SF EPP Pilot Project through a stakeholder process; see http://www.sfenvironment.org/our_programs/interests.html?ssi=9&ti=22&ii=110 . Original point-based criteria were changed to pass/fail criteria to better harmonize with Green Seal GS-37 certifications. Criteria 1-16 now correspond to Green Seal GS-37 criteria (March 2005), City of Santa Monica, CA, and Commonwealth of Massachusetts; criteria 17-19 are unique to San Francisco. Products screened were drawn from the SF EPP Pilot Project results, along with some additional products requested by City departments. Criteria are detailed in Technical Specifications for Procurement of Janitorial Cleaners, March 25, 2005. http://www.sfenvironment.org/downloads/library/specsjanchem05.pdf

Bid structure. SFE and OCA staff separated the janitorial products into three categories: (1) EPP-Only for those work areas where a number of tested EPP are known to exist; (2) Green Seal Certified for those instances where vendors have obtained GS-37 certificates, but the City has not yet tested the product; and (3) Traditional janitorial

products. SFE requested specific EPP products for categories that had an abundance of complying products (general purpose cleaners, basin tub & tile cleaners, window cleaners, general purpose cleaners/degreasers). City staff will be required to only purchase EP products in these four product categories.

Performance testing: Products meeting the technical specifications were screened for the availability of performance reports from San Francisco's EPP Pilot Project, City of Seattle, WA (2003), Massachusetts, Santa Monica , CA (2004), and Ventura Co, CA. GS-37 Certification by Green Seal was also accepted as a positive performance report.

Multiple awards: Multiple awards were permitted on this contract (i.e., one vendor per item, instead of one vendor for the entire contract). It was determined that no single vendor carried a broad enough range of both EPP and traditional products.

Disclosure Requirements: Vendors must disclose the ingredients used in EPP, either to the City or to an independent third party certifier (e.g., Green Seal). This approach is required by the Precautionary Principle Policy of the San Francisco Environment Code (Chapter 1).

End User Involvement/Training:

SFE met with City end users nine times in 2004 - 2006; six meetings were at department level and three meetings was combined. . Training events are planned for early 2007.

Cost:

Buying EPP is expected to cost roughly the same as traditional products. Awarding the contract to multiple vendors may lower costs through competition, or increase costs through lower volume.

Future Opportunities & Obstacles

Training and outreach: Training and vendor support are important factors contributing to a successful transition to environmentally preferable janitorial products.
Expanding to other product subcategories: SFE will work with City departments to evaluate additional EPP and Green Seal Certified products, so that the next contract renewal may contain more preferable items (e.g., carpet cleaners, floor finish and other floor care products).

Appendix D, Attachment 4

Precautionary Purchasing Ordinance, City and County of San Francisco

Key Products (1) & Product Category	Justification (2)	Key Environmental & Health Issues (3)
Computers, monitors and other accessories, **copiers and printers** (and other multi-function office machines), and other **office equipment**	Computers are largest City contract. Opportunity to implement new EPEAT computer standard. New standards needed for other e-equipment. Opportunity to implement City's resolution on manufacturer take-back/recycling for equipment and packaging.	Carcinogen/Repro Tox/Endocrine (product), Other Human Health Effects/IIAQ (product), PBTs (product), Creates Non-Recyclable Wastes (product), Inefficient Resource Consumption (product), User Community Effects/EJ (product), Animal Effects/Aquatic Tox/Habitat (mfr, product), Consumes Non-Renewable Resources (mfr), Source Community Effects/ Trade (mfr)
Food, beverages, disposable food service items, and other **food service consumable products**	City resolutions to promote Fair Trade- & organic-certified food/ beverages; opportunities in dairy and bread contracts. City Composting Resolution promotes reusable, recyclable, or compostable food service ware.	Creates Non-Recyclable Wastes (product), User Community Effects/EJ (product), User Community Effects/EJ (product), Animal Effects/Aquatic Tox/ Habitat (mfr, product), Animal Effects/ Aquatic Tox/Habitat (mfr, product), Consumes Non-Renewable Resources (mfr), Agrichemicals /GMOs (mfr), Source Community Effects/Trade (mfr)
Lighting (lamps, switches, ballasts, wire, etc.), **Carpet, flooring**, and other **building maintenance consumables**	Significant purchases of lamps - opportunity to improve existing SF standards on mercury content, lamp life, and energy efficiency. Carpet, flooring, and other building materials have PVC, plasticizer, indoor air quality issues. Building materials often under service contracts, except for lighting & lumber.	PBTs (product), Consumes Non-Renewable Resources (mfr)
Electrical fixtures, furniture, and other **building maintenance equipment**	Opportunity to replace lighting fixtures with more energy efficient/ low mercury models - closely connected to lighting contract (#3 above). Opportunity to address fire retardants in furniture.	Inefficient Resource Consumption (product)

Attachment 4 in Appendix D, Continued

Key Products (1) & Product Category	Justification (2)	Key Environmental & Health Issues (3)
Toner and ink cartridges, office paper (copy paper, printing and writing paper, specialty paper, envelopes, etc.), and **other office consumables**	Opportunity to expand purchase of low-toxicity/remanufactured toner cartridges. Batteries already listed as Targeted (Resource Conservation Ordinance).	Creates Non-Recyclable Wastes (product), Animal Effects/Aquatic Tox/ Habitat (mfr, product), Consumes Non-Renewable Resources (mfr), Agrichemicals / GMOs (mfr), Source Community Effects/Trade (mfr)
Restroom cleaners, disinfectants, metal polishes, hard floor care products, and other **janitorial cleaners**	Opportunity for full implementation of existing SF standards for cleaners. Finding safer metal polishes, carpet cleaners, hard floor care products, and disinfectants are current challenges.	Carcinogen/Repro Tox/Endocrine (product), Other Human Health Effects/IIAQ (product), PBTs (product), Creates Non-Recyclable Wastes (product), Inefficient Resource Consumption (product), User Community Effects/EJ (product), Air Qual/Global Enviro Effects (product), Animal Effects/Aquatic Tox/Habitat (mfr, product)
Asphalt, asphalt patching products, concrete, playground surfaces, plants, nursery supplies, and other **grounds maintenance consumables**	Environmental justice issues with city asphalt production, low-VOC asphalt/asphalt patching options available; possibility of using recycled aggregate	Inefficient Resource Consumption (product), Animal Effects/Aquatic Tox/ Habitat (mfr, product)
Graffiti removal chemicals, pesticides, sidewalk cleaning products, and other **grounds maintenance chemicals**	Opportunity for leadership standards on graffiti removal chemicals. Inert ingredient issues with pesticides.	Source Community Effects/EJ (mfr), Animal Effects (mfr, use), Non-Renewable Resources (mfr), User Community Effects/EJ (product), Carcinogen/Repro Tox/Endocrine (product), other Human Health Effects (product), PBTs (product)
Motor oil, fuel (diesel, bio diesel), engine degreasers And other vehicular chemicals	Opportunities for bio-based products; diesel one of City's largest contracts by dollar amount.	Carcinogen/Repro Tox/Endocrine (product), Other Human Health Effects/IIAQ (product), Creates Non-Recyclable Wastes (product), Air Qual/Global Enviro Effects (product), Source Community Effects/Trade (mfr)

Key

(1) Key products: Products identified as highest priority during review

(2) Justification: Considerations for inclusion/exclusion of product category, outside of health and environmental factors considered in scoring.

(3) Key Environmental and Health Issues: Criteria on score sheet that received a "high concern" rating by the primary reviewer.

Note: The San Francisco Department of the Environment will address these ten "targeted product categories" first in its development of environmentally preferable purchasing specifications. Approved product lists will be developed for some of these products, and City departments may be required to purchase only from these lists.

Product Categories Not Listed as Targeted- 3/28/06 Precautionary Purchasing Ordinance, City and County of San Francisco

Product categories are listed in alphabetical order.

Product Category (1)	Key products (2)	Justification (3)	Key issues (4)	Total Points (5) & Tier (6)
Energy Related - Equipment	Solar panels, wind mills; diesel generators	Few opportunities due to established City programs; most equipment purchased in construction (service) agreements	Carcinogen/Repro Tox/ Endocrine (product), Other Human Health Effects/IIAQ (product), PBTs (product), Creates Non-Recyclable Wastes (product), Inefficient Resource Consumption (product), User Community Effects/EJ (product), Air Qual/Global Enviro Effects (product), Animal Effects/ Aquatic Tox/Habitat (mfr, product), Consumes Non-Renewable Resources (mfr), Agrichemicals / GMOs (mfr), Source Community Effects/ Trade (mfr)	18 1
Energy Related- Consumable Supplies	Electricity	Few opportunities due to established City programs; diesel covered elsewhere; electricity not purchased as commodity	Carcinogen/Repro Tox/ Endocrine (product), Other Human Health Effects/IIAQ (product), PBTs (product), Creates Non-Recyclable Wastes (product), Air Qual/ Global Enviro Effects (product), Animal Effects/ Aquatic Tox/Habitat (mfr, product), Consumes Non-Renewable Resources (mfr), Source Community Effects/ Trade (mfr)	17 1
Vehicular - Equipment	Vehicles (cars, trucks, etc.)	Few opportunities due to established City programs; many vehicles are leased by City (under service agreements)	Creates Non-Recyclable Wastes (product), Inefficient Resource Consumption (product), Air Qual/Global Enviro Effects (product), Animal Effects/ Aquatic Tox/Habitat (mfr, product), Consumes Non-Renewable Resources (mfr)	1
Medical - Chemicals	Drugs, laboratory chemicals	Hospital purchases not covered by the ordinance	Carcinogen/Repro Tox/ Endocrine (product), Other Human Health Effects/ IIAQ (product),	II

Product Categories Not Listed as Targeted- 3/28/06

Precautionary Purchasing Ordinance, City and County of San Francisco, Continued

Product Category (1)	Key products (2)	Justification (3)	Key issues (4)	Total Points (5) & Tier (6)
Clothing & Textiles - Consumable Supplies	Treated fabric such as draperies (with formaldehyde, stain resistant chemicals, etc.)	Few opportunities due to rigid performance specifications (uniforms). Predominantly service contracts	Carcinogen/Repro Tox/ Endocrine (product), Agrichemicals / GMOs (mfr), Source Community Effects/ Trade (mfr)	11 II
Office - Chemicals	Printing ink	Few goods purchased. Most/all printing already converted to digital toner or soy-based ink; much printing on service agreements	Carcinogen/Repro Tox/ Endocrine (product), Other Human Health Effects/IIAQ (product), PBTs (product), Air Qual/Global Enviro Effects (product), Animal Effects/ Aquatic Tox/Habitat (mfr, product)	10 II
Janitorial - Consumable Supplies	Janitorial papers, trash bags	Few opportunities due to established City programs. Janitorial papers are already included as targeted product category under Resource Conservation Ordinance; City Composting Resolution already mandates compostable trash bags for food service operations.	Creates Non-Recyclable Wastes (product), Animal Effects/Aquatic Tox/Habitat (mfr, product), Consumes Non-Renewable Resources (mfr), Source Community Effects/Trade (mfr),	10 II
Clothing & Textiles - Chemicals	Fabric treatment chemicals	Few goods purchased	Carcinogen/Repro Tox/ Endocrine (product), PBTs (product)	II
Vehicular - Consumable Supplies	Tires, vehicular batteries	Predominantly service contracts for most tires and batteries; few feasible alternatives	Creates Non-Recyclable Wastes (product)	II
Grounds Maintenance - Equipment	Fabricated wood products (playground equipment, picnic tables, fences, etc.)	Few opportunities due to established City programs - Arsenic-treated wood ordinance.	PBTs (product), Consumes Non-Renewable Resources (mfr)	II
Medical - Equipment	Mattresses, mercury-containing devices (blood pressure monitors, etc.)	Hospital purchases exempt; few goods purchased	Carcinogen/Repro Tox/ Endocrine (product), PBTs (product)	III

Product Categories Not Listed as Targeted- 3/28/06
Precautionary Purchasing Ordinance, City and County of San Francisco, Continued

Product Category (1)	Key products (2)	Justification (3)	Key issues (4)	Total Points (5) & Tier (6)
Medical - Consumable Supplies	Examination gloves	Hospital purchases exempt, few goods purchased except exam gloves		8 III
Janitorial - Equipment	Vacuums, mops	Few goods purchased, low health/ environmental score	Inefficient Resource Consumption (product), Animal Effects/Aquatic Tox/ Habitat (mfr, product	7 III
Food Service - Equipment	Pots and pans (containing Teflon)	Low health/ environmental score; large equipment installed in service agreements	PBTs (product)	7 III
Food Service - Chemicals	Dishwashing detergent	Low health/ environmental score, few goods purchased		4 III

KEY

(1) Product Category: Categories of products commonly purchased by the City (based on initial public brainstorming)

(2) Key products: Products of greatest interest within the product category

(3) Justification: Considerations for inclusion/exclusion of product category, outside of health/environmental factors considered in "total point" score. These factors were listed in the "implementation" section of the scoresheet.

(4) Key issues: Criteria on scoresheet that received a "high concern" rating by the primary reviewer.

(5) Total Points: Point score on environmental/health scoresheet. High scores are of greater concern, and received higher priority as TPC

(6) Tier: Tier I (top 33% percentile of point scores) = high concern
Tier II (middle 33% percentile of point scores) = medium concern
Tier III (bottom 33% percentile of point scores) = low concern

Note: Under the Ordinance, the Dept. of the Environment will address these ten "targeted product categories" first in its development of environmentally preferable purchasing specifications. Approved product lists will be developed for some of these products, and City

Endnotes

[86]Note: the Science Advisory Panel Subcommittee reports are products of the Subcommittee that authored the report, not the entire Panel.

[87]The National Academy of Sciences (NAS, 1983) describes risk assessment as comprised of four activities: hazard identification, dose response assessment, exposure assessment, and risk characterization. Alternatives assessment typically uses one or more of these components of risk assessment, but need not always fully characterize the risk. In a comparative analysis, for example, where exposure profiles are essentially the same, comparing relative hazard rankings and dose-response curves (i.e., potency) may suffice.

[88]Regulatory risk assessment evolved in response to Congress and the Supreme Court. The Supreme Court's 1980 Benzene Decision found that the Occupational Safety and Health Administration could not require reductions in workplace exposure to benzene unless an actual risk to health could be demonstrated. Congress has enacted laws calling for limits on chemical exposures that, for example, "provide an ample margin of safety to protect public health" [Clean Air Act; 42 U.S.C. §7412f], "assure protection of public health" [Clean Water Act; 33 U.S.C. §1312], provide "a reasonable certainty that no harm will result" [Food Quality Protection Act; 21 U.S.C. §346a], or "adequately assures, to the extent feasible, on the basis of the best available evidence, that no employee will suffer material impairment of health or functional capacity" [Occupational Safety and Health Act; 29 U.S.C. §655]. Regulatory agencies interpret the qualitative health-protective goals of those statutes by promulgating quantitative requirements such as air quality criteria, maximum contaminant levels, pesticide residue tolerances, and permissible exposure limits. Agencies establish those quantitative limits through the use of human health risk assessment. In that context, risk assessment provides a reproducible, transparent process that, if challenged, has a greater likelihood of surviving judicial challenge as "arbitrary and capricious" under the Administrative Procedure Act than would a less structured process.

[89]http://www.epa.gov/dfe/

[90]http://www.epa.gov/dfe/pubs/projects/flameret/index.htm

[91]http://www.epa.gov/dfe/pubs/projects/formulat/index.htm

[92]http://www.epa.gov/dfe/pubs/projects/formulat/formpart.htm

[93]http://www.cleanproduction.org/Green.Greenscreen.php accessed April 2008.

[94]Ibid.

[95]US patent No 6,973,362

[96]Fast Track Media LLC. (2007) SC Johnson Makes Greenlist Available Royalty-Free. [Online-Accessed May 1, 2007] Available from URL: http://www.environmentalleader.com/2007/02/22/sc-johnson-makes-greenlist-available-royalty-free/

[99] "Industrial Safety: The Neglected Issue in Industrial Ecology" in the Special Issue on Industrial Ecology, Ashford, N. A. and Côté, R. P. (eds,), Journal of Cleaner Production, 1997. 5(1/2), pp 115-121. Available at www.elsevier.com/locate/jclepro. Note that this example was not offered as a "complete" alternatives assessment; rather, it usefully emphasizes some neglected elements of other "systemic approaches;" those are the elements highlighted in the "IS" column of Table 1.

Appendix E: Science Advisory Panel Meeting Notes

California Environmental Protection Agency
Department of Toxic Substances Control
Green Chemistry Initiative Science Advisory Panel
October 23, 2007

Meeting Notes

Meeting Participants

- Dr. Paul Anastas
- Dr. Nicholas Ashford
- Dr. John Balmes
- Dr. Eric Beckman
- Dr. Michael Dourson
- Dr. Gail Charnley
- Dr. Richard Denison
- Dr. Daryl Ditz
- Dr. Lynn Goldman
- Dr. John Graham
- Dr. Robert Grubbs
- Dr. Neil Hawkins
- Dr. Lauren Heine
- Dr. James Hutchison
- Dr. John Peterson Myers
- Dr. Mary O'Brien
- Dr. John Warner
- Dr. Michael Wilson
- Maureen Gorsen, DTSC
- Anne Baker, DTSC
- Jeff Wong, DTSC
- Kathy Barwick, DTSC
- Emerson - facilitator

Meeting Objectives

- Understand the purpose for the Science Advisory Panel (SAP).
- Increase understanding of the Green Chemistry Initiative and outcomes.
- Determine how the SAP will organize itself to accomplish its purpose.

Welcome/Introduction

- John Warner opened up the meeting and welcomed participants. He clarified that the role of the panel was not to reach a consensus on what the state of California should but rather to advise the decision makers around the science.
- Participants introduced themselves.
- Today's meeting agenda was reviewed.
- The draft ground rules were reviewed. Comments are below:
  - Confidentiality – we need to trust each other, so not a strict closed door on confidentiality. This means that we can converse with a colleague but not with the media. In doing so, there should be a lack of attribution to a specific panel

member. We are seeking a diversity of thoughts and opinions and we do not want to suppress any members. This is a deliberative process we are engaged in.
  - There was a short discussion about developing ground rules for interacting with the media and for press releases. Nothing definitive was decided, and the issue has been added to the "Parking Lot."
  - No additional ground rules were identified at this time; SAP members were asked to forward any additional ground rules to staff.
  - No objections were identified regarding the ground rules.

DTSC – Background on the Green Chemistry Initiative (GCI)

- Jeff and Kathy provided an overview of the initiative and the work done to this point.
- On 1/1/08 DTSC will make public a Draft GCI Options Report. A one page summary (document sent to participants) was reviewed and explained.
- It was asked if the SAP could forward recommendations to the director. The answer was yes. SAP members can submit their own recommendations that are not represented by the SAP – this includes contradictory recommendations.
- Kathy (DTSC) will clarify how SAP members can put in recommendations via the website.
- There was a conversation about how DTSC selected the seven categories for the options report. The GCI work teams at DTSC selected the seven categories. They are not subject to recommendation or change.

Purpose of SAP

- Draft Vision and Mission statements:
  - Jeff and Kathy compiled the draft and Drs. Warner and Balmes made slight revisions.
  - Member conversation became fairly specific, particularly around including the word "processes" in the second bullet of the vision.
  - There was a concern expressed about the role of the SAP. Staff clarified that, in addition to evaluating the comments submitted via the blog, letters, and stake holder meetings, that the SAP or any individual SAP member is free to add new ideas.
  - Based on limited time at today's meeting to wordsmith the vision and mission statements, Kathy will send out a second draft vision and mission statement based on today's conversation for review and input. Identified scope issues included ("processes" as well as "products," and life cycle analysis.

Maureen Gorsen, Director, DTSC

- Maureen came on the call to welcome and thank SAP members. She shared her vision of the important work of the SAP.

Purpose of SAP and What Is It That We Will Actually DO and How?

- This conversation delved into the particulars of how the SAP was going to accomplish its mission. Two previously sent documents were reviewed – the 10 questions on the Considerations for the GCI SAP document and the seven chapter titles from the draft options report.
- This review led to the thought that sub-committees should be formed with looking first at the 10 questions and seven options. Further thinking included:
  - Have the SAP chair and vice-chair develop a straw man subcommittee, including the possible creation of a 'synthesis' committee address cross-cutting issues between the sub-committees.
  - Complete this structure off-line and let the members know.
  - SAP members to self-select which sub-committees they want to work on.

Scheduling Meetings

- There will be a gathering of SAP members in San Francisco in January, 2008. Kathy will work off-line with SAP members to determine exact dates.
- Again working off-line, Kathy will identify standing dates/times for monthly conference calls.
- It was agreed that there should be one to two more conference call meetings prior to meeting in January.

Meeting Evaluation

Pluses	Change
• Useful and necessary to understand the context of what we are to be about.	• As we move forward, the ability to talk openly and creatively even if it is outside the framework.
• Having the preparatory materials ahead of time.	• Be more succinct – specifics – less process (even though we had to do this at this first meeting).

Parking Lot

Are the GCI SAP meetings open to the public?

How will the SAP deal with the media? Should we develop ground rules for interacting with the media and for press releases?

California Environmental Protection Agency
Department of Toxic Substances Control
Green Chemistry Initiative Science Advisory Panel
November 27, 2007

Meeting Notes

Meeting Participants

- Dr. Paul Anastas
- Dr. John Balmes
- Dr. Michael Dourson
- Dr. William Carroll
- Dr. Gail Charnley
- Dr. Daryl Ditz
- Dr. Ken Geiser
- Dr. Lynn Goldman
- Dr. John Graham
- Dr. Robert Grubbs
- Dr. Neil Hawkins
- Dr. Lauren Heine
- Dr. Mary O'Brien
- Dr. Barry Trost
- Dr. John Warner
- Dr. Michael Wilson
- Dr. Katy Wolf
- Maureen Gorsen, DTSC
- Anne Baker, DTSC
- Jeff Wong, DTSC
- Kathy Barwick, DTSC
- Emerson - facilitator

Meeting Objectives

- Clarify DTSC's expectations and final product from the Science Advisory Panel.
- Develop subcommittee structure and enrollment process.
- Develop next steps for subcommittees and January 10th meeting.

Welcome/Introduction

- John Warner opened up the meeting and welcomed participants. John Balmes followed by saying a few words about the change in the ground rules to allow for public listening of the SAP meetings.
- Participants introduced themselves.
- Meeting notes from the October 23, 2007 SAP meeting were reviewed, amendments suggested, and approved with the recommended changes.
- Today's meeting agenda was reviewed and revised as follows:
  - The presentation and discussion about the Education and the Environment program was postponed until January.

Review of Mission & Vision Statements

- The revised mission/vision statement was reviewed
- There were concerns expressed about the wording of the third bullet, regarding use of the word "toxic." The concerns focused on the issue of how to distinguish substances that are less toxic from those that are more toxic. Other concerns expressed concerning the use of the word "toxic" included:
  - too narrow a scope
  - doesn't include life cycle issues
  - doesn't address persistence
  - doesn't address cumulative exposures

There was additional discussion regarding the concern that the SAP might continue to focus on how and why risk assessments are performed. The SAP agreed to leave the draft mission/vision unrevised for the present, and requested that the "draft" watermark be retained to allow for further discussion and refinement.

- There was a request for clarification on the first bullet. Because this is a correction of a clerical error in incorporating comments from the first SAP review of the vision statement, revisions were made and posted to the web work space, as follows:

  Implement strategies to stimulate a green chemistry industrial revolution to drive technological innovation and the development of safer, healthier, and more environmentally benign chemicals, products and processes across their life cycles impacts.

Discussion: DTSC Director Maureen Gorsen

- Director Gorsen thanked the SAP for their efforts and observed that the SAP's mission and vision statements are on target.
- Director Gorsen reviewed the document entitled "Green Chemistry Foundational Recommendations" and asked SAP members for their feedback, especially on the first two items. She then talked about the role of the SAP in advising her on green chemistry. Discussion items included:
  - The relationship of the first two items (training future scientists, incorporating green chemistry principles into the Environmental Education Initiative) to research.
  - A SAP member mentioned that the Society of Toxicologists has a fifteen-minute video on toxicity and volunteered to make it available to the panel.
  - Key findings from the two-day seminar hosted by the Office of Environmental Health Hazard Assessment were noted, including a lack of data on chemicals used in California, and the importance to businesses about having information about chemicals.
  - The need to define what is "toxic," "bioaccumulative," etc. in California.
  - Discussion on the use of the word "toxic." There were suggestions to focus on the development of benign products and processes, and so

bypass arguments of toxicity.
  - Suggestion to use the word "hazardous" rather than "toxic," as a broader and more useful term.
  - Suggestion to talk about Green Chemistry in a positive sense, and avoid "toxicity" as a singular issue. There was discussion about it being easier to talk about what we mean by "green" and what is good, rather than what is bad. General sense that the discussion should be more about qualitative attributes of materials.
  - Question about the third bullet: what does "developing" mean? Assembling, rather than generating new information? Answer: yes, more the former.
  - The last two items of the "foundational" document are less concrete, and more a recognition that there needs to be something about those topics.
  - More discussion on what Director Gorsen would like from the SAP:
    - Feedback on foundational document, more specificity if possible.
    - Between January and July of 2008, we need a recommended "frame work" for green chemistry. Director Gorsen would like the SAP view by May 2008.
  - Question: can the SAP submit its ideas about the "foundational" list? Answer: yes, submit soon. Ideas should be submitted to Jeff, Kathy, or the SAP work space.
  - There was a reminder to the group that while consensus is good when possible, it is not required of the SAP.

Discussion of the Draft Ground Rules

The draft ground rules were reviewed. A change to the ground rules regarding public access to the SAP meetings was discussed. DTSC staff noted that the change was made with respect to a recent lawsuit on the matter. DTSC staff affirmed that meetings of the Science Advisory Panel would be open to the public, and that subcommittee meetings will not be subject to that requirement. Comments specific to this issue included:

- Consider the trade-offs between transparency/public access and the more frank discussions that can occur in a closed session. Brainstorming may be limited.
- It is appropriate for the SAP to determine its own ground rules.
- There is a potential for the SAP efforts, and the usefulness of its product, to be undermined if the process is closed.
- Clarification was requested on conversations outside of the meetings; DTSC staff noted that the need to make SAP meetings open to the public does not affect other conversations, or subcommittee meetings of the SAP.

Other comments on the ground rules included:

- Need to define "consensus."
- There was a comment regarding potential difficulty, given the make-up of the SAP, to get a single document or point of view that the SAP endorses. The commenter suggested that instead, the SAP should facilitate expert advice and input into the process of developing the recommendations for Secretary Adams.

It was moved that the ground rules be approved; no objections were heard.

Subcommittee Structure

Dr. Warner introduced the subcommittee structure proposal, and reviewed how it was developed. Noting that there are many ways to organize, the SAP was asked to determine if there were any missing elements in the proposal.

After discussion, the following suggestions were made for revisions:

- #1, last bullet, include NGOs
- #5, add as 2nd bullet: "What are some of the major areas of concern [classes of materials processes], where alternatives are available but not being used?"
- Suggestion to add "advancing green chemistry through" to the beginning of each subcommittee, to make sure they make sense. The outcome of this discussion was that the SAP members on this committee will determine the most appropriate name for the subcommittee.
- Subcommittee membership was solicited at the end of the meeting. Results are posted on the SAP work space. Subcommittees will designate chairs & co-chairs.
- A question was asked about the operation of subcommittees relative to the overall SAP. Dr. Warner clarified: subcommittees frame the specific topics for subsequent discussions with the entire SAP (five parallel efforts).

SAP meeting in San Francisco on January 10, 2008

- Kathy briefly reviewed expectations for the January 10, 2008 SAP meeting in San Francisco, including a brief review of agenda items and travel arrangements. Initial agenda items include reports from the subcommittee, and opportunities for public comment.
- Kathy asked that after subcommittees meet that they communicate regarding ideas for agenda items.

Meeting Evaluation

SAP members were requested to provide feedback on the meeting via the SAP work space. A discussion thread entitled "Feedback on the 11.27.07 SAP meeting" has been created for this purpose. SAP members are encouraged to state what worked well, and what could be improved on in the future, in this space.

Parking Lot

How will the SAP deal with the media? Should we develop ground rules for interacting with the media and for press releases?

California Environmental Protection Agency
Department of Toxic Substances Control
Green Chemistry Initiative Science Advisory Panel
January 10, 2008 Meeting
San Francisco, California

Meeting Notes

Meeting Participants

- Dr. Paul Anastas
- Dr. Nicholas Ashford
- Dr. John Balmes
- Dr. Eric Beckman
- Dr. William Carroll
- Dr. Gail Charnley
- Dr. Richard Denison
- Dr. Daryl Ditz
- Dr. Michael Dourson
- Dr. Ken Geiser
- Dr. John Graham
- Dr. Neil Hawkins
- Dr. Lauren Heine
- Dr. Vistasp Karbhari
- Dr. John Peterson Myers
- Dr. Mary O'Brien
- Dr. Barry Trost
- Dr. John Warner
- Dr. Michael Wilson
- Dr. Katy Wolf
- Anne Baker, DTSC
- Kathy Barwick, DTSC
- Maureen Gorsen, DTSC
- Don Owen, DTSC
- Jeff Wong, DTSC
- Emerson - facilitator

Visitors:

- Robert Reinhard, Morrison Foerster
- Claudia Polsky, California Department of Justice
- Arlene Blum, UC Berkeley
- Paul DeLeo, The Soap & Detergent Association
- Diana Graham, Keller & Heckman
- Greg Gorder, Technology Sciences Group
- Nancy Noe, Johnson & Johnson
- Ann Blake, EPHC
- Virginia St. Jean, San Francisco Department of Public Health
- Jennifer Harris, XenoPort

- Joanne McFavlin, SULG
- Meg Schwarzman, UC Berkeley/COEH
- Randy Fischback, Dow Chemical
- Joe Gregorich, ACA
- Sandy McDonald, UC Berkeley
- Fareed Ferhut, CIWMB
- Caroline Scruggs, Stanford University
- Ansje Miller, Center for Environmental Health & CHANGE
- Dana Smirin, Consultant
- Andria Ventura, Clean Water Action
- Andrea Lewis, Cal/EPA
- Luis Cabrales, CCA
- Sara Schedler, Friends of the Earth
- Neil Gendel, Healthy Children Organizing Project

Meeting Objectives

- Finalize the mission/vision statement
- Hear from DTSC about stakeholder input received and understand the next steps.
- Hear about the Cal/EPA Environmental Education Initiative.
- Allow for public comment to the SAP.
- Hear reports from the five SAP subcommittees.
- Understand the SAP work process through June 2008.

Welcome/Introduction

- DTSC Director Maureen Gorsen welcomed everyone to the meeting and introduced SAP Chair Dr. John Warner and Vice-Chair Dr. John Balmes.
- John Warner welcomed participants reviewed the challenge presented to the SAP; John Balmes followed by saying a few words about the desire of Californians to see an improved chemicals policy. Dr. Balmes also referenced the new University of California report authored by SAP member Dr. Michael Wilson, entitled "Green Chemistry: Cornerstone to a Sustainable California."
- Participants introduced themselves.
- Meeting notes from the November 27, 2007 SAP meeting were reviewed, amendments suggested, and approved with the recommended changes. Recommended changes included:
    - Adding Dr. Carroll to the list of attendees
    - An editorial revision with respect to relative toxicity
    - Nonsubstantive editorial revisions
    - Today's meeting agenda was reviewed; no revisions were made.
    - Emerson reviewed the ground rules for today's meeting.

Review and Approval of Mission & Vision Statements

- The revised mission/vision statement was reviewed. Additional changes were made to the wording, and the mission/vision statement was approved with the requested changes.

Presentation and Discussion: DTSC Director Maureen Gorsen

- Director Gorsen gave a brief presentation, entitled "Next Steps." Included in the presentation was a specific set of questions to the SAP, as follows:
- What is the state of the science of producing green chemicals?
- What is the state of the scientific training related to the design, production, and use of green chemicals?
- How would you incorporate the following into the policy framework:
  - Data
  - Alternative Analysis
  - Research and Development
  - Ph.D. Programs
  - Education and the Environment Initiative
  - Community Colleges
- The discussion included a number of topics and ideas, including:
  - The need to fully exploit the significant talent present on the SAP;
  - Scoping issues;
  - Further clarification of the goals of the SAP, pursuant to Director Gorsen's need for advice;
  - Reconciliation of the work conducted to date by the SAP, particularly with respect to the subcommittees, to the further clarification of the goals presented by Director Gorsen;
  - More clarification by Director Gorsen with respect to the development of a variety of green chemistry frameworks; and
  - The possible role of the SAP in reviewing the DTSC's green chemistry options report.

Other comments included:

- An observation that much of the discussion has been around the supply aspect of green chemistry and the need to also focus on demand.
- Acknowledgment of the political context of this effort.
- The potential to develop "First Principles" for evaluating green chemistry options.
- Several observations from SAP members regarding their desire to contribute meaningful and helpful advice to Director Gorsen.
- A SAP member proposed a possible structure or framework for the SAP's work including these basic ideas:

1. willingness to change, bolstered by knowledge of alternatives;
2. opportunity or motivation
3. building capacity for the movement to green chemistry

- Proposal to establish another committee to build a policy framework, noting three policy frameworks suggested to date (UC report "gaps;" supply/demand framework; and the three items noted above).
- A request from agency staff to help us develop a baseline, and to help identify not just the "what," but also, who, when, where, why, etc.
- Possible need for a problem statement.
- Observation that "the industry" is not monolithic.
- Observation that the term "green chemistry" isn't quite right; that this effort also includes chemicals policy; and a suggestion to include this on a SAP meeting agenda.

With respect to the Options Report, Director Gorsen responded with a request to the SAP to think further about frameworks for green chemistry, and noted that the options report could be used as background for this effort.

Presentation: Andrea Lewis, Assistant Secretary, Cal/EPA

Ms. Lewis presented information about the state's Education and the Environment Initiative, and encouraged SAP members to contribute to the effort.

Public Comment

Visitors were invited to present their comments to the SAP. Emerson reviewed the ground rules for the public comment portion of the agenda. The following is a list of commentors and a summary of their comments.

- Paul DeLeo, Soap & Detergent Association: Mr. DeLeo suggested that the SAP should recommend relevant metrics (public health metrics, such as biomonitoring).
- Randy Fischback, Dow Chemical: Mr. Fischback's comments focused on the need to have a comprehensive, rather than piecemeal, chemicals program. Noting that the Dow Corporation considers Green Chemistry as including energy, toxicity, waste reduction, renewable resources, transportation security, and efficacy, he noted and approved the movement within "green chemistry" from a narrow focus on toxicity toward "life cycle analysis."
- Andria Ventura, Clean Water Action: Ms. Ventura stated her appreciation of DTSC and Cal/EPA in establishing the Green Chemistry, and her respect for the expertise of the SAP members. Ms. Ventura stated that she is concerned about the role of the SAP, and whether or not it would be called on to establish the framework for California policy. Ms. Ventura suggested that any policy should be based on the needs of the environment, protecting public health, and growing a sustainable economy. There is concern that California is losing its competitive edge in this area, due to progress in Europe and other countries.
- Robert Reinhard, Morrison & Forster: Mr. Reinhard noted that the Federal Trade

Commission has issued a warning regarding "green" labels on products. He noted that it is a challenge to explain science to the public, and asked for the SAP to help explain the outcome of the Green Chemistry Initiative process to the public, in order to refrain from creating unrealistic expectations.

- Claudia Polsky, California Attorney General's Office: Ms. Polsky would like to see the SAP establish principles for intellectual independence in green chemistry research, noting that public funding is scarce, and that there is the need for public/private partnerships. A second suggestion was that the SAP not apply any political filter to its work. Ms. Polsky's third point was to answer the question of whether the SAP should engage in broader public policy issues (as brought up in earlier public comments); her response was, yes—DTSC should give deference when appropriate (e.g., with respect to scientific issues). Finally, there was further discussion with the SAP about "intellectual independence."
- Dana Smirin, Consultant: Ms. Smirin encouraged the SAP to bring the conversation to the financial industry. Ms. Smirin that green chemistry is an aspect of compliance for the portfolio companies within funds such as CalPERS. There is a need to reach out to the design community. Ms. Smirin noted that the United States is behind the curve with respect to green chemistry, but that its strengths are that it is "risk capable" and has a culture of innovation.
- Ansje Miller, Center for Environmental Health and CHANGE: Ms. Miller noted that the SAP is advising a public agency on a path forward. Ms. Miller asked the SAP to think about its role as "science in the public interest" and not in the interest of any represented company's bottom line. The focus should be on science. Ms. Miller noted that a framework was submitted to the SAP by CHANGE and requested feedback on that framework.
- Gretchen Lee, Breast Cancer Fund: Ms. Lee expressed support for earlier comments, and expressed respect for the work of the SAP. Ms. Lee expressed some confusion about the role of the SAP and recommended that it be clarified, suggested that the SAP consider the most important things to address, suggested that the agency's questions for the SAP be consistent, and expressed concern that the SAP's advice might be overly weighted.

There was some general discussion about the SAP's work with respect to policy and science.

Subcommittee Reports

The SAP discussed the established subcommittee framework and how to move forward. Each of the five SAP subcommittees reported to the SAP. The short descriptors below do not necessarily reflect the full scope of each subcommittee, as work had just begun.

Subcommittee 1: Data & Related Themes

Drs. Carroll and Denison have been designated as co-conveners. The name of the subcommittee is revised to Subcommittee on Data Needs and Availability. The group will focus on what data are available, and who has access to data.

Subcommittee 2:

Drs. Ashford and Dourson have been designated as co-conveners. The name of the subcommittee is revised to Advancing Green Chemistry and Engineering through Alternatives Assessment. The group will be looking at relative risks, benefits and costs, and the issues of moving from full characterization of risks to looking at achieving functionality at lower risks and costs. The group noted a link to Subcommittee 3's work (barriers/ incentives).

Subcommittee 3:

Dr. Daryl Ditz was designated as the chair, with Dr. Bill Carroll as assistant chair. The name of the subcommittee is Advancing Green Chemistry Through Evaluation of Incentives and Barriers. The group is starting with a review of existing information, and discussions about what works, and what doesn't, regarding the advancement of green chemistry.

Subcommittee 4:

Dr. Kenneth Geiser will chair this subcommittee, which is called Advancing Green Chemistry through Education and Information Dissemination. Initial discussions included the possible addition of business schools to the topic, and the need for a "world class informational portal" for green chemistry information.

Subcommittee 5:

Dr. Paul Anastas will chair this subcommittee, called Advancing Green Chemistry Through Science and Technology. Initial discussions included the need to identify short-, mid- and long-term objectives.

Review of the SAP process

Dr. Balmes reviewed the SAP process, including the work of the subcommittees, and the potential for a "writing group" to work on the final SAP product. A crosscutting group to integrate subcommittee work was established and titled the "Synthesis Committee" (subcommittee #6), with membership consisting of the leadership of each subcommittee. The SAP agreed that the work of the Synthesis Committee should begin immediately, in order to organize and coordinate the subcommittee work.

Adjournment

The meeting was adjourned at 4 pm.
California Environmental Protection Agency
Department of Toxic Substances Control
Green Chemistry Initiative Science Advisory Panel
February 11, 2008 Meeting
Conference Call

Meeting Notes

Meeting Participants

- Dr. Paul Anastas
- Dr. Nicholas Ashford
- Dr. John Balmes
- Dr. Eric Beckman
- Dr. William Carroll
- Dr. Gail Charnley
- Dr. Richard Denison
- Dr. Daryl Ditz
- Dr. Michael Dourson
- Dr. Ken Geiser
- Dr. Lynn Goldman
- Dr. Robert Grubbs
- Dr. Neil Hawkins
- Dr. Mary O'Brien
- Dr. John Warner
- Dr. Michael Wilson
- Dr. Katy Wolf
- Anne Baker, DTSC
- Kathy Barwick, DTSC
- Don Owen, DTSC
- Jeff Wong, DTSC
- Emerson - facilitator

Meeting Objectives

- Approve 1/10/08 San Francisco meeting notes
- Listen to subcommittee progress reports
- Evaluate progress to date
- Confirm SAP path forward and next steps

Welcome and Introductions

- Dr. Warner welcomed participants and reviewed the agenda.
- Participants introduced themselves.
- Today's meeting agenda was reviewed; no revisions were made.
- Emerson reviewed the ground rules for today's meeting.

Review and Approval of January 10, 2008 Meeting Notes

Meeting notes from the January 10, 2008 SAP meeting were reviewed. No changes were requested and the notes were approved.

Subcommittee Reports

Subcommittees delivered brief reports on their activities to date.

- Subcommittee on Data Needs and Availability (Subcommittee 1): Dr. Richard Denison reported for the group:
  - Established a process to conduct its operations;
  - As a starting point, the group is looking at a set of questions that need to be formulated to all SAP subcommittees: what kinds of questions/issues would be illuminated by more data?
  - As a second step: the group will examine the options for generating or making those data available, including an assessment of existing data, data sources and their adequacy.
  - Subcommittee 1 has posted on the SAP web work space an "ask" of the other subcommittees to get this feedback.

Discussion items included:

  - It's important to link the data needs with Subcommittee 2's matrix.
  - It's important to look not just at what data exist, but also how the data are organized, and whether they are accessible and useful. Are the data presented in a way that's comparable and available to use in alternative assessments?
  - Who can access the data?
  - The role of information technology systems.
  - What kinds of uses exist for the data? Knowing this will help determine form and accessibility.
- Advancing Green Chemistry and Engineering Through Alternatives Assessment (Subcommittee 2). Dr. Nick Ashford reported for the group.

  - The need for the subcommittees to work closely together.
  - Issues around mandating alternatives assessment, with the New Jersey's and Massachusetts' programs as models.

- What is the minimum data set needed for alternatives assessments? Need to provide that information to Subcommittee 1.
- Need to link data to specific purpose(s), and a suggestion to develop a brief list of the problems that alternatives analyses are to address.
- Note that technology alternatives analyses is an art form rather than solely formulaic; there are judgments involved.
- The representation of various interests is important.
- Good for Subcommittee 1 to know that there are various kinds of alternative assessments for various purposes (e.g., a retailer, versus a city such as San Francisco).
- A request to place an issue on the "Parking Lot," regarding the motivation for performing alternative assessments. What process/procedure at the front end warrants an alternatives assessment?

Discussion items included:

- Interest in the process of performing alternatives assessment, as well as the criteria. Subcommittee 1 was asked whether they are working on the process of how alternatives assessments are performed.

- Advancing Green Chemistry Through Evaluation of Incentives and Barriers (SC3): Dr. Daryl Ditz reported for the group.
  - Subcommittee 3 has compiled options submitted by subcommittee members, in an options template. 15 options have been collected; these are posted on the SAP's work space. The purpose of collecting these options is to put the subcommittee ideas on the table, to promote dialog on possible solutions. Not resolved yet is how to move the ideas forward.
  - Subcommittee 3 is also reviewing the DTSC Green Chemistry Options Report.
  - Subcommittee 3 will gather approximately 25 options, then ask the SAP to review and comment prior to whittling the list down.

The discussion included a comment regarding the need to link the honing of recommendations into the SC6 process.

- Advancing Green Chemistry Through Education and Information Dissemination (Subcommittee 4). Dr. Ken Geiser reported for the group.
  - Subcommittee 4 encompasses a very broad area. The group is developing recommendations with various sections being developed by subcommittee members.
  - Dr. Geiser clarified that DTSC and Cal/EPA would like to include K-12 in the SAP's work on education, as well as higher education.
  - Looking at fellowships and internships to allow for green chemistry students to get industrial green chemistry experience.
  - Looking also at integrating green chemistry concepts into business schools.
  - Looking at the development of a "world class web-based information portal" for green chemistry solutions.
  - Evaluating the usefulness of the states' technical assistance programs for businesses, and to what degree green chemistry can be introduced (e.g., state extension programs).

- Advancing Green Chemistry Through Science and Technology (Subcommittee 5). Dr. Paul Anastas reported for the group. Discussion items included:
  - This group is working closely with subcommittee 4.
  - Looking at the following issues:
    - Ways to enhance the ability of universities and industry to work together on research projects? Need to remove impediments and make California a magnet for these partnerships.
    - Best mechanism to identify a portfolio of green chemistry research challenges.
    - How to provide funding for the scientific research and technological development, and leveraging existing research funding.
    - Scientific tools; infrastructure; tools & equipment.
    - Extent of education/research fellowships, etc.
    - Excellence in scientific research and recognition of green chemistry accomplishments.
  - Recommendations will be generated and posted for comment.

Discussion included:

- A recommendation to expand the verbiage from "green chemistry" to "green chemistry and engineering."
- Massachusetts and New Jersey both have state offices of technical assistance that are instrumental in improving environmental performance; a suggestion to include such programs in any recommendations.
- Implications regarding intellectual property; will this subcommittee look at this? Answer: yes, that's part of the discussion.

- Synthesis Subcommittee (Subcommittee 6): Dr. Warner reported for the "synthesis committee."
  - Subcommittee 6 has had one conference call plus follow-up up work. Drs. Ashford and Denison have provided two framing alternatives ("structures") that have been distributed to the chairs of the five subcommittees for feedback.

Path Forward

SAP members noted that valuable tools are being developed in the subcommittees. These tools will help to integrate the subcommittee work into a unified product from the SAP.

DTSC staff gave a short overview of what is planned for the March 25 & 26, 2008 meeting in San Francisco. The meeting will be largely a working meeting of the SAP. Discussion points included:

- The time in San Francisco should be used to address problematic issues.
- It will be good to have a briefing from DTSC on 3/25, but would prefer to have that today; we need this information sooner.

- Noted the tension between having subcommittees work separately and getting the entire SAP together. There is a need to balance the time.
- Suggestion that the SAP chairs ask subcommittees to elevate issues for discussion in the whole group.
- Some subcommittees might have clear links and therefore will want to meet together in San Francisco.
- We need to start with a clear picture of what we want to accomplish, and then work within the subcommittees to formulate how to get there.
- Start with a subcommittee 6 "needs assessment."
- Check in during the March 4, 2008 conference call on these issues. Devote time for discussion of the two proposed structures.
- Assign subcommittees the job of returning comment on the proposed structures to Subcommittee 6. OR—have subcommittee leaders report back on the next conf call.
- The subcommittee structure is very positive. Is it expected that subcommittees produce a written product?
- Some SAP members haven't joined a subcommittee; need to follow up with them.
- Discussion of the need to achieve consensus. The SAP was reminded that Director Gorsen has clarified that she is not requiring consensus, but would like the SAP to identify areas of agreement.
- Suggestion to define and highlight areas of agreement and disagreement.
- Dr. Warner clarified operational issues with respect to the SAP's final product and the role of Subcommittee 6 (the synthesis committee). Subcommittee 6 will:
  - Determine how to represent the areas of agreement and disagreement;
  - Determine the nature and form of the final product, and how it wants to receive information from subcommittees;
  - Evaluate ways to frame the subcommittee outputs in a way that is comparable across the subcommittees.

It was noted that a written product from the subcommittees is expected.

Overview of Green Chemistry Initiative Current Status and Phase 2 Activities

At the request of SAP members, DTSC's Don Owen gave a brief overview of the current status of the GCI, and the next steps for the agency. Information included:

- Noting the work done by GCI agency staff to extract and articulate the 818 options identified in phase one and recorded in the options report.
- There will be a new round of stakeholder meetings designed to gather information about implementing the options, including issues about how, when, by whom, how funded, and timing. These meetings will be held over the next few months.
- On a concurrent track, agency staff is identifying key elements, including options characterized by a high degree of consensus. These items are not necessarily

foundational, but are actions that can be done administratively within Cal/EPA. Internal teams will develop implementation work plans for these items.

- Draft frameworks for green chemistry will be formulated by early June 2008. Input about these frameworks will be gathered in five public workshops and the GCI website.
- By summer 2008, agency staff will prepare early drafts of possible legislative and administrative actions.
- A SAP member asked for clarification of the SAP operations relative to the work to be done in Phase 2 of the GCI:
  - GCI Phase 2 was clarified as an external process to get feedback from external parties about the recommendations. Agency staff will develop a final framework for people to react to. The SAP's role is to inform the agency regarding scientific and engineering issues related to green chemistry.

Next Meeting

The next SAP meeting will be via conference call March 4, 2008 from 11 am to 1 pm PST/2 pm to 5 pm EST.

Parking Lot

A SAP member requested that the following issue be placed on the "parking lot" for resolution at a future time: Regarding the motivation for performing alternative assessments: what process/procedure at the front end warrants an alternatives assessment?

Adjournment

The meeting was adjourned at 11 am PST.

California Environmental Protection Agency
Department of Toxic Substances Control
Green Chemistry Initiative Science Advisory Panel
March 4, 2008 Meeting
Conference Call

Meeting Notes

Meeting Participants

- Dr. Paul Anastas
- Dr. Nicholas Ashford
- Dr. John Balmes
- Dr. William Carroll
- Dr. Gail Charnley
- Dr. Richard Denison
- Dr. Daryl Ditz
- Dr. Michael Dourson
- Dr. Ken Geiser
- Dr. Lynn Goldman
- Dr. Vistasp Karbhari
- Dr. Pete Myers
- Dr. Mary O'Brien
- Dr. John Warner
- Dr. Michael Wilson
- Dr. Katy Wolf
- Kathy Barwick, DTSC
- Jeff Wong, DTSC
- Emerson - facilitator

Meeting Objectives

- Approve 2/11/08 SAP conference call notes
- Listen to subcommittee progress reports
- Evaluate progress to date
- Plan for SF meeting
- Confirm SAP path forward and next steps

Welcome and Introductions

- Dr. Warner welcomed participants and reviewed the agenda.
- Roll call was taken.

- Today's meeting agenda was reviewed; no revisions were made.
- Emerson reviewed the ground rules for today's meeting.

Review and Approval of February 11, 2008 Meeting Notes

- Meeting notes from the February 11, 2008 SAP meeting were reviewed. No changes were requested. After a motion to approve the February 11, 2008 meeting notes, and a second, the meeting notes for 2/11/08 were approved.

Subcommittee Reports

Subcommittees delivered brief reports on their activities to date

- Subcommittee on Data Needs and Availability (Subcommittee 1): Dr. Bill Carroll reported for the group:
  - Reiterated SC1's request to other subcommittees regarding data needs, and noted that the request and template are on the SAP's web work space. The other subcommittees were requested to send the information directly to Drs. Carroll and Denison.
  - Held internal discussions on data and information needs and availability, including data for answering specific questions.
- Advancing Green Chemistry and Engineering Through Alternatives Assessment (Subcommittee 2). Dr. Mike Dourson reported for the group.
  - Increased mutual understanding within the subcommittee.
  - Looking at the two proposed structures and trying to work into those frameworks the various examples of alternatives assessment, with the purpose of better understanding the examples and how they fit in to the structures.
  - The subcommittee had not yet envisioned a report.
  - Noted that a lot of the current green chemistry-related activities are focusing on information generation and dissemination, with less on capacity-building, which is important for the consideration of incentives and barriers related to the advancement of green chemistry.
  - Has generated a lot of materials, including examples.
- Advancing Green Chemistry Through Evaluation of Incentives and Barriers (SC3): Dr. Daryl Ditz reported for the group.
  - Subcommittee 3 continues to develop a sampling of potential policy options. Sixteen options have been developed to date.
  - The group is applying the proposed structures to the work done to date, and looking at the kinds of interventions (regulatory, voluntary, etc.) to identify any overall patterns. The process has revealed that some part of the structures show lots of ideas, where in other places there are gaps.
- Advancing Green Chemistry Through Education and Information Dissemination (Subcommittee 4). Dr. Ken Geiser reported for the group.
  - Subcommittee 4 has had four meetings to date. They are preparing a report divided into two sections:

- ◊ education (including K-12, undergraduate, and graduate education), including integrating green chemistry into other disciplines, as well as free-standing green chemistry programs
- ◊ information dissemination, on three tracks:
  - Δ a web portal, as an access point for information on green chemistry;
  - Δ state technical assistance components; and
  - Δ awards and recognition programs.

- ° There was further general discussion about the possible addition of the term "green engineering" to the "green chemistry" focus of this subcommittee and SAP's work, including:
  - ◊ The need to consider nonchemical solutions
  - ◊ The possible misinterpretation of "green engineering" to include secondary/tertiary treatment and other engineering controls
  - ◊ A possible unintended consequence that "green chemistry" may be interpreted to only include chemistry
  - ◊ A reported tendency for those using the "green engineering" term to not focus enough on the reduction of inherent hazard
  - ◊ The need for clarity in the terms used by the SAP
  - ◊ Noting that the SAP's work has included discussions of green engineering
  - ◊ There should be a glossary of terms in the SAP's final report
  - ◊ Request to add this to the SF meeting agenda

The end result of the discussion was to place this issue in the "parking lot" for future consideration.

- Advancing Green Chemistry Through Science and Technology (Subcommittee 5). Dr. Paul Anastas reported for the group.
  - ° Looking at the nature of the final report
  - ° Compilation of a set of recommendations
  - ° Some of the discussion is occurring in small groups and one-on-one
  - ° discussions, including:
    - ◊ How to best provide funding for research
    - ◊ Identify the major research & development challenges
    - ◊ How to leverage existing funding and approaches
    - ◊ Developing and fostering university/industry partnerships
    - ◊ Collaborations between universities and national laboratories
    - ◊ Recognition of scientific accomplishments
    - ◊ Tools, including instrumentation, computational tools
    - ◊ Some overlap with other subcommittee topics (especially SC4)
- Synthesis Subcommittee (Subcommittee 6): Dr. Warner reported for the "synthesis committee:"
  - ° Subcommittee 6 is working on how to synthesize the final product from the SAP. Guided by the two framework documents.
  - ° Proposing sample Tables of Contents to describe the final report, as a guiding principle. A final proposal will go to the SAP for the March meeting in San Francisco.
  - ° The final report will include a glossary
  - ° It was noted that both proposed organizational structures, or frameworks,

are being used by the subcommittees to organize their work. Some are making modifications to the frameworks to increase their utility. A request for suggestions for further modifications was made.

- A SAP member asked whether DTSC's implementation of Phase 2 of the Green Chemistry Initiative continues to use the same organizational approach (categories). DTSC staff responded with yes, current work is based on the Phase 1 structure and the options report. The stakeholder meetings scheduled for Phase 2 are designed to get a better characterizations of the options (who, what, when, how). Staff will then perform a comparative analysis of options. The chapter headings in the Green Chemistry Options Report are still being used as an organizing principle. Teams within Cal/EPA and other relevant state agencies are being assembled for developing implementation plans for early action items.
- It was noted that many recommendations under discussion call for actions outside of DTSC's capability; there was a suggestion that the SAP provide a briefing or presentation to the Green Chemistry Leadership Council.

Path Forward

Staff reviewed the schedule for SAP activities. There was discussion about the nature of the two-day meeting in San Francisco scheduled for March 25-26, 2008.

There was a suggestion to make sure the web space postings are complete.

There was a request for a brief instruction email from Drs. Warner & Balmes delineating what materials should be posted.

There was a request for a general email to everyone regarding access to the SAP web space.

Next Meeting

The next SAP meeting will be in San Francisco, California on March 25-26, 2008. There was discussion about the nature of the work to be done at that meeting, including a request for the Synthesis Subcommittee to meet very soon and provide clarity and guidance to the other subcommittees.

There was a reminder to the subcommittees to provide a response to Subcommittee 1's request for input on data needs.

Parking Lot

A SAP member requested that the following issue be placed on the "parking lot" for resolution at a future time: Regarding the motivation for performing alternative assessments: what process/procedure at the front end warrants an alternatives assessment?

Add "green engineering"

Adjournment

The meeting was adjourned at 11 am PST.

California Environmental Protection Agency
Department of Toxic Substances Control
Green Chemistry Initiative Science Advisory Panel
March 25 & 26, 2008 Meeting
San Francisco, CA

Meeting Notes

March 26, 2008

Meeting Participants

- Dr. Nicholas Ashford
- Dr. John Balmes
- Dr. William Carroll
- Dr. Gail Charnley
- Dr. Richard Denison
- Dr. Daryl Ditz
- Dr. Michael Dourson
- Dr. Ken Geiser
- Dr. Lynn Goldman
- Dr. Neil Hawkins
- Dr. Lauren Heine
- Dr. Vistasp Karbhari
- Dr. John Warner
- Dr. Michael Wilson
- Dr. Katy Wolf
- Kathy Barwick, DTSC
- Cathy Cooke, DTSC
- Don Owen, DTSC
- Jeff Wong, DTSC
- Emerson – facilitator
- Guest: Sara Hoover, OEHHA

Meeting Objectives

- Approve 3/4/08 SAP conference call notes
- Working meeting of the SAP toward its final advice on advancing green chemistry
- Work toward preparation of the final SAP report
- Hear public comment

Welcome and Introductions

Dr. Balmes welcomed participants and reviewed the agenda.

- Meet as a panel to review SC work. Not necessarily to come to agreement about policy options, but to review what the subcommittees have done, their

lists of options/recommendations.
    - Not a consensus process. Trying to catalog policy options for the state re green chemistry/policy. The synthesis subcommittee (SC 6) will take stock at the end of the day.

Participants introduced themselves.
Today's meeting agenda was reviewed; no revisions were made.
Emerson reviewed the ground rules for today's meeting

- Emerson: review the packets.
    - sap mission—advisory, recommendations
    - SC membership
    - ground rules.
    - agenda review

Review and Approval of March 4, 2008 Meeting Notes

The draft meeting notes from the March 4, 2008 SAP conference call were reviewed. One editorial change was requested. The meeting notes were approved as revised. Motion to approve, seconded, approved as corrected.

Brief subcommittee report-outs

The five subcommittees reported on progress.

SC1 Data
Dr. Carroll reporting: listing of data sources, characterizing what's out there, and making that available as a resource. Starting with work Dr. Denison has done.

SC2 Alternatives Assessment
Dr. Dourson reporting: the group is mapping alternatives assessment processes into the Denison framework.

SC3 Barriers & Incentives
Dr. Ditz reporting: developed a one-page template for a description of policy options, with eighteen developed to date. The group has attempted to put the 18 ideas into both organizational matrices. Several of the options also fit into other subcommittees.

SC4 Education & Information
Dr. Geiser reporting: overview of progress to date. Fitting into the two frameworks was not difficult; they neither help nor hinder the recommendations. We noted that most of the options are supply-side. Looking at education (teacher training materials) and information dissemination. Looking at ideas such as a web portal, recognition, etc.

There was a general discussion of the evolution of the table of contents for the SAP's final report, regarding the origins of the table of contents and the "blueprint" document. The table of contents was developed by SC6, and the "blueprint" evolved from the table of contents.

SC5 Science

Dr. Karbhari reported for the group, and walked the group through the draft report, with 6 recommendations. For background, as a green chemistry driver, create an engine in California for building healthy economy and community. Recognize that California has a large number of building blocks, but it's uncoordinated, unrecognized and underutilized. Partnerships & collaborations are key, as are visibility & recognition are also key drivers. An overriding recommendation is to ensure the integrity of green chemistry & technology. To support GC research & development efforts in California establish a $10k GC research fund. $250k grants, 40 across the state. Must be overhead-free.

There was a general discussion about needed data and decision-making, including topics associated with data required for risk assessment, the level of information required to perform risk characterization, and potential for making qualitative judgments, data required for alternatives assessments, and nonlinearities (low-dose effects, etc.).

As an example of other data uses, the SAP discussed the Washington state alternatives assessment that supported its deca regulations (using qsars). Dr. Geiser offered to map additional examples.

There was a discussion regarding the SAP's process for Wednesday March 26.

The SAP spent the last part of the day working to group the ideas.

Adjourn: 5:30 pm PST.

March 26, 2008

Members of the public in attendance:

- Darrell Thacker, California Office of Homeland Security
- Paul DeLeo, Soap & Detergent Association
- Juanita Martinez, KP Public Affairs
- Greg Hemsworth, Veolia
- Rebecca Sutton, Environmental Working Group
- Debbie Raphael, City of San Francisco
- Ansje Miller, Center for Environmental Health, CHANGE
- Laura Metz Duncan, Berridge & Diamond
- Megan Schwarzman, UC Berkeley COEH
- Gretchen Lee, Breast Cancer Fund
- Andria Ventura, Clean Water Action
- Diana Graham, Keller & Heckman LLP
- Claudia Polsky, DTSC

Welcome and Introductions

Dr. Warner welcomed members of the public.
Don Owen provided an update on the DTSC's Green Chemistry Initiative.

Discussion included:

- "Key elements" "early action items:" concerned that the information generation section has been removed from the GCI web site. Response: we found that category is large and so vaguely defined; 47% of the Phase 1 comments are related to this issue. We should have internally prepared a baseline. I invite further comment/advice on what to do with respect to information. At now, the topic is too large and unspecific within our current time frame.
- Regarding the baseline, why could that not be an early action item? Response: excellent idea. Rather than developing an action plan for using the data, but instead develop an implementation plan to do the baseline. Dr. Denison volunteered to help.

Public comment

1. Paul DeLeo Soap & Detergent Association

- I encourage you to look at broad-based support. I understand that the SAP is not consensus-based but I ask for designation of recommendations with broad support, to begin the work.
- Data, data transparency: industry is on board with transparency issues. There should be publicly-available hazard data sets. We need to recognize that when we're looking at "green chemistry," we're talking about new chemistries, with less data than existing chemistries. Industry is comfortable with the concept of ingredient disclosure on consumer products.
- Related to alternatives: prioritize chemicals, identify chemicals of concern. Massachusetts and Canada have similar programs. Develop metrics on chemicals of concern.
- SAP members had several questions for Mr. DeLeo:
- SAP member: does your association represent mostly manufacturers? Answer: about 1/3 chemical manufacturers, 2/3 formulators. There is currently much transition from petroleum to plant-based materials.
- SAP member: have you had discussions about who would produce the data & information? Answer: generally, the manufacturer of a particular chemical; we expect it to support its chemical, and defend the information. Question: is it your sense that they have that information? Answer: yes, largely. There are some gaps some information relies on models. For testing, they are trying to transition out of animal testing, which is a big challenge.
- SAP member: how to propose a list of priority chemicals? Answer: combine hazard data plus exposure; primarily a risk-based approach.
- SAP member: what would you warn us about? What is industry afraid of coming out of this process? Answer: mandatory across-the-board registration March 26, 2008 for every chemical. In Canada, 85% of Canada chemicals are not of high concern. Industry is more comfortable with a prioritization approach.

- SAP member: I note California's unique characteristics (Prop 65, etc.). I see a potential parallel with Prop 65. You mentioned new emphasis on nonanimal toxicity testing. No one's really got a handle on that. Answer: new methodologies: issue of low-dose effects, that's a huge open question.
- SAP member: do you have a suggestion for how California would assign priorities? Answer: look at existing databases. Canada model could be used, or U. S. EPA's IUR (Inventory Update Reporting) program. Do a first cut; use data not available in California.

2. Rebecca Sutton, Environmental Working Group: we have a short written statement (attached at the end of these notes). Our primary comment is, do not rely solely on voluntary action; we also need mandatory enforceable standards.

SAP members had several questions for Ms. Sutton:

- SAP member: I appreciate your comment regarding relying only on voluntary actions. What aspects about the initiative have led you to believe that may be the outcome? Answer: I'm just concerned; there are many difficult issues.
- SAP member: any examples of examples of "mandatory enforceable standards?" Answer: not at this time. We are currently working on the federal Safe Chemicals Act.

3. **Ansje Miller, Center for Environmental Health, CHANGE**: I would like to thank SAP members for their participation. This is critical for health AND economic opportunities. We need strong recommendations from the SAP. 2nd point: at the last SAP meeting, I asked if you had had a chance to look at the CHANGE framework; have you looked at that framework? I am also interested in whether this panel has reviewed the frameworks from DTSC. Finally, it's challenging to comment with no documents to comment on. Here is what we'd like to see:

- Information piece: make sure we have all the info about all the chemicals that are out there, using up to date testing methodology. We need information about chemicals' hazard traits, and their uses.
- We need more information, but we know enough to take action on known bad actors. We have lists already (prop 65) we can use to take action.
- Burden of proof: we would like to see a "no data no market" policy. Industry should demonstrate safety before putting chemicals in products.

SAP members had several questions for Ms. Miller:

- SAP member: I like the CHANGE "building blocks for Green Chemistry." Discussions in this group capture all or most of those principles. You did a good job of linking the gaps/ market failures with motivating innovation in green chemistry.
- SAP member: I'm a toxicologist. Do you have an idea of how to define "safe." Answer: battery of tests should be developed. Chemicals should have to go through the entire battery of tests to take action.
- SAP member: I read the CHANGE letter; it's well thought-out. Regarding "burden of

proof": this is an area where REACH dramatically changes how the system works. Are you advocating a REACH-like approach? Or something shorter? Answer: put the burden of proof on industry.

- SAP member: I looked at your framework, and thought it was very good. Do you have thoughts about what we should address now? Answer: not ready at this point, but there are lists we could start with (e.g., Prop 65 list).
- SAP member: in the creation of the Prop 65 list, there was a reliance on authoritative bodies; California used others' data. Not all the data was developed through new testing. I'm wondering if we can leverage other data (e.g., Canada list). How would you feel about us using those lists? Build on their work. Creating an inventory is huge. Could be similar to REACH. Answer: those are excellent starting points. At the same time, have to look at new chemicals coming on the market. California doesn't have to act alone (Interstate Clearinghouse; use REACH, DSL, etc.)
- SAP member: thank you for your remarks. The Canadian DSL, and EU REACH processes are much more collaborative. Regulatory processes here (federal) are much more confrontational. There's a faster pace of real change when it's more collaborative. How would you feel about a more collaborative process in California? Answer: hard to answer without knowing what it would look like.
- SAP member: thanks for the CHANGE comments, they are very helpful. We are looking at information dissemination. It's one thing to generate information, and another to get the information out to people for decision-making. What kinds of information (e.g. ingredient lists, information about where chemicals are in the state, what's needed for green chemistry alternatives assessment. Answer: ingredient list. Known and potential uses; hazard traits; known safer alternatives.
- SAP member: would CHANGE be clearer and provide more information? Answer: yes.
- SAP member: the CHANGE letter does indicate types of chemicals for priority action: bioaccumulative, persistent, those with known ecological effects, those in children's products. This is helpful to think about.

4. Gretchen Lee: Breast Cancer Fund: I would like to echo Ansje's comments and commend your work on this accelerated process. It's difficult to give public comment when I don't know what your thinking is. Next time, please provide information ahead of time. My recommendations:

- California needs a strong regulatory framework. Voluntary is good, but the regulatory framework is needed. We are already in a voluntary environment. Some volunteer, most do not. We need minimum data requirements for specific hazard traits. We need to invest in test methods, for endocrine disruption, neurotoxicity, respiratory toxicity.
- We should start now to eliminate bad actors. Continuous improvement. When we have the test methods for endocrine disruption, we can start taking action. LEED is a good model; it changes over time as more information is developed.
- Burden of proof: no data, no market. Untie regulator's hands so they can take action without proof beyond ALL doubt.
- We urge you to be bold and visionary; don't hold back. This is an extraordinary opportunity. Be aggressive.

SAP members had several questions for Ms. Lee:

- SAP member: do you have more information about LEED? Answer: standards change over time, incorporates new information over time. Key: continuous improvement. Agree with a SAP member's call for collaboration, but only if all parties have the same goal.
- SAP member: appreciate you bringing up LEED. Good illustration of where guidance, standards, and market forces, can produce dramatic results very quickly. No regulations for this, but people expect that these principles are being followed. Process: developing principles, sharing information. Also need some regulatory enhancement, to deal with bad actors. Both approaches have merit. Something very clear, platform for consumer products, that help drive market forces, will result in quick progress.
- SAP member: as you know, all chemicals are hazardous depending on the dose. How is your community work in that concept of dose? Ideas that could guide us? Answer: new science re: "dose makes the poison," timing of exposure, different genetic responses, and low-dose exposures. You can't look just at dose-response. We must start looking at intrinsic hazard, not dose. Also, stop looking at the average person, but instead look to protecting the most sensitive.

5. Debbie Raphael, City and County of San Francisco: Data: on the ground, trying to do chemicals policy at the local level, it calls instead for state and federal action). I'm representing not just San Francisco, but also ten "Green Cities California." We are meeting regularly to effect change at the state level. Those cities support what I'm saying today.

In a current project, we take what we know and translate it for the public, so residents can make informed decisions. For cleaning products, we spent thousands of hours to identify what's in a cleaning product. I need an MSDS that is easy to find. The authority exists for this. I need to know, where are these chemicals in products? Where are my constituents being exposed to a certain chemical (e.g., DHP)? The state of Massachusetts has a fact sheet on DHP, where is it used, etc. I can use that to make decisions. I need this in California.

The U.S. Building Council is afraid San Francisco will mandate LEED. LEED is a leadership standard. LEED: Title 24 in California sets minimum standards. LEED doesn't set a bottom standard; we need that. LEED /Green Seal doesn't help me. Set the bar low, set incentives high, and give me the information I need for decision-making. We need to ask the right questions, share the same goal (health of children and the planet).

- Data:
  - accessible data: need searchable database, expanded MSDS
  - completeness of data
  - baseline information: what data does the state collect now?
  - How chemicals are used in California; what products contain each chemical (i.e., Massachusetts DEHP fact sheet)

- Setting the bar: need to act on "bad actors" to ensure products meet some minimum standard (e.g., Title 24 sets the bar on energy efficiency)

- Regulatory authority: agency like DTSC must have the authority to take action. The legislature is the wrong place to debate phthalates.
- Language matters. Need to explain and be clear: there are near, medium and longer term options.

SAP members had several questions for Ms. Raphael:

- SAP member: have you been able to determine what consumers can and will do? Even with very toxic products, you can't put very much information on a label that people will assimilate. What you do put there has to be very recognizable symbology. What fraction of consumers will go on the internet, take it to the store, etc.? Answer: I was part of the Consumer Labeling Initiative. Symbols are key. In San Francisco, we found that people listen to trusted voices. The trusted voice is sometimes government, sometimes not. Trusted voices include day care centers, schools, and parent groups. Those are the people that want my lists, not the consumer. Some consumers might want a web site. Labels are sometimes good, beware of greenwashing. The basic assumption that products are safe is reasonable, supporting the idea that we should eliminate substances that we know aren't safe.
- SAP member: the decision-making about consumption is not at the consumer level. Consumer: color, picture, recollections regarding advertising. When Wal-Mart makes the decision about what goes on the shelf, when San Francisco does procurement: that is where the consumption decisions are made. Those people also can't find the information they need. When you plea that you do not have the information to make decisions about a safe line of products, that is very important for green chemistry. Regarding your comment about the inadequacy of the MSDS, what information, through what channels, would you feel most comfortable regarding getting the information that you need? Answer: I need to know what is in a product (MSDS does some of this). I am frustrated with the idea of proprietary ingredients. Second, I need to know, for each ingredient, what do we know about it (e.g., REACH, DSL screens)? Exposure is important to me, acute exposure issues are important as well. One of the challenges: when we prioritize, is how to weight? Corrosivity vs aquatic toxicity, etc., these are related to expected use. I'm worried about asthma, the data are poor (no screen). Which cleaning products might be an asthma trigger? That's a data gap on an outcome we're struggling with.
- SAP member: would the portal we've been discussing be helpful? Answer: searchable data bases are my favorite. DPR has a great searchable data base for products. I would like to have that for everything sold in California. Linked to other databases that are updated.
- SAP member: Thanks for your comments. Another wrinkle in the data question: which information is not there? Unsung aspects of what Canada did: limited to judgments based on existing criteria. Identified thousands of chemicals with little data. Confidence assigned was related to confidence in the source data. We need to know what we don't know. From your perspective, in your role, is identifying the unknowns part of your problem? Answer: if there's a gap, we assume the worse about a chemical. My perfect database would identify those gaps. Gretchen's "continuous improvement" idea is important here.
- SAP member: are there a few initiatives that the state would do, what would be most

helpful? I heard two: 1) making information more available, and 2) raise the floor. Are there other things? Answer: raising the bar, the information. One thing that's very challenging: reason for this conversation: TSCA is broken, other countries are looking at changing how regulate chemicals, California is doing the same. A department like DTSC needs more authority to take quicker action. The legislation should not be debating this on a chemical by chemical level.

- SAP member: Third complication: dose & timing issue. Exposure/dose: doing this at the local level is inappropriate. Mantra: don't let the perfect be the enemy of the good. Err on the side of precaution. If we can't determine a safe dose, then ask, is it necessary to make the product out of this chemical (for example, arsenic in playground equipment).
- SAP member: A problem with identifying bad actors, there's an opportunity cost. Instead, work on identifying clearly better alternatives. Some safer approaches are nonchemical. I think it will take twenty years before parts per billion exposure hazards are known. This is not conventional toxicology. I think probably not more that 2,000 (probably more like 1,200-1,400) chemicals are causing most of the problems. We have alternatives for those. Looking for more data is a diversion of public effort. From my perspective, the Green Chemistry Initiative should look for that kind of data.

Dr. Warner thanked members of the public for their attendance and input.

Review of the options drafted by the SAP subcommittees

Dr. Warner introduced the list of ideas on the table and stressed that this is not a debate, but for clarification of the ideas on the table. The following fifty ideas were explored in a general discussion.

Institutional

1. Establish an independent non-profit institute to identify, develop and test safer alternatives.
2. Establish funding and support for CA Institutes for Green Chemistry and Engineering within the UC system.
3. Create public-private partnerships for Green Chemistry R&D
4. Establish Green Chemistry Innovation Centers

Educational

1. Train K-12 science educators in Green Chemistry
2. Develop Green Chemistry K-12 teaching materials
3. Develop Green Chemistry general education materials
4. Integrate Green Chemistry concepts into undergrad chemistry
5. Create Green Chemistry curriculum for business schools

6. Develop Green Chemistry fellowship and internships programs
7. Fund new Green Chemistry faculty lines
8. Develop Green Chemistry Technology transfer training

Information Generation

1. Authorize OEHHA to evaluate toxicity of emerging solvents and make recommendations on how to deal with them
2. Create a Chemical Map of California

Research/Technology

1. Advance science of Alternatives Assessment
2. Identify existing Green Chemistry science and technology efforts
3. Identify Green Chemistry research and technology gaps
4. Establish Green Chemistry research fund
5. Establish innovative R&D support policies for GC
6. Establish Green Chemistry patent assistance program
7. Develop Intellectual Property policy for Green Chemistry research
8. Establish Green Chemistry labs and test sites
9. Advance science of toxicity testing

Regulation

1. Require manufacturers and importers of chemicals to provide health, safety and use info as entry condition
2. Create legislation that phases-out use of chlorinated solvents in California.
3. Require all air districts to adopt regulations of the South Coast Air Quality Management District.
4. Phase out sale of aerosol cleaning products
5. State mandate that manufacturers provide list of all ingredients in their products. NGOs compile lists.
6. Require manufacturers and users of hazardous chemicals, and processes involving

hazardous exposures, to submit an alternatives assessment, identifying "greener" alternatives.

7. Manufacturers and retailers of chemicals in California must provide hazard info about products to Cal/EPA

Incentives

1. Implement a management system for CA chemicals manufacturers
2. Establish awards program and financial incentives for green chemistry innovators.
3. Creates a top ten list of problem materials. Solicits proposals for alternative design.
4. Incorporate green chemistry criteria to state procurement processes
5. Establish mechanisms to promote, maintain and nurture Green Chemistry processes and products (i.e., tax incentives, subsidies, grants, low interest loans).
6. Provide marketing exposure for Green Chemistry processes and products thus educating consumers.
7. Screen Formulations for Purchasing
8. Establish Governor's award for Green Chemistry research, education and other appropriate categories
9. Create a Green Chemistry R&D business plan competition (seed grants)

Information Dissemination

1. Provide retailers with guides for green alternatives to toxic products to help them select better alternatives.
2. Create a uniform and transparent scorecard that informs producers and consumers which products are "green."
3. Value Chain Communications
4. Leverage Chemistry Evaluation Info
5. Provide information on Chemistry Evaluation Approaches
6. Create a web-based greener chemical marketplace
7. Develop a web portal for Green Chemistry solutions
8. Integrate Green Chemistry in State Technical Assistance Programs
9. Promote Green Chemistry through industry associations

10. Promote Green Chemistry in job/workforce training and vocational education

11. SAP business:

Discussion around the SAP's draft list:

- this is just an initial draft for discussion today. What will the public see next? Our mandate is one third of the GCI process. Ongoing dialog on the web, and more public comment phase.
- Will SAP come to an end? Or continue as oversight to DTSC's implementation of green chemistry?

Staff requested SAP members to submit travel reimbursement information by Friday, April 4, to Cathy Cooke.

Emerson: next steps for today.

There was a general discussion of how to synthesize the work completed to date. Issues such as compressing the options list to a more workable number, logical groupings for the specific options, supply versus demand side options, appropriate length and level of detail for the final report.

The Synthesis Subcommittee will meet next week to work on planning the final SAP work.

Additional discussion:

- Policy/science discussion
- Make sure that as we squeeze down the options that nothing is dropped
- Cancel the larger call on April 1? That should be an SC6 meeting.
- Can we establish more benchmarks?
- Friday 4/18: see what we have re: a draft.

In closing the meeting, DTSC Director Maureen Gorsen commended the SAP for its hard work.

Adjournment
The meeting was adjourned at 5:30 pm PST.

Attachment: Submitted Written Comments from Members of the Public

Rebecca Sutton, Environmental Working Group

Environmental Working Group is encouraged by the growing level of attention and energy surrounding the issue of green chemistry in California. We thank the Science Advisory Board for this opportunity to participate in the dialogue.

However, like many others in the environmental community, we are concerned that the outcome of this conversation may not be the substantive, pro-active reform that we need. Green chemistry reform based largely on voluntary actions, economic incentives, and other measures that are discretionary for chemical and consumer product manufacturers are inadequate to address the public health threat caused by the pervasive contamination of our bodies and our environment with industrial chemicals.

We face a daunting situation – a world contaminated by thousands of synthetic chemicals, the majority of which have reached the market without any requirement for safety testing. Our own research indicates that industrial pollution begins in the womb: The body of each infant born in California contains a unique mixture of perhaps hundreds of chemicals, most never having been tested for safety individually, let alone in combination. Increasing rates of breast and prostate cancer, diabetes, autism, and many other serious health conditions in industrialized countries suggest our chemical-intensive economy may play a significant role in the health and well-being of our population.

We have an exciting opportunity in this state to create the broad changes in chemical policy necessary to protect human health and the environment. California's history of innovation and leadership in related issues including air quality, sustainability, and renewable energy, will foster the means to seek substantive solutions for reform of chemical health protections. And our powerful economy will ensure that the steps we take will have far-reaching impacts.

California is in a unique position to lead the country towards meaningful advances in public health. We ask the Science Advisory Board to ensure that the proposals it develops do not rely solely on voluntary actions by industry, but instead encompass mandatory, enforceable safety standards.

Paul DeLeo, The Soap and Detergent Association

While the SAP is not designed as a consensus-based activity, SDA encourages the SAP to consider and advocate solutions that will have broad support. As an industry trade association, we believe there are a number of those opportunities. For example, SDA supports transparency with regard to chemical data such as complete publicly available hazard data sets for chemicals. SDA believes it is appropriate to conduct a prioritization exercise and focus green chemistry and engineering resources on those chemicals of greatest concern.

APPENDIX C

Summary of Phase One and Phase Two Options Included in the Proposed Policy Recommendations—April 2007 through July 2008
(organized by respective policy recommendation)

CALIFORNIA GREEN CHEMISTRY INITIATIVE
PROPOSED POLICY FRAMEWORK

(Phase One and Phase Two options organized by policy recommendation)

1. EXPAND POLLUTION PREVENTION:

Assist California Facilities in Shifting Their Focus to Greener Design and Production

1.1. Summary: This policy component will position California industry and municipalities at the forefront of sustainable, greener practices. By applying lifecycle thinking, California facilities will shift their focus from end-of-pipe waste management to greener design and production. Business will save money, improve efficiency, and reduce liability for a "triple bottom line" profit. California communities will be safer as less hazardous chemicals are substituted and prevention planning reduces the risk of catastrophic accidents.

1.2. Expand California's Pollution Prevention Program {P.5}

1.2.1. Broaden across economic/industrial sectors

1.2.2. Move from end-of-pipe to design; from waste, to use

1.3. Expand California's Pollution Prevention Program {KE 3.0}

1.4. Refocus the *Source Reduction Act* on Chemical Use Reduction Rather than Waste Reduction {KE 3.1}

1.5. Increase State Funding For Development Of Safer Alternatives {KE 3.2}

1.6. Expand Voluntary Programs and the Role of Regulation to Achieve Large-Scale Safer Substitutes {KE 3.3}

1.7. Promote Extended Producer Responsibility For Consumer Products {KE 3.4}

1.8. Establish California as A Pollution Prevention and Green Technology Leader Through Adoption of Existing Feasible and Cost-Effective Pollution-Prevention and Green Technology Measures {KE 3.5}

1.9. Increase State Support For Local Green Business Programs {KE 3.6}

1.10. Add Green Chemistry to State Technical Assistance Programs {SAP 19}

1.11. Enhance Homeland Security {P.5}

1.11.1. Move to safer material and practices that prevent catastrophic loss of life

1.12. Establish Green Chemistry Innovation Awards, Governor's Green Chemistry Award, and/or Green Business Plan Competition {SAP 16}

2. DEVELOP A GREEN CHEMISTRY WORKFORCE AND INNOVATIVE TECHNOLOGICAL CAPACITY

Create Innovative Engine of Economic Growth

2.1. Summary: This policy component will enable California to usher in the new Gold Rush in green chemistries and products in the quest for global material prosperity. It will establish in California the knowledge workforce of the next industrial revolution based on green chemistry and green engineering design. Governor Schwarzenegger can energize the hopes and dreams of the next generation to go into scientific and engineering fields that have the potential to solve our greatest environmental problems.

2.2. Train Tomorrow's Leaders, Chemicals, Materials Engineers, And Technical Workers {P.2}

2.2.1. Public Education for K-12 School Children {KE.5.0}

2.2.1.1.1. Include green chemistry principles in Education and the Environment Initiative (EEI)
2.2.1.1.2. Establish green chemistry principles in kindergarten through 12th grade
2.2.1.1.3. Expand Education and the Environment Initiative (EEI) to include green chemistry principles

2.2.2. Train K-12 Science Educations {SAP 1}

2.2.2.1.1. Develop a program to train K-12 science education teachers in the concepts of green chemistry

2.2.2.1.2. Such training programs could be provided through a variety of mechanisms, including:

2.2.2.1.3. In-service professional training programs offered through various professional associations

2.2.2.1.4. Continuing education programs offered by college teacher training programs,

2.2.2.1.5. Summer enrichment training programs tied to certification and accreditation requirements.

2.2.3. Develop K-12 Green Chemistry Teaching Materials {SAP 2}

2.2.3.1.1. Expand California's science education materials programs to include training and laboratory materials for conveying concepts in green chemistry to K-12 classrooms suited to each grade level

2.2.4. Augment the Science Curricula for Kindergarten through Grade 12 with Age-Appropriate Content Related to Green Chemistry {P1.EO-1}

2.2.5. Train a New Generation of Scientists and Engineers {KE.4.0}

2.2.5.1.1. Establish new green technology curricula in Universities
2.2.5.1.2. Expand core curriculum with green chemistry principles
2.2.5.1.3. Expanding continuing education with green chemistry principles
2.2.5.1.4. Use sustainable production principles in teaching the design of systems
2.2.5.1.5. Use lifecycle analysis and management in economics, science, and engineering coursework
2.2.5.1.6. Provide opportunities to disadvantaged communities to advance green chemistry

2.2.6. Develop Green Chemistry Interdisciplinary Education Courses {SAP 3}

2.2.6.1. Develop programs to introduce interdisciplinary green chemistry into the general education curriculum for undergraduates in California colleges and universities

2.2.7. Establish or Enhance Academic Programs at Colleges and Universities to Supply the Technical Expertise and Advanced Designs Needed to Promote an Environmentally Sustainable Economy {P1.EO-2}

2.2.8. Integrate Green Chemistry into Higher Education Chemistry and Chemical Engineering Curricula {SAP 4}

2.2.8.1. Reformulate conventional graduate and undergraduate chemistry and chemical engineering curricula in California colleges and universities to emphasize green chemistry and to include aspects of toxicology, health-related issues, ecology, environmental science, and environmental law.

2.2.9. Develop Fellowships and Internships in Green Chemistry {SAP 5}

2.2.9.1. Develop a program to support graduate education fellowships and both undergraduate and graduate internships focused on green chemistry research and application

2.2.9.2. Partnering with other interested parties including the federal government and national laboratories, industrial interests including individual companies and industrial sectors, and non-governmental organizations including philanthropic institutions, the program could include:

2.2.9.2.1. Universities in California seeking to develop internship partnerships with industry to provide practical experience in green chemistry could apply for seed grants to launch the program.

2.2.9.2.2. Twenty-five graduate student research fellowships in green chemistry would be offered competitively to students doing research on any area of green chemistry at the Ph.D. or Masters level. Funding would cover stipend and tuition.

2.2.9.2.3. Twenty-five undergraduate research fellowships in green chemistry would be offered competitively to students doing research on any area of green chemistry.

2.2.9.2.4. Ten post-doctoral research fellowships in green chemistry would be provided to outstanding candidates and would supply matching funds to the principal investigator at a university or national/state laboratory in California to cover the salary of the researcher.

2.2.10. Promote Green Chemistry in Business School Education {SAP 6}

2.2.10.1. Commission the development of practical teaching cases in green chemistry that can be incorporated into the curricula of business schools throughout the university systems in California

2.2.11. Support New Faculty Positions in Green Chemistry {SAP 7}

2.2.11.1. Encourage and financially support the hiring of faculty qualified in green chemistry throughout the state's colleges and universities

2.2.12. Introduce Green Chemistry into Vocational and Workforce Development Training Programs {SAP 8}

2.2.12.1. Support and fund a green chemistry program for vocational schools and other workforce development programs

2.2.13. Help Advance the Science of Toxicology {SAP 24}

2.3. Stimulate Innovation, Research, And Development Of Green Chemistries, Materials, Tools, And Technologies {P.2}

2.3.1. Implement A Process To Identify All On-Going Efforts In Green Chemistry Science And Technology In California, And Use That To Determine Critical Gaps In Green Chemistry Research And Technology {SAP 9}

2.3.1.1. Identify an independent third-party group, external to California, to conduct a 9-month audit of green chemistry activities in California that would:

2.3.1.1.1. Identify all research programs in green chemistry at public and private universities and colleges of California (in all departments, schools, and centers).

2.3.1.1.2. Identify green chemistry research and development in industry that has led to commercialization of improved products.

2.3.1.1.3. Identify all science- and technology-related programs in the state government and the federal government operations in the state of California (e.g., national laboratories)

2.3.1.1.4. Identify any non-governmental, not-for-profit, philanthropic organizations, advocacy or research institutions with programs to advance green chemistry science and technology.

2.3.1.2. Compile any gathered data in a searchable database of maximum use in identifying opportunities and needs.

2.3.1.3. Conduct a gap analysis that reviews the current portfolio of green chemistry science and technology in California and provides an analysis of where the state has strengths weaknesses, opportunities, and needs. This

2.3.2. Support Green Chemistry Research and Development Efforts in California {SAP 10}

2.3.2.1. Establish a $10 million Green Chemistry Research Fund to provide a minimum of forty, $250,000 direct grants annually to faculty at universities and colleges in California. The fund would be overseen by the Green Chemistry Council and should be focused on those areas identified as being crucial to development of Green Chemistry Science and Technology through efforts undertaken following the audit discussed above.

2.3.2.2. Establish a policy at all California state institutions of higher learning that any research grants that are deemed to be supporting green chemistry science and technology will receive specific institutional support.

2.3.2.3. Establish supportive tax credit and other policies to encourage and reward corporate support of research and development activities at California Universities and Colleges in the area of green chemistry.

2.3.2.4. Establish a patent assistance program that will provide funding for academics, small businesses, and entrepreneurs to cover the costs of patenting innovation in green chemistry science and technology.

2.3.2.5. Establish an overall policy for intellectual property ownership for projects funded by the state of California and by public-private partnerships to ensure that the public receives the benefits of resources allocated to this enterprise, while maintaining a commercial incentive for private partners to collaborate with public actors.

2.3.3. Promote, Encourage, and Facilitate the Development of Industry-University Partnerships {SAP 11}

2.3.3.1. Establish Green Chemistry Institutes within the University of California system that would enable focused research and development using strong public-private collaboration. The Institutes should be structured following the highly-successful California Institutes for Science and Innovation program implemented earlier by the state.

2.3.3.2. Establish an infrastructure within these institutes and other specially-established centers to not only focus on education and research, but also to aid implementation by providing the means for testing new products and solutions in a real-world context. The focus should be on accelerating innovation and product introduction, ultimately strengthening California's economy.

2.3.3.3. Establish a common, fair, intellectual property agreement that facilitates private-sector investment in research and university collaborations and ensures a public benefit from such collaborations. Agreements could be modeled on those established by the California Institute for Regenerative Medicine to promote public-private collaboration.

2.3.4. Strengthen the Green Chemistry Infrastructure {SAP 12}

2.3.4.1. Establish unique Green Chemistry Science and Technology Innovation

2.3.4.2. Establish specialized laboratories and test sites operated by the

2.3.4.3. Establish centers for the advancement of the science of toxicity testing.

2.3.5. Establish a "California Chemistry Research Challenge" {SAP 17}

2.4. Conduct Research to Identify Safer Alternative Starting Materials for Products that are now Known to Employ Hazardous Substances at the Beginning of the Process {P1.RT-1}

2.5. Conduct Research to Develop Analytical Chemistry Screening Methods for Commercial Products {P1.RT-2}

2.5.1. Keep pace of new methods to evaluate toxicity other than animal testing. These include: OECD QSAR Toolbox and other international QSAR Foundation activities, OECD and NTP toxicogenomics initiatives, ILSI/HESI's Tiered Toxicology Testing Proposal for Pesticide Chemicals, OECD Integrated Approaches to Testing and Assessment, and others. {P1.DC-1.3-163}

2.6. Encourage Public-Private Partnerships among Government, Universities, and Industry, and between Industries and Manufacturers {P1.VM-2}

2.7. Institute Awards and Recognition that Provides a Market Advantage to the Recipients {P1.EI-4}

2.8. Develop an Awards Program to Publicly Recognize Green Chemistry Achievement and Guide Environmentally Preferred Purchasing {P1.RAC-1}

2.8.1. Presidential Green Chemistry Awards

2.8.2. USEPA National Program for Environmental Priorities (NPEP)

2.8.3. England's Green Chemistry Network

2.8.4. Australian Green Chemistry Challenge

2.8.5. Germany Haltermann Innovation Prize

2.8.6. Italian Green Chemistry Award

2.8.7. American Chemical Society (ACS) awards

2.9. Ensure Rapid Technology Transfer And Diffusion To All Economic Sectors {P.2}

2.10. Establish One or More Independent Non-profit Institutes to Identify, Develop, and Test Safer Alternatives {SAP 21}

2.11. Provide Marketing Exposure for Green Chemistry Products and Processes. {SAP 37}

2.12. Develop Funding Sources for Green Chemistry Activities {P1.EI-5}

2.13. Establish Incentives and Disincentives to Encourage or Discourage Specific Actions {P1.EI-1}

2.13.1. Incentives

2.13.1.1. Loans and grants

2.13.1.2. Tax incentives

2.13.1.3. Reporting incentives

2.13.1.4. Product rebates

2.13.2. Disincentives

2.13.2.1. Usage fees

2.13.2.2. Deposit and refund schemes

2.13.2.3. Taxes

2.13.2.4. Fines

2.14. Establish Statutory/Regulatory Measures To Create Economic Incentives To Drive Green Chemistry {P1.SR-4}

2.14.1. Incentives

2.14.2. Government procurement

2.14.3. Fees and taxes

2.14.4. Third-party certification

3. CREATE AN ONLINE PRODUCT INGREDIENT NETWORK

3.1. Summary: This policy component will create an online product ingredient registry, where California businesses, retailers, and consumers will have the ability to access non-confidential information about which chemicals, including nanomaterials, are in the products and goods they purchase in California. This information will allow manufacturers, retailers, and ultimately consumers to make informed choices about the goods and products they buy and use.

3.2. Disclose Chemical Ingredients In Products {P.4}

3.2.1. Product manufacturers disclose all ingredients for all products sold in California, by Chemical Abstract Service number and uniform product codes (barcodes).

3.2.2. Ingredient data is accessible (to anyone), using a state of the art algorithm design, via a dynamic, decentralized, web-based distributed data network (e.g., Google Earth, Craigslist, "wiki' type network architecture).

3.2.3. Where the producer claims a trade secret, that particular data is accessible to a designated governmental entity [DPR] (i.e., a "Virtual Vault"), which can trigger a regulatory action if specified hazard circumstances are found.

3.3. Require Product Manufacturers and Importers in California to Disclose Chemical Ingredients {SAP 28}

3.4. Establish Statutory/Regulatory Requirements for Disclosure, Labeling, and Certification {P1.SR-2}

3.5. Screen Chemical Product Formulations for Safety, Health, and Environmental Preferability, Based on Full Ingredient Disclosure by the Producer to the Screener. {SAP 35}

3.6. Encourage Corporate Responsibility and Accountability by Helping Businesses Make Informed, Green Choices {P1.EI-3}

3.7. Promote Value Chain Communications {SAP 15}

3.8. Empower Consumers To Make Informed Choices; Disseminate Information On Toxic Chemicals And Strategic International Partnerships {KE.1.0}

3.8.1. Design and implementation of outreach, marketing and communication plan

3.8.1.1. Establish target audience

3.8.1.2. Develop suitable message that modifies behaviors

3.8.1.3. Establish method of delivery

3.8.1.4. Establish methods for measuring outcomes

3.9. Facilitate Public Access To Clear And Objective Information To Enable Informed Choices {P1.EO-3}

3.10. Develop Management And Technology Infrastructure For Chemicals And Products {KE 1.2}

3.10.1. Development of web based information portal to manage chemical information

3.10.2. Development of method to make information accessible to stakeholders

3.11. Establish Key Partnerships {KE 1.3}

3.11.1. Establish MOU-type agreements with Governments to exchange information

3.11.1.1. Europe

3.11.1.2. Canada

3.11.1.3. Sweden

4. CREATE AN ONLINE TOXICS CLEARINGHOUSE:

4.1. Summary: This policy component will increase our knowledge about the toxicity and hazard traits of the thousands of chemicals used in California everyday. An online clearinghouse will link scientific studies worldwide with individual chemicals, compounds, and nanomaterials so product manufacturers, policymakers, and Californians can ascertain what is known—or not known yet—about chemicals found in the goods, products, and commodities they produce, sell, and use everyday.

4.2. Create an Online Clearinghouse of Chemical Information that Identifies Toxicity and Hazard Traits for California {P.6}

4.2.1. A governmental entity [OEHHA] will—through a transparent and public process--define the hazard traits/toxicological end-points of concern for California.

4.2.2. A "Green Ribbon Science Panel" provides expert scientific advice to the Environmental Policy Council regarding priority chemicals, authoritative bodies, and other scientific matters.

4.2.3. The Environmental Policy Council (a plural, multimedia body) considers the "Green Ribbon" advice, receives public input, and evaluates technological, economic, and social matters in order to prioritize the first list of chemicals of concern.

4.2.4. A governmental entity [the Secretary for Environmental Protection] enters into international agreements with the designated authoritative bodies (i.e., European Union, Canada, Sweden, IARC, etc.) to share chemical data.

4.2.5. Chemical manufacturers are responsible for ensuring that the hazard/toxicity/end-point data is generated—through specified methods and appropriate entities—for chemicals on the priority list (for which data is incomplete or unknown).

4.2.6. To create the virtual clearinghouse, the specified data is made accessible (to anyone), using a state of the art algorithm design, via a dynamic, decentralized, web-based distributed data network.

4.2.7. The Environmental Policy Council periodically reviews the California matrix and adopts an updated list of chemicals of concern to the state; an interested party may petition the council regarding prioritization matters.

4.3. Adopt a Policy to Identify Chemicals of Concern, Including, as Appropriate, Associated Processes and Approaches, and Develop Specific Criteria for This Purpose. {SAP 22}

4.4. Systematically Collect Data and Information Needed to Categorize and Prioritize Chemicals, and Take Actions to Reduce Toxics in Products. {P1.DC-1}

4.4.1. Prioritize and address chemicals by toxicity, risk, and volumes used and/or released into commerce and the environment. {P1.DC-1.1-6}

4.4.2. Prioritize protection from chemical harm in decision-making. Use data on all toxicological end-points, including cancer, reproductive effects, developmental effects, etc. {P1.DC-1.1-18}

4.4.3. Establish mandatory reporting and requirements needed to fill gaps about chemicals. In addition to CMR data, other end-points—neurotoxicity, long-term toxicity, endrocrine disruption, immunotoxicity, etc.—are needed. Industry should be responsible for developing these data, with the government as auditor/verifier. {P1.DC-1.1-36}

4.4.4. Do not reinvent the process, as a whole new process could have a negative effect. Study, instead, the Canadian list, EU REACH, and others to determine usefulness, validity, etc. {P1.DC-1.2-124}

4.4.5. Look at available data sources to obtain information on chemical toxicity. These include USEPA's various programs (IRIS, HPV, VCCEP); TSCA test submissions of unpublished technical reports, European Chemical Substance Information System, OECD member countries, and International Programme on Chemical Safety. {P1.DC-1.3-55}

4.5. Require Chemical Manufacturers and Importers in California to Provide Specific Information About the Hazards and Uses of Their Products {SAP 26}

4.6. Build a Toxicological and Exposure Potential Database on Chemicals Used in California {P1.DC-6}

4.7. Develop a "Green Chemistry" Web Portal {SAP 18}

4.8. Promote Value Chain Communications {SAP 15}

4.9. Facilitate Public Access To Clear And Objective Information To Enable Informed Choices {P1.EO-3}

4.10. Empower Consumers To Make Informed Choices; Disseminate Information On Toxic Chemicals And Strategic International Partnerships {KE.1.0}

- 4.10.1. Design and implementation of outreach, marketing and communication plan
  - 4.10.1.1. Establish target audience
  - 4.10.1.2. Develop suitable message that modifies behaviors
  - 4.10.1.3. Establish method of delivery
  - 4.10.1.4. Establish methods for measuring outcomes

4.11. Develop Management And Technology Infrastructure For Chemicals And Products {KE 1.2}

- 4.11.1. Development of web based information portal to manage chemical information
- 4.11.2. Development of method to make information accessible to stakeholders

4.12. Establish Mechanisms and Tools to Facilitate Sharing, Use, and Analysis of Data {P1.DC-4}

- 4.12.1. Analytical tools
- 4.12.2. Web-based information clearinghouse
- 4.12.3. Database of chemical or technological alternatives
- 4.12.4. "Wiki" approach to data collection
- 4.12.5. Develop a data audit system
- 4.12.6. Establish partnerships with states to create an interstate clearinghouse of environmental health and safety

4.13. Establish Key Partnerships {KE 1.3}

- 4.13.1. Establish MOU-type agreements with Governments to exchange information
  - 4.13.1.1. Europe
  - 4.13.1.2. Canada
  - 4.13.1.3. Sweden

4.14. Establish a Partnership Network for Information Sharing and Dissemination {P1.TA-2}

4.15. Coordinate and Harmonize Laws and Regulatory Requirements with Those of the Federal Government, Other States, and Other Countries {P1.SR-11}

4.16. Use the Best Elements of Other Programs in the United States as Sources of Data or as Models for Data Collection and Use. {P1.DC-3}

- 4.16.1. Massachusetts Toxic Use Reduction Act (TURA)
- 4.16.2. Oregon Toxics Use and Hazardous Waste Reduction Act (TUHWR)
- 4.16.3. Oregon Executive Order—Elimination of Persistent, Bioaccumulative, and Toxic Pollutants
- 4.16.4. U.S. EPA Inventory Update Rule

4.17. Use the Best Elements of the Canadian Environmental Protection Act (CEPA) and the European Union's Registration, Evaluation And Authorisation Of Chemicals (EU REACH) Program as Models for Data Collection and Use. {P1.DC-2}

5. ACCELERATE THE QUEST FOR SAFER PRODUCTS

Science-based Alternatives Analysis

5.1. Summary: This policy component will create a new regulatory approach to toxic ingredients in product. Rather than government studying how bad something is and then limiting or banning it, government will require industry to find the good and seek out the alternatives that are inherently safer and have a lesser impact on the environment. Alternatives analysis with lifecycle thinking shifts society's resources towards safer solutions that also enhance innovation and economic growth.

5.2. Apply Lifecycle Thinking In Alternatives Analysis When a "Trigger" Occurs For a Chemical of Concern {P.3}

5.2.1. A governmental entity [the environmental policy council] considers stakeholder input in a transparent, public process and adopts: (a) the specific attributes to be evaluated and (b) the life-cycle assessment methodology to be used.

5.2.2. Product manufacturers apply the specified methodology and conduct life-cycle assessments to determine if "greener" alternatives (i.e., product reformulation, design changes, non-chemical alternatives, etc.) Are feasible and implementable.

5.2.3. "California Green Products Institute" (modeled on the various non-governmental organizations, such as ANSI, ISO, US Green Buildings Council) assists businesses and government in implementing and improving the methodology, collecting performance data, and monitoring outcomes of life-cycle assessments across product categories and economic sectors.

5.2.4. Using implementation data from any source, a government entity may take one of several regulatory actions, including research, monitoring, engineering controls, extended produced responsibility, substitution, restriction, phase-out, ban, etc.

5.3. Adopt a Policy to Identify Chemicals of Concern, Including, as Appropriate, Associated Processes and Approaches, and Develop Specific Criteria for This Purpose. {SAP 22}

5.4. Target Chemical Uses of Concern Based on Hazard, Exposure, and Risk {SAP 25}

5.5. Require Chemical Manufacturers and Importers in California to Provide Specific Information About the Hazards and Uses of Their Products {SAP 26}

5.6. Require Chemical Makers and Users to Systematically Identify and Consider Safer Alternatives {SAP 29}

5.7. Require Companies that Provide Chemical Information to Cal/EPA that They Submit to Other Authorities {SAP 27}

5.8. Establish Statutory/Regulatory Requirements for the Development and Reporting of Toxicity and Exposure Data, Safety Assessments, and Follow-Up Actions on Chemicals, Products, and Processes {P1.SR-1}

5.8.1. Registration and data submittal requirements

5.8.2. Timelines

5.8.3. Public Access to Data

5.8.4. Safety assessments

5.8.5. Lifecycle assessments

5.8.6. Risk, hazard, or alternatives assessments

5.8.7. Follow-up actions

5.8.8. Stakeholder involvement

5.8.9. Progress metrics and continual regulatory improvement.

5.9. Authorize Cal/EPA to Phase Out Hazardous Chemicals {SAP 30}

5.10. Take Immediate Actions to Prohibit or Restrict the Use of Known Hazardous Substances {P1.SR-8}

5.11. Eliminate the Use of Hazardous Chemicals by Prohibiting Their Use, Replacing Them with Alternatives Found to be Preferable, or Establishing Pre-Market Approval Requirements {P1.SR-7}

5.12. Reduce or Restrict the Use of Hazardous Substances Through Use Reduction Measures, Standards Setting, Process or Engineering Changes, and Product Stewardship Initiatives {P1.SR-9}

5.13. Consider a Broad Range of Sustainability, Social, Economic, and Other Factors Associated with the Lifecycle of a Product, in Addition to Human and Environmental Impacts, in Chemical Management Decisions {P1-SR-6}

5.14. Mandate Extended Producer Responsibility and Other Measures to Control the Waste Stream {P1.SR-5}

5.15. Expand the Regulatory Authority and Funding for State Programs {P1.SR-10}

5.16. Establish One or More Independent Non-profit Institutes to Identify, Develop, and Test Safer Alternatives {SAP 21}

5.17. Provide Technical Assistance to Businesses in Evaluating Alternative Products and Processes {P1.TA-1}

5.18. Advance the Science of Alternatives Assessment {SAP 20}

5.19. Use Green Engineering Research to Develop and Assess Green Designs and Production Processes {P1.RT-3}

5.20. Promote Green Chemistry by Industry Associations {SAP 14}

5.21. Promote Value Chain Communications {SAP 15}

5.22. Publicize Guidelines, Chemical Databases, Evaluation Tools, and Other Information to Simplify the Selection of Preferable Alternatives {P1.TA-3}

5.23. Account For Chemical Toxicity And Impacts In State Procurement Decisions {KE 6.0}

5.24. Incorporate Green Chemistry Criteria into State Procurement Processes. {SAP 36}

5.25. Lead Through Example {KE 6.1}

5.25.1. Leverage State agencies' influence in the marketplace by including cradle-to-cradle and life-cycle cost analyses in purchasing decisions.

5.25.2. Expand and strengthen environmentally preferable purchasing (EPP) criteria to include cradle-to-cradle and life-cycle cost analyses in purchasing decisions.

5.26. Facilitate Public Access To Clear And Objective Information To Enable Informed Choices {P1.EO-3}

6. MOVE TOWARD A CRADLE-TO-CRADLE ECONOMY

Leverage Market Forces to Produce Products that are "Benign by Design"

6.1. Summary: This policy component will start infusing the California marketplace with lifecycle thinking and accelerate the innovation and selection of sustainable, non-toxic choices for consumers. It will create a climate that allows market forces to design, produce, and sell ever more environmentally benign products. It may have the effect of applying Moore's Law to environmental protection—where businesses will compete in environmental cost reduction to obtain ever lower environmental footprint scores to gain competitive advantage. With the profit motive and market competitiveness as its ally, California's environment and our public health have the potential to see great gains at little cost to the public.

6.2. Moving Toward A Cradle-To-Cradle Economy For California By 2050 {P.1}

6.2.1. A new non-governmental organization—the "California Green Products Institute"—is created and patterned on the California Climate Action Registry. This new institute will function as a consensus standards entity (like ANSI, ISO, USGBC, etc.).

6.2.2. The California Green Products Institute establishes lifecycle/sustainability ("green") criteria for consumer goods, products, and commodities sold in California.

6.2.3. Retailers who sell products in California set a "baseline" for their product portfolio and set targets for improvement (to more sustainable, greener products for California) and publish publicly those baseline and targets by 2020.

6.2.4. By 2030, retailers will achieve a 25 percent improvement (to more sustainable, greener products) for products sold in California. If that target is achieved or missed, the governmental entity [DTSC] may provide an incentive or assess a penalty, respectively.

6.2.5. By 2040, retailers will achieve a 50 percent improvement.

6.2.6. By 2050, retailers will achieve a 75 percent improvement and establish a new baseline.

6.3. Require Chemical Makers and Users to Systematically Identify and Consider Safer Alternatives {SAP 29}

6.4. Use Market Drivers to Accelerate the Demand for Safer Products in the Marketplace {P1.EI-2}

6.5. Implement Management System Approaches for California Chemical Manufacturers {SAP 13}

6.6. Promote Value Chain Communications {SAP 15}

6.7. Establish One or More Independent Non-profit Institutes to Identify, Develop, and Test Safer Alternatives {SAP 21}

6.8. Advance the Science of Alternatives Assessment {SAP 20}

6.9. Collect Data Needed to Conduct Life-Cycle Analysis of High-Use Products and Develop a Lifecycle Analysis Prototype {P1.DC-5}

6.10. Provide Retailers with Access to Guides for Selecting Greener Alternatives to Toxic Products, Via a Retailer Clearinghouse {SAP 33}

6.11. Provide Technical Assistance to Businesses in Evaluating Alternative Products and Processes {P1.TA-1}

6.12. Develop a "Green Scorecard" for chemical products that Lets Both Producers and Consumers Know Which Products Truly Are Greener than Others. {SAP 34}

6.13. Publicize Guidelines, Chemical Databases, Evaluation Tools, and Other Information to Simplify the Selection of Preferable Alternatives {P1.TA-3}

6.14. Create a Web-based Marketplace for Greener Chemicals and Products {SAP 38}

6.15. Establish a Partnership Network for Information Sharing and Dissemination {P1.TA-2}

6.16. Strengthening Consumer Protection Laws {KE 3.0}

6.17. Establish Interagency Consumer Products Workgroup {KE 2.1}

6.17.1. Identify consumer products where authorities overlap

6.17.2. Identify streamlined agency approach to maximize on resource use

6.17.3. Exchange information on compliance and investigative work

6.18. Develop Stepwise Method To Build A Cradle To Cradle System {KE 2.2}

6.18.1. Identify consumer product data gaps

6.18.2. Identify chemicals of concern in consumer products

6.18.3. Prioritize of chemicals of concern requiring further action

6.19. Facilitate Public Access To Clear And Objective Information To Enable Informed Choices {P1.EO-3}

6.20. Establish Metrics to Assess the Effectiveness of Chemical Management Strategies Implemented {P1.SR-12}

KEY	
P	Proposed Policy Framework Component Number
SAP	Science Advisory Panel's recommendation number
KE	Key Element Teams' recommendation number
P1.X X	Phase One Options Report recommendation number, by chapter

APPENDIX D

Key Element Team Reports—July 2008
(organized by respective team topic)

APPENDIX D
GREEN CHEMISTRY INITIATIVE – KEY ELEMENTS

Introduction

During the first phase of the Green Chemistry Initiative, stakeholders throughout the state met with staff from Cal/EPA and national and international experts to identify the options for a successful green chemistry framework for California. A number of these options fell into areas identified by a majority of the stakeholders as "key" and were addressed by key element teams charged with aligning existing state governmental programs with the overall objectives of the Green Chemistry Initiative.

In the second phase of the Green Chemistry Initiative, interagency stakeholders joined with other stakeholders to form the key element teams that defined, evaluated and developed implementation plans for each of the six key elements:

- Disseminate information on toxic chemicals, empower consumers to make informed choices, and forge strategic partnerships
- Strengthen consumer protection laws
- Expand California's pollution prevention program
- Train a new generation of scientists and engineers
- Include Green Chemistry principles in an environmental education initiative
- Account for chemical toxicity and impacts in state procurement decisions

Each key element report identifies the challenge that the key element addresses, the options and opportunities available to accomplish the goals of the key element, the implementation plan and timeframe for completing the specified tasks, and a recommendation for action. Summaries of the report findings are presented below.

EMPOWER CONSUMERS TO MAKE INFORMED CHOICES
DISSEMINATE INFORMATION ON TOXIC CHEMICALS
FORGE STRATEGIC PARTNERSHIPS

Conveying information about both toxic substances and the absence of toxic substances in products to consumers, retailers and manufacturers is key to stimulating demand for green products and "greening" the marketplace. To provide this information in a way that's useful and effective, the key element team identified the following actions:

- Design and implement an outreach, marketing and communication plan that takes into consideration the target audience, message, and information to be conveyed, as well as the most appropriate means for delivering those messages and methods for monitoring outcomes and adjusting the approach.
- Facilitate development of a management and technology infrastructure for chemicals and product information by determining the types, amounts and quality of available information and needs for translating, as well as determining the best methods for managing chemical information and making it accessible to stakeholders by teaming with public and private information management and technology partners, such as Google, to create an innovative solution.
- Establish contacts with and open negotiations for MOU-type agreements with Canada, the EU, Massachusetts, Maine and other western states to share product and chemical information.

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GREEN CHEMISTRY INITIATIVE – KEY ELEMENTS

STRENGTHENING CONSUMER PROTECTION LAWS

Laws to protect consumers from hazardous substances in products are numerous at both the federal and state level, but they are scattershot. There is an overall perception that consumer protection laws are ineffective because some laws overlap and regulate the same product, yet many consumer products are not covered. Although enforcement mechanisms vary widely and may include effective tools, these mechanisms are not applied consistently across the universe of consumer product laws. Two stop gap measures that can be implemented in the short-term to improve current efforts are:

- Establish an interagency consumer products workgroup to establish a cooperative and coordinated working relationship in those instances where consumer products authorities overlap.
- Expand this relationship to share resources for compliance and investigative work.

Two additional, more long-term options that form a logical stepwise method to build a cradle to cradle system are:

- Fill the consumer product gaps in the current system by covering consumer products not currently included in the regulated universe of currently identified chemicals of concern.
- Expand the assessment and regulatory actions of the above option to all chemicals of concern, and focus on criteria to identify and prioritize those chemicals of concern.

EXPAND CALIFORNIA'S POLLUTION PREVENTION PROGRAM

The Department of Toxic Substances Control's (DTSC) Office of Pollution Prevention and Green Technology (P2) administers a well-regarded collection of programs that successfully reduce hazardous wastes and set the stage for the shift toward a cradle to cradle approach, but are limited by their emphasis on wastes and narrow scope of programs that support green technologies and businesses. Opportunities to improve and expand P2 programs to detoxify industrial production and consumer products require a new focus for the P2 Office on the point of generation rather than disposal, and a willingness to consider a broader array of regulatory tools in instances where industry fails to embrace green and economically feasible alternatives on a broad scale voluntarily. The recommended options for expanding pollution prevention programs include:

- Refocus the Source Reduction Act on chemical use rather than waste.
- Increase state funding for development of safer alternatives.
- Expand voluntary programs and the role of regulation to achieve large-scale safer substitutes.
- Promote extended producer responsibility for consumer products
- Make state government a pollution prevention and green technology leader,
- Increase state support for local green business programs.

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GREEN CHEMISTRY INITIATIVE – KEY ELEMENTS

TRAIN A NEW GENERATION OF SCIENTISTS AND ENGINEERS

California needs experts trained to think holistically about chemicals. California universities should offer scholarships, promote research and development, issue technology licenses and train students in eco-toxicity, life-cycle analysis and Green Chemistry principles. Through the California Green Chemistry Initiative, the California Department of Toxic Substances Control (DTSC) wants to facilitate the development of a scientific and industrial workforce that produces safer alternatives for materials and products in terms of design, manufacturing, application and disposition at end-of-life. Options to develop a skilled workforce include DTSC working with the University of California in part to:

- Establish new green technology curricula.
- Provide "continuing education" in Green Chemistry principles, sustainable production, and life-cycle analysis for established industrial cultures of scientists and engineers in the "high and clean tech" sectors.
- Re-train displaced scientists, engineers and high technology workers to think in green chemistry principles and innovate toward "cradle-to-cradle" production.
- Prepare disadvantaged communities for employment opportunities as high technology technicians in the industrial sector.

INCLUDE GREEN CHEMISTRY PRINCIPLES IN AN ENVIRONMENTAL EDUCATION INITIATIVE

Students from kindergarten through 12th grade will be tomorrow's workforce and consumers and they should be able to understand toxic chemicals, risk, consumer choice and sustainability. California is currently poised to lead the nation in environmental literacy as a result of a landmark education law, the Education and the Environment Initiative (EEI), which requires the development and dissemination of a environment-based education program for all K-12 grade students in the State's public schools. The mission of the EEI is to provide teachers with K-12 instructional materials that will produce environmentally literate students using a standards-driven curriculum. This key element report recommends that although not required by the law, the EEI curriculum include the subject-matter of green chemistry, as appropriate to California academic content standards and grade levels.

ACCOUNT FOR CHEMICAL TOXICITY AND IMPACTS IN STATE PROCUREMENT DECISIONS

California must lead by example and adhere to the same standards it proposes for the private sector. State agencies can leverage their influence in the marketplace by including cradle-to-cradle and life-cycle cost analyses in purchasing decisions. State law directs the Department of General Services (DGS), in consultation with Cal/EPA, to provide state agencies with information and assistance regarding environmentally preferable purchasing (EPP); as a result DGS has established a framework for EPP throughout its procurement activities. Options for this key element are:

- Continue ongoing EPP efforts.
- Develop a strategy to strengthen the state's existing environmentally preferable purchasing activities.

APPENDIX D
GREEN CHEMISTRY INITIATIVE – KEY ELEMENTS

- Broaden the scope of the state's EPP efforts to provide green chemistry solutions to consumers beyond state government.

APPENDIX D-1

KEY ELEMENT

EMPOWER CONSUMERS TO MAKE INFORMED CHOICES
DISSEMINATE INFORMATION ON TOXIC CHEMICALS
FORGE STRATEGIC PARTNERSHIPS

Team Leader: Peggy Harris, DTSC

California's leadership position in information technology should be leveraged to develop new ways to communicate chemicals and toxicity to the public. Information about toxicity in products should appear proximate to the products as an information label or notice. Public awareness campaigns similar to the Flex Your Power program could also help close information gaps and increase public demand for green products. California can also leverage its position as the United States' largest consumer market by entering into memoranda of understanding with the European Union and Canada to share information about toxic chemicals. Such information is already being collected under the 2007 Registration, Evaluation and Authorization of Chemicals initiative (EU REACH) in Europe and the "domestic substances list" generated under the *Canadian Environmental Protection Act* (CEPA) of 1999. California's participation would help harmonize these international efforts.

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EXECUTIVE SUMMARY

The three interconnected aspects of this key element focus on developing consumer outreach methods and information, information technology options for collecting and distributing information, and international cooperation and collaboration partnerships to share information. Conveying information about both toxic substances and the absence of toxic substances in products to consumers, retailers and manufacturers is key to

stimulating demand for green products and “greening” the marketplace. It is important to recognize, however, that different target audiences require different messages and different means of delivering it. While convenience is important to consumers for whom outreach and proximate chemical information will be needed, completeness and comprehensiveness will be important to other stakeholders, such as producers or researchers, for whom methods to manage and distribute large amount of complex chemical information must be developed.

Not only is developing and implementing an appropriate and effective system of information delivery essential to this key element, but the data itself is also critical. Methods to acquire, assemble, compile and generate this information will be enhanced by a collaborative relationship with other governments at all levels, including international, national, state and local governments, to share the data collected by all chemicals policy programs. Because data and information are often considered a valuable commodity and typically a limiting factor in an efficient marketplace, all parties will benefit from a true partnership with reciprocal data exchange.

To successfully disseminate information about chemicals in products and empower consumers to make informed choices the key element team recommends that California concurrently pursue a number of activities. Namely, the state should design and implement an outreach, marketing and communication plan that takes into consideration the target audience, message, and information to be conveyed, as well as the most appropriate means for delivering those messages and methods for monitoring outcomes and adjusting the approach. The state should also facilitate development of a management and technology infrastructure for chemicals and product information by determining the types, amounts and quality of available information and needs for translating, as well as determining the best methods for managing chemical information and making it accessible to stakeholders by teaming with public and private information management and technology partners, such as Google, to create an innovative solution. Finally, the state should establish contacts with and open negotiations for MOU-type cooperative agreements with Canada, the EU, Massachusetts, Maine and other western states to share product and chemical information.

INTRODUCTION

This chapter addresses three distinct, but related, aspects of the first key element (disseminate information on toxic chemicals and empower consumers to make informed choices):

- methods for disseminating information about toxic chemicals for consumers;
- the information technology options available for cost-effectively transmitting information; and
- the means for leveraging relationships with other nations, states and private organizations to maximize the types and amount of information that can be made available.

The overarching goal of these three components is to enhance and facilitate public consumer, retailer and producer demand for more sustainable chemicals and products containing safer ingredients, by increasing awareness and knowledge of the safety and toxicity of various chemicals. Through this increased awareness and knowledge,

communities will be mobilized to prefer and “demand” greener chemicals and products and support public policy approaches that help make them safer, more common and easily identified.

To evaluate and develop the steps for implementing this key element, an interagency team comprised of participants with expertise, experience and interest in information collection and dissemination was joined by external stakeholders with the same expertise and experience to discuss potential options and suggest milestone tasks for the implementation plan. This chapter presents the findings of the key element team, addressing the three components of the key element separately to distinguish the issues and strategies of each.

Marketing and Outreach

Stakeholders identified consumer and public outreach as a cornerstone to California’s Green Chemistry Initiative. Successful marketing and outreach will educate the public, consumers and retailers about chemicals and products in a meaningful and useful way to empower everyone, including manufacturers, to make better, more informed choices, create demand for safer solutions and shift product development to “benign by design” options. Essential elements of a marketing and outreach campaign include:

- Creating a coherent message directed at and appropriate for the targeted audiences
- Embracing a wide variety of creative approaches for communicating information
- Making additional, more detailed chemical information available to the public, when possible (such as through websites or hot lines)
- Evaluating outcomes to adjust the message or methods and influence policy decisions

Information Technology (IT)

As manufacturers, retailers, consumers, workers and the general public begin to seek more, and better, information about chemicals and products, the methods for collecting that information and making it available will become increasingly complex and require innovative IT approaches. The Green Chemistry Initiative should use tools that will provide access to the widest audience possible and accelerate the flow of relevant information. At a minimum, the system established to compile available information should be able to:

- Organize the collection and dissemination of existing and new information, such as summarize new studies, and disseminate essential concepts through electronic newsletters, model policies and educational materials;
- Identify, prioritize and research existing limitations or uncertainties with chemical information;
- List safer alternatives for high hazard chemicals;
- Maintain registry of producers and users of high hazard chemicals;
- Provide a forum for requesting exchange and/or sharing additional information (e.g., blogs, peer-to-peer technical assistance networks)
- Create and organize a decentralized database for chemicals information;
- Develop web-based training and education, including podcasts, videos, presentations, references, and peer-to-peer information exchanges among experts

Forging Strategic Partnerships
To maximize existing and future resources and fully tap all information sources, California must collaborate with international, national and state governments and organizations to collect data as it becomes available. As other green chemistry policies are enacted nationally and internationally, the amount of information gathered about chemicals and products will begin to expand and California should capitalize on the other programs in foreign governments, the United States and private organizations as sources of data and models for information collection and use. This cooperative approach will provide reciprocal benefits to the other governments as information from California's green chemistry efforts are added to the global chemical database.

THE CHALLENGE

The collective challenge for this key element is two-pronged. That is, the state must determine both what useful and meaningful information to disseminate and the most effective means of collecting, protecting (if needed) and delivering it. The information that various stakeholders need to act upon their concerns is widely dispersed among a variety of sources, if it exists at all. Not only is the information about chemical and product safety, or danger, often not available to the public, retailers, consumers, workers or manufacturers, but comprehensive, verifiable, accessible chemical and product information is also not available from a single source.

Furthermore, the information in existing chemical databases typically require a further "translational" or "synthesis" step in order to be useful to a lay person or average consumer or retailer. Information translation may be needed because conclusions about product safety may be difficult for the average person to determine using only information about the chemicals they contain. This challenge is compounded by the ongoing problem of not knowing what chemicals the products contain. In addition, while the emphasis on human toxicity is understandable, other data also would be helpful for advancing a more sustainable future. For example, data regarding life cycle impacts could help consumers make more informed decisions when considering the purchase of one product over another.

The lack of available information about chemicals and their uses remains one of the major issues in the management of chemicals. The extent of this "data gap" is sizeable and has been described at length in other reports and the first phase of the Green Chemistry Initiative[1]. While several thousand chemicals used in commerce today have some evidence of toxicity, including carcinogens and reproductive toxins, tens of thousands of additional chemicals in commerce do not yet have widely available information. This lack of information not only stymies efforts to identify which chemicals may pose harm, but also makes decisions about specific chemical alternatives or substitutes difficult to determine; in some instances the best alternative for consumers is to seek to avoid products containing chemicals with missing information. This situation will improve over time, as the data gap is addressed through other chemicals policy programs and this Green Chemistry Initiative.

[1] Wilson, et al. *Green Chemistry in California: A Framework for Leadership in Chemicals Policy and Innovation.* California Policy Research Center: University of California. 2006.

In addition, while personal health concerns can motivate some consumers' purchasing behavior, many people are also concerned about buying products that contribute to ecological and environmental degradation. Toxic chemical pollution is on all lists of factors that are contributing to global environmental degradation today, and this degradation is not just a moral or ethical issue but one that affects people and their health: degradation of our oceans, lands and waters is threatening their ability to support life, both human and natural. When information about ecological and environmental impacts exists or emerges, it should also be made available to consumers.

The need for information about chemicals and products is a well-documented foundation for chemicals policy programs in general and was reiterated by stakeholder participants in the first phase of the Green Chemistry Initiative. Different chemicals policy approaches, however, will require various types and forms of information and will use the data in different ways. The amount of information that ultimately becomes available through California's Green Chemistry Initiative potentially could be quite large once the hurdles are overcome, and the data will likely need explanation, organization, protection and communication. Each of the three components of this key element will seek to address aspects of this challenge.

Marketing and Outreach

In the face of frequent product recalls and questions about the safety of ingredients in products, consumers are confused about which products are safe to use and how to distinguish safe products from those that could potentially pose a hazard. Many consumers mistakenly assume that control over the safety of products is more extensive than current authority allows, and that a product's presence on a store shelf indicates that it must be safe to use. Retailers and consumers need accurate, reliable and useful information about the ingredients in products to make informed choices.

At the same time, many companies are capitalizing on the general public's concern about product safety and interest in environmental impacts by promoting products as green, safe or wholesome. The public is frequently confused by these claims and some studies have found that many green claims are false or misleading, resulting in accusations of "greenwashing." Retailers and consumers need information resources that will provide consistent, systematic and meaningful definitions to compare and select green products.

Ultimately, as consumers and retailers realize the importance of greener, safer products, manufacturers will respond to changes in market demand and develop products or substitutes that are "benign by design." Yet manufacturers themselves may need additional information about the chemicals and other product ingredients to effectively improve products.

Information Technology

Although it is clear the Green Chemistry Initiative will need information and data to advance its goals, often the information and data required are either not available or are widely dispersed among a variety of sources. Further, because multiple international, national, federal and state agencies administer separate programs, each with its own distinct goals, the data that each collects and the ways that the data is organized may not be compatible or amenable to integration with other data sources. Although there

are numerous databases that currently contain chemical information the data is typically:

- not well organized or readily accessible;
- not compatible;
- limited to media-specific criteria;
- incomplete;
- not unique with regard to CAS# and/or name-indexing; and
- limited in its accessibility to full database content.

The information management system for this key element will need to address database limitations as well as the challenges associated with distributing information in a format useful to the public, retailers and manufacturers. Since information about product safety is typically not available to consumers, and is often not comprehensive or verifiable, new and expanded data collection efforts should include the following elements:

- An inventory of chemical production, distribution, applications and/or use;
- Collection of toxicity, persistence and bioaccumulation potential data;
- Data on types of, efficacy, life cycle and cost of alternative technologies.

Because the traditional approach to IT infrastructure development may not provide the flexibility needed to adapt and adjust to rapidly changing needs and demands, the information management system for the Green Chemistry Initiative will need to rely on creative applications of information technologies to communicate meaningful and reliable information.

Forging Strategic Partnerships

Although numerous international, national and state and local programs have pollution prevention programs in place to address green chemistry principles, many of these programs are not well-coordinated to address environmental issues on a broader scale. As a result, different governmental programs pursue like-minded projects with limited awareness of what others are doing.

California can leverage its position as the largest consumer market in the U.S. by entering into memoranda of understanding with the EU and Canada to share information about chemicals. Such information is already being or soon to be collected under the EU‘s REACH regulation and Canada’s chemicals management plan developed under CEPA. California’s participation would help harmonize these international efforts by expanding the information exchange and transparency of other programs, as well as adding data and information collected in California to the global information base. California can also establish cooperative relationships with other states to develop and establish information clearinghouses to facilitate information exchange, improve knowledge and maximize efficiency.

With one of the top ten economies in the world, California can play a pivotal role in advancing an effective exchange of technology and information. Through partnerships with other international, national and state governments, California can establish an international and interstate clearinghouse of data on priority chemicals in commerce and safer and more sustainable alternatives. Collaborative efforts to enhance information exchange among international, national, state, and local partners provides the groundwork and relationship building needed to facilitate and accelerate global

dissemination of strategies to minimize the health impact of chemicals used in consumer products. California's Green Chemistry Initiative must be crafted and implemented in the context of a global economy since many chemicals and consumer products that enter the state are manufactured in states or countries other than California.

International, national and state and local government policies play an important role in the development and implementation of environmental programs. To harness the collective knowledge of these entities and advance green chemistry principles California must lead the way through strategic relationships between international, national, federal, state and local governments and private organizations.

BACKGROUND

A number of existing programs both within the state and at the national and international levels can serve a examples for effectively communicating information to the general public through various methods.

Marketing and Outreach

Some existing state programs provide models for designing and structuring a marketing and outreach program for the Green Chemistry Initiative. California's Tobacco Control Program and the Flex Your Power program[2] are two examples of successful and effective ongoing consumer outreach and education campaigns administered by state agencies and public/private partnerships. Both programs incorporate multi-media campaigns, including providing detailed information through information technology services, to convey a clear, focused message and achieve specific outcomes. Additionally, the California Tobacco Control Program includes a robust community education program which includes funding to local health departments and community-based organizations that facilitate development of local policies that support the Program's overall goals to de-normalize tobacco use.

Beginning in 2008, the "Spare the Air Campaign," the program known for providing air quality alerts in the summertime, will expand its program to emphasize healthier lifestyles year-round. The new focus of the program will motivate the public to consider everyday actions that can improve air quality, not just those taken during the summer when air quality is at its worst. The goal associated with this effort is likely to be similar to the goals of the Green Chemistry Initiative.

Other existing state programs focus on protecting consumers from certain dangerous products and include elements that provide consumer information. For example, although the Proposition 65 warning is not necessarily specific, it does alert consumers to potential carcinogens and reproductive toxicants in products. Similarly, pesticides used in California must contain specific use information and warnings on its packaging, which helps provide consumer information. Experience from these programs can help to inform techniques for providing consumer information.

[2] See http://www.fypower.org and http://ww2.cdph.ca.gov/programs/Tobacco/Pages/default.aspx

Information Technology

Multiple international, national, federal and state agencies administer programs that collect chemical data and information to protect consumers from exposure to hazardous products and/or pollution. These information sources are examples of the types of existing data that may be considered useful to a decentralized database. A partial list of these includes:

- Health-related chemical data - The California Department of Public Health (DPH) collects or monitors certain chemical data and human health information for various health-related programs, including childhood lead, occupational health, indoor air, and other programs.
- Pesticide data - The California Department of Pesticide Regulation (DPR) maintains the most extensive pesticide use reporting system in the United States. Recent data show a decline in the use of high-toxicity pesticides.
- Cancer and reproductive harm chemical data - The Office of Environmental Health Hazard Assessment (OEHHA) administers the Proposition 65 program and maintains data used in reviewing chemicals for possible listing as known to cause cancer or reproductive harm.
- Public health goals for drinking water contaminants: OEHHA develops health-protective values known as "public health goals" that are used by DPH in setting primary drinking water standards, or maximum contaminant levels.
- Child-specific reference doses for contaminants at school sites: OEHHA develops numeric health guidance values for contaminants commonly found at school sites, intended for use in the assessment of risk at proposed or existing school sites. Currently, OEHHA focuses its evaluation on non-cancer effects.
- Toxicity criteria database: OEHHA maintains a database of cancer potency values, acute and chronic exposure levels, and other toxicity values.
- Fish advisory chemical data - OEHHA issues site-specific fish consumption guidelines for sports fish in California, based on its assessment of the health effects associated with contaminant levels found in the fish.
- Water and sediment quality chemical data - The State Water Resources Control Board (SWRCB) and the nine Regional Water Quality Control Boards collect discharge and receiving water data to assess water quality and sediment quality.
- Air quality and toxic air contaminants data - The State Air Resources Board (ARB), along with the local air districts, gathers chemical concentration data for ambient air and emissions for certain criteria air pollutant and toxic air contaminant chemicals. OEHHA conducts health risk assessments of air contaminants.
- Bio-monitoring chemical data - A multi-agency program (DPH, DTSC, and OEHHA) that is being initiated to identify and track data on chemicals of concern in humans,
- Hazardous waste data - Pursuant to the *Hazardous Waste Source Reduction and Management Review Act of 1989* DTSC collects data on hazardous waste generation, transportation, treatment and disposal.
- Pollution prevention chemical data - Local governments are beginning to collect data on green business and pollution prevention programs. The data will measure the progress of small businesses in reducing waste.

In addition to the state databases numerous international, national, and federal databases exist or are under development. Although not an exhaustive list, these include:

- OECD HPV – The Organization for Economic Cooperation and Development is developing and making accessible screening-level hazard data and initial assessments on high production volume (HPV) chemicals. The work is being carried out by both member countries and individual companies or consortia organized through the International Council of Chemical Associations (ICCA).
- US HPV - The U.S. high production volume (HPV) chemicals are those which are manufactured in or imported into the United States at levels ≥ one million pounds per year. The U.S. HPV Challenge, launched in 1998 as a companion to the OECD program, is developing screening-level information on chemicals produced at the HPV level in the U.S. EPA is also beginning to assess data developed under the program.
- CEPA - The Canadian government, through the 1999 amendments to its Canadian Environmental Protection Act, used existing information to categorize chemicals in its national inventory, identifying more than 4,000 chemicals that possessed hazard or exposure characteristics of potential concern. Further assessments of these chemicals are now underway, focused on about 200 high-priority chemicals for which the government has mandated the submission by manufacturers and importers of information on their production and uses.
- EU REACH – This new regulation, Registration, Evaluation, Authorization and Restriction of Chemicals (REACH) went into effect on 1 June 2007.The aim of REACH is to improve the protection of human health and the environment through better and earlier identification of the intrinsic hazards of chemical substances, while enhancing the innovative capability and competitiveness of the EU chemicals industry. For chemicals already in commerce, REACH's provisions will be phased-in over 11 years. Most information developed under REACH will be made publicly available.
- E-Chem Portal – The eChemPortal offers free public access to information on properties of chemicals; and allows for simultaneous search of multiple databases. The eChemPortal gives access to data submitted to government chemical review programs at national, regional, and international levels. Users can search multiple sources of information simultaneously using a chemical substance name or CAS Registry Number and obtain direct links to the retrieved data within each site.
- TOXNET – An online searchable cluster of databases maintained by the National Library of Medicine and covering toxicology, hazardous chemicals, environmental health and related areas, including the Hazardous Substances Data Bank (HSDB) and U.S. EPA's Integrated Risk Information System (IRIS)
- HSDB - A factual database focusing on the toxicology of over 5,000 potentially hazardous chemicals. In addition to toxicity data, HSDB provides information in the areas of emergency handling procedures, industrial hygiene, environmental fate, human exposure, detection methods, and regulatory requirements. The data are fully referenced and peer-reviewed by a Scientific Review Panel composed of expert scientists.
- IRIS - A database from the U.S. Environmental Protection Agency (U.S. EPA) containing carcinogenic and non-carcinogenic health risk information on over 500

chemicals. IRIS risk assessment data has been scientifically reviewed by EPA scientists and represents EPA consensus

Forging Strategic Partnerships

Both Canada and the EU are undertaking information development programs that are much broader than those undertaken to date in the US, and will generate considerable information on many chemicals that are likely to be produced in, imported into, and used in California. Access to such information will be extremely useful to the State in understanding actual and potential uses and risks of chemicals that enter and are used in California, and in setting priorities for activities to be undertaken pursuant to the Green Chemistry Initiative. During the first phase of the Green Chemistry Initiative, representatives of these programs and other experts regarding their implementation delivered presentations at the green chemistry workshops and these contacts with California will help facilitate our international relationships. Brief descriptions of these two programs follow.

Canada's Chemicals Management Plan

The Canadian Environmental Protection Act (CEPA 1999) required that every chemical substance made in Canada or imported from other countries be assessed using existing information against specific criteria to identify those posing high hazard or exposure potential. In 2006, Canada completed the major task of systematically sorting through the approximately 23,000 existing substances that had not been previously assessed This exercise was called "categorization." Categorization was the first step in determining which of these chemical substances required further assessment, testing and/or measures to control their use or release. This effort was divided between Environment Canada and Health Canada.

Based on existing data and modeling, Canada identified 4,300 substances meeting the categorization criteria. These were further prioritized into high, medium and low priority groups. For roughly 200 of the top 500 chemical substances that were found to pose the greatest potential to harm human health or the environment, Canada has stated its intention to impose controls over their production or use, and has begun a process to challenge industry to provide additional information that might later that conclusion. The challenges are being published in batches of 15-30 substances. Where risk assessments of these chemicals indicate they meet the "CEPA-toxic" criteria, the government intends to impose appropriate risk management measures.

Registration, Evaluation, Authorization, and Restriction of Chemical Substances (REACH)

REACH is the European Community's regulation for chemicals and their use. REACH gives greater responsibility to industry to identify and manage the risks from chemicals they produce and use, and to provide safety information for the substances. Manufacturers and importers of a chemical in amounts of one metric ton or more are required to register the chemical with the newly established European Chemicals Agency (ECHA), identify and assess all of its uses, and provide safety information to any downstream users. ECHA will make non-confidential information available to the public. ECHA or public agencies in the EU's member countries can substances of very high concern, and require that they be subject to use-specific authorization. Use authorization will be granted only if any risks are demonstrated to be adequately controlled or, for chemicals for which such a showing cannot be made, if social/economic benefits are shown to outweigh the risks and there are no suitable substitutes. The burden of proof in such cases is on the applicant for authorization, not the government.

THE OPPORTUNITY

Sharing, organizing and managing information to benefit the public, retailers, manufacturers and other governmental entities are activities that the state can initiate using existing authorities. Making outreach and information management a cornerstone of the Green Chemistry Initiative will help lay the groundwork for and enhance implementation of framework activities.

Marketing and Outreach

Because a marketing and outreach campaign primarily informs and typically does not impose mandates or requirements, it does not need specific statutory or regulatory authority. It represents an opportunity to leverage existing resources to provide a highly visible and clearly useful program for a variety of audiences, ultimately benefiting the overall goals of the Green Chemistry Initiative, from the strength of the consumer base, resonating up through a product's supply and production chain. However, based on the experiences of the Tobacco Control Program and the Flex Your Power program, an effective campaign requires clear messages related to the goals of the program, additional information resources to augment the program's message, and a budgetary commitment commensurate with the campaign's media focus.

In the very near term Cal/EPA can introduce a Green Chemistry Retailers and Consumer Marketing and Outreach program containing information to be determine during the implementation phase using current outreach approaches, such as press releases, workshops and existing websites and new website links. Many of the essential considerations for a marketing and outreach plan can be addressed through existing infrastructure.

Information Technology

Although the boards, departments and organizations within Cal/EPA currently work towards more collaborative environmental solutions, many of the existing IT resources are managed independently, creating multiple discrete databases with multiple fields

that are not necessarily designed with the intention of being compatible with others. The goal of this aspect of the key element is to align certain aspects of their IT services and organization to gather and disseminate the information needed by consumers, retailers and manufacturers.

Further, databases maintained by U.S. EPA, the European Union, Canada and others are not always compatible with each other and may not address all of the data needs requested by the stakeholders or identified by agencies. This aspect of the key element requires further planning integrated with the business needs of each BDO to establish the protocols needed to collect the data and provide a foundation for the framework elements.

Because many uncertainties regarding the needs for a comprehensive information management system remain, options for maximizing public/private partnerships and optimizing features of the IT infrastructure of Cal/EPA and its BDOs will be developed and considered as the information needs are further refined. Cal/EPA and its BDOs can establish a task force to evaluate programs and capabilities, especially information management and technology activities related to the Green Chemistry Initiative. During this evaluation phase, serious consideration should be given to using an iterative IT design process rather than the traditional process used in state government since the rapidly evolving field of green chemistry requires a more flexible adaptive process.

The task force will also be asked to devise strategies to ensure that long-term data collection efforts will access all readily available sources. The task force would consist of representatives from each of the BDOs that will be involved in the planning and identification of the most suitable IT infrastructure as well as identifying and refining data collection needs simultaneously. Because of the uncertainties in identifying all actual needs until the work has progressed to a strategic point, this aspect of the key element proposes to use aspects of the existing IT infrastructure within Cal/EPA and its BDOs to both refine the business needs in advancing the green chemistry principles, and solicit further input on the final framework.

In addition, partnerships with private organizations and industry to make web-based information available may advance green chemistry goals and objectives by increasing the accessibility of this information.

At a minimum, in the short-term, each BDO has the capacity to:

- Verify existing information regarding programs and human and IT resources within its jurisdiction, as well as authorities that are related to or that can be linked to green chemistry efforts.
- Provide web links on their websites directing stakeholders to other websites for additional information on chemical hazards.
- Prepare and make available fact sheets that address stakeholder needs related to green chemistry.
- Prepare focused surveys soliciting input on usefulness of existing databases and other data needs.
- Include a “Wiki”-type forum within Cal/EPA and its BDOs to maximize the ability of collecting information. Because volunteers can contribute to the content on the Wikipedia, measures would need to be put in place to advise users. The data

that is compiled could include chemicals in commerce, their uses, and toxicity, and emerging green chemistry technologies.

- Use on-line general interest notification devices, such as Craigslist, to distribute public notices, solicit input on surveys, and inform the public of on going developments in Green Chemistry. On-line classifieds and forum sites are widely accessible and can notify millions of people efficiently and economically.
- Enter a partnership with Google, similar to the partnerships between Google and top universities, to scan and digitize select collections and information to make it publicly available and searchable. Google is a leader in providing the public with access to billions of web pages through a search engine that processes requests in less than half a second, and responds to more than 150 million search queries per day. Google and the University of California have entered into such an agreement because of their mutual interest in making information available to the public. An agreement between the BDOs and Google would specify the standards and automated methods for organizing and indexing web-based and digitized work, and would refine standard requirements for repositories of digital content.

Some advantages associated with the listed options include:

- Modifying existing web links on each BDO's website requires minimal effort for a potentially large impact.
- Would not have to purchase, develop or maintain a database system.
- Allows BDOs the opportunity to inventory green chemistry resources and gauge the needs of stakeholders.
- Allows for thorough evaluation of each BDO's database systems for compatibility with others.
- Refines business needs.

In the short-term, re-aligning and re-directing existing BDO resources would allow the Green Chemistry Initiative to begin implementing many aspects of a consumer marketing and outreach program such as:

- Conduct consumer opinion research and surveys.
- Research key issues and chemicals of concern.
- Identify goals, outcomes and the essential message to convey.
- Identify, gather and define information resources for consumers.
- Develop a process to evaluate program impacts and refine implementation

In addition the realignment and redirection of existing BDO resources would provide the following advantages:

- Minimal and absorbable to modify existing web links on each BDOS website.
- Would not have to purchase, develop or maintain a database system.
- Allows BDOs opportunity to inventory GC resources and gauge the needs of stakeholders.
- Allows for thorough evaluation of each BDOS data base systems for compatibility with others.
- Refinement of business needs.

For example, BDOs can form partnerships within Cal/EPA, with other state agencies and with other stakeholders to maximize efficiency, expertise, available information and existing resources. In this way data needs can be refined to better serve the needs of all stakeholders. Long term goals for improving the IT infrastructure may include:

- Web based Clearinghouse to collect, store and disseminate chemical data
- Exposure simulation models
- Expanded Toxicity data
- Technical Assistance/ Substitution Clearinghouse
- Life cycle analysis/ carbon foot print
- Iterative Data Updates
- Access to web-based training

Forging Strategic Partnerships

To harness the collective knowledge at the international, national and state level California could enter into memoranda of understanding or other cooperative agreements with international, national, state and local governments, or with private organizations. Under these agreements, governments and organizations will agree to work collaboratively to develop policies that would leverage existing knowledge and share data. Such collaboration could establish data gap priorities where information on chemical properties, toxicity, and information that is not publicly available or data claimed as confidential business information could be exchanged.

By negotiating Memoranda of Understanding with the European Union and Canada, California will gain access to chemical information being submitted to those governments that would be germane to advancing the Green Chemistry Initiative. In recent years, both governments have undertaken or initiated efforts to significantly expand the scope and amount of information on industrial chemicals to be developed and submitted by companies that produce and use such chemicals, a portion of which is expected to be designated by the submitter as confidential business information (CBI).

The Canadian Environmental Protection Act (CEPA) and the EU's REACH Regulation contain specific provisions for agreements to be reached that allow CBI obtained under those authorities to be shared with other governments. The requirements for such agreements require that the recipient governments have in place mechanisms to ensure that such information remains confidential, and that it is intended for use in administration or enforcement of that government's legal obligations and authorities under relevant law, and/or cooperation on implementation or management of legislation governing industrial chemicals. (Section 316 of CEPA and Article 120 of REACH)

Because companies typically claim CBI status for information relating to how chemicals are used – which is important to understanding the potential for releases of and exposure to those chemicals – gaining access to CBI information submitted under the EU and Canadian programs will help to advance the goals of identifying both chemicals of concern and potentially safer alternatives.

More generally, gaining access to all available information that will already be organized within the sophisticated relational database being developed by the EU for its REACH program will give the state an opportunity to build upon the work already done by the EU and Canada. The ability of the state to use such information and to share the non-

confidential portion of it with stakeholders will be greatly facilitated if portions of "reinventing the wheel" can be avoided.

To complement information gathered from international sources, California can also participate in the development and implementation of an informational clearinghouse with other states. In addition California can explore options, perhaps legislative changes, for improving access to information gathered by federal activities.

IMPLEMENTATION PLAN

The effort to communicate information about chemicals and products to empower consumers to make informed choices may best be undertaken in phases since certain critical steps, such as characterizing the target audiences, lay the foundation for following activities, such as surveys and outreach.

Major strategies (actions)

Marketing and Outreach

The goals, outcomes and messages conveyed are the essential elements for a successful consumer marketing and outreach program. The desired outcome of a consumer outreach or education campaign is to change consumer behavior or community norms. One of the goals of this key element is to increase consumer awareness and knowledge regarding chemicals and products. A proposed marketing and outreach campaign, modeled after other state information campaigns would include the following steps and considerations:

Step One: Define clear objectives and desired outcomes

- Identify short-term objectives and outcomes
- Identify long-term objectives and outcomes

Step Two: Develop strategies based on valid and agreed assumptions

- The need for outreach and priorities
- The action (e.g., supply side or demand (consumer) side)
- Public's attention (existing and necessary)
- Need to educate
- Public opinion, concerns, motivations etc.
- The "teachable moments" (e.g., when in the market to purchase?)

Step Three: Characterize the four T's and identify resources

- Targeting
  - Each audience is different, programs, measures, messages should be targeted. For instance, communicate differently to businesses than general public.
  - Target the market segments campaign intends to reach: commercial, industrial, government (all levels), agriculture, residential, etc.
  - Target the best messengers to reach each audience
  - Target best communications channels to reach each (TV, industry leaders, targeted events, etc.)

- Tools
  - There is no single best approach - government should use all the tools at its disposal, and coordinate them.
  - Examples of the tools government has, and each benefits from good communications:
    - Mandates
    - Prohibitions
    - Incentives
    - Disincentives
    - Public Education
    - Technical assistance
    - Public/private partnerships
    - Investments
- Timing
  - Marketing campaigns have a rhythm, a progression.
  - Early messages…building to later messages, etc.
  - Perhaps start with education, incentives…then move to more mandates and prohibitions as they are developed.
- Tone (messages and delivery)
  - Warning/crisis/danger?
  - Educational in nature?
  - Social marketing techniques?
  - Government here to help, or a "people's" campaign?
- Budget
  - Comprehensive campaign needs the objectives and information in place (which chemicals, etc.)…probably down the line. Comprehensive budget is expensive in a state as big as California (e.g., broadcast communications to reach the general public.)
  - Prioritize and phase campaign based on best use of available budget

Target Audiences:
Because retailers and consumers are a heterogeneous mix of individuals from the "advocates" who demand action at one extreme to the uninterested at the other extreme, the desired outcomes of the marketing and outreach efforts should reflect the intended changes in behavior in a given segment. For instance, for the "disinterested," a desired outcome would be to raise awareness about the issue of product safety/greenness. For the "aware," the desired change would be to provide them with clear, easily accessible information that's useful in making buying choices. For the "concerned," we want to provide them with information that would mobilize them to take action to demand safer, greener products. As an extension the key element should also define "consumer" broadly, based on sectors such as commercial, industrial, governmental, agricultural and residential and define desired outcomes of an outreach effort to each of these segments.

Consumer		**Desired Outcome and Message**
Residential	Disinterested	Raise awareness about product safety – media campaign
	Aware	Clear info for making buying choices – website info

	Concerned	Mobilize action to demand safer choices – agency assistance
Commercial		What's hazardous and why
Industrial		What do consumers want
Agricultural		
Governmental		Environmentally preferred purchasing

Since the outreach message must be tailored both to the desired outcome and target audience, target audiences must be carefully defined before the messages can be formulated. As this key element is implemented, the key element implementation team should select one or two sectors to characterize and develop outcomes, messages and methods for measuring success.

Content, Messages and Informational resources:
The information that can and should be communicated varies with the sector and target audience and will need to be determined as part of this key element. The key element team identified the following questions as potential concerns for most residential consumers:

- What harmful chemicals are present in everyday household goods?
- What is a benchmark or standard for identifying what's good/safe?
- What do the label terminology or confusing green marketing terms mean?

Because this key element focuses on using existing available information as much as possible at the outset of this information campaign, the key element implementation team will identify the sources of available information and the consumer sectors that will benefit from them. A number of existing information sources include product lists compiled by credible groups include City of San Francisco and Environmental Defense; others will be identified as part of the implementation of this key element. As mentioned earlier, some consumer sectors will need technical chemical information to be interpreted and made accessible. The key element implementation team will need to determine the types of information best suited for each of the consumer sectors and the best methods for delivering this information. The key element team identified some methods for effectively communicating information to certain consumer sectors:

- Broadcast media campaign – residential consumers, disinterested and aware
- Product labels – all consumers except disinterested residential consumers
- Website and phone line - all consumers except disinterested residential consumers
- Government interventions - all consumers except disinterested residential consumers

To be effective the message and its method of distribution must be designed to engage the target audience and move them from knowledge to action. Again, these will depend upon the targeted consumer sector and desired outcomes. The key element team identified several key issues that must be considered as part of the outreach message:

- Frame issues around personal health effects & impacts to children in addition to long-range environmental or economic impacts
- Focus on alternatives as part of the message

- Identify top priority issues/chemicals, such as a “Dirty Dozen” approach
- Deliver bad news first, then follow up with positive actions the consumer can take
- Where possible, identify chemicals with positive attributes; ingredients with health benefits

Methods
Some of the strategies for accomplishing the steps in the proposed outreach and marketing plan include the following:

- Stakeholder input – solicit and obtain input from 3rd parties, other agencies with consumer outreach campaign experience, NGOs with residential consumer emphasis and other interested stakeholders, to help characterize and prioritize the following:
    - Short- and long-term objectives and outcomes
    - Assumptions for the outreach program
    - Consumer sectors, and needed information
    - Target audiences and appropriate and suitable messages
- Consumer survey – using stakeholder input regarding target audiences and other research, conduct consumer and business surveys to help define the following:
    - content of the outreach campaign
    - types and forms of informational resources to make available
    - baseline conditions to gauge and monitor public opinion before the outreach program begins
- Communication and outreach evaluation – using stakeholder input, agency experience and other research, identify and evaluate mechanisms for disseminating information (focus particular attention on mechanisms that can be implemented effectively with limited resources), including:
    - media campaigns: TV and radio, billboards, print, toll-free number)
    - IT and internet/online approaches
    - substantive public relations events
    - ongoing/continuous mechanisms
- Monitoring and feedback mechanisms – develop methods to measure progress and success of outreach approaches, including:
    - Consumer behavior and purchasing data
    - follow-up surveys to compare to baseline conditions

<u>Information Technology</u>
The strategy for planning and developing and information management system will reflect stakeholders’ and governments’ needs, vision, mission, and values. A chief Information Officer will convene the appropriate level of technical and programming staff to develop the most suitable alternatives in the interim and as a final product.

A report or summary identifying the strategic objectives, performance measures and targets will be developed and provided for review by stakeholders.
At a minimum the summary or report will contain the following.

- Relationship to overall strategy
    - Evaluation of alternatives to address the strategic needs; vision and mission of stakeholders.
        - Centralized Database System
        - Decentralized Web-based System

- Resource summary
    - Summary of resources dedicated to green chemistry/pollution prevention programs in the state
    - Staffing
    - Budget
- Summary of key business needs
- Internal capabilities
- External capabilities
    - Partnerships
- IT portfolio management - An inventory of current international National, federal state and local databases related to Green Chemistry.
    - Identification of compatibility between the databases contained in the inventory.
    - Identification of strengths and weaknesses of databases in the inventory.
- Identification of Internal and External stakeholders
    - Summary of needs driven by all stakeholders
    - Expectations of all users
- Threats
    - Description of disruptive forces that could cause the organization to become less functional
- Organizational structure and Governance
    - Organization roles and responsibilities
    - IT role description /Governance
- Milestones
    - List of monthly, quarterly or mid-year milestones and review dates to indicate if the strategy is on track
    - List milestone name, deliverables and metrics.

Audience
A technology strategy document must be designed to be read by non-technical stakeholders involved in the planning and organization of advancing green chemistry. To the extent practical the summary should be free of technical jargon and information technology acronyms.

The IT strategy should also be presented to or read by other internal IT staff members. Many organizations circulate prior year versions to internal IT staff members for feedback before new annual IT strategy plans are created.

<u>Forging Strategic Partnerships</u>
The approach for developing strategic relationships with international, national, state and private organizations will require direct communication with key contacts, participation in roundtables and one-on-one meetings.

Major milestones (timeline)

<u>Marketing and Outreach</u>
The overall time line will be governed by the other key elements, overall framework and Cal/EPAs BDOs business needs. In the near term this key element should be implemented in phases, beginning with stakeholder input to resolve the list of

considerations. Given the uncertainty regarding available resources, the initial phases should also include those research, survey and communication elements that are less resource-intensive.

Consumer Outreach - Activity	*Timeframe*
Reconvene task force (external) - refine goals & objectives of key element - finalize priorities (& associated criteria)	1 month
Establish executive steering committee (internal) - responsible for expediting decisions & contract issues	1 month
Develop approach to collect stakeholder input - develop comprehensive list of stakeholders and outreach efforts to ensure stakeholders have been reached - workshops - online surveys & message boards	ongoing
Develop a detailed plan and system to evaluate the consumer outreach key element to include the following: - develop list of key outcomes and indicators to evaluate the key element - prepare evaluation procurements (or enter into Interagency Agreement with universities) for telephone survey, observational retail survey, scanner data - award evaluation contracts - design baseline and follow-up survey instruments and protocols	2-3 months for planning; 6 months to prepare and award contracts
Develop a detailed plan to determine target audiences: - identify consumers, producers, etc - characterize audiences (demographics, location, opinions, special language needs, environmental justice concerns, etc) - consider how consumer information (at all levels of the supply chain) can be improved (could potentially lead to packaging regs)	3-6 months
Develop a detailed plan to determine appropriate messages for the target audiences: - identify interests and concerns - focus on specialized messages for environmental justice communities & non-native English-speaking communities - identify & prioritize information needs – focus on info needed to make informed consumer and production decisions - identify “green” manufacturers, products, approaches – also develop criteria to determine this	3-6 months
Design and develop an ongoing consumer awareness and information campaign to include the following: - review literature and studies on the relative effectiveness of various forms of media among specific target populations - identify and evaluate potential methods for delivering intended messages – include cost-effectiveness estimates - identify specialized methods to reach “under-served” communities (lower income consumers, non-native English-speakers, environmental justice communities) - prioritize methods - conceptualize and release consumer awareness media campaign procurement - award consumer media campaign contract	6-12 months
Launch consumer media campaign	3-6 months
Develop ongoing internal/external communication plan to keep upper mgt., internal and external stakeholders informed of implementation	1 month
Conduct baseline & consumer and retail observational Survey(s) - evaluate & interpret results	3-6 months

- determine effectiveness of implemented options - provide feedback to consumer outreach plan & system	
Develop policy tracking database	2-3 months
Develop resulting policy efforts: - identify rulemaking opportunities - develop proposals for implementing policies - create on-line source (blog) for dialog and information - assess impact studies - develop a systematic approach for identifying components in products without violating confidential business information requirements (typically federal)	ongoing

Information Technology

The IT key element requires planning that is integrated with all of the business needs identified in the GCI and those identified by each BDO. This can only be accomplished by establishing a working task force that will reconvene at strategic points to refine the needs and design the final system. This key element will be completed in phases as follows:

Information Technology - Activity	*Timeframe*
Reconvene Task Force	July 2008
Develop a detailed plan and approach for identifying and evaluating IT needs and approaches	July 2008 - Aug. 2008
Identify inventories to help focus consumer outreach milestones - inventory of current labeling requirements that may exist (packaging requirements) - inventory of different purchase decisions - information needed to make purchase decisions (potentially from consumer surveys) - inventory of information available - compiled health warnings (related to goals & objectives)	July 2008 - Aug. 2008
Analysis of IT needs and approaches: - develop criteria for evaluating databases – consider factors such as relevance, user-friendliness - develop methods for improving usefulness of databases - identify new databases & info needed to fill data gaps	Sep 2008 - Oct.2008
Recommendations and design for IT information – specific strategies may include: - identify methods for placing green chemistry messages on desktops, such as RSS feeds, partnerships with news websites, podcasts, listservs, blogs, etc - centralize databases identified as relevant & useful through web-linkages - include links to websites that encourage sustainable practices, such as the DPR School Integrated Pest Management (IPM) Website and the UC IPM Website	Nov 2008 – Dec 2008

Forging Strategic Partnerships

The overall strategic partnerships are crucial in harnessing collective knowledge to avoid duplication of efforts. The task force will be responsible for convening and having agreements in place.

Strategic Partnerships - Activity	*Timeframe*
Develop a detailed plan and approach for establishing international and national contacts: - research existing MOUs with Canada and the EU - maintain contacts already made with Environment Canada	July 2008 - Aug. 2008

- determine what information used by Health Canada that is not publicly available is needed - continue to work with UC Berkeley, NGOs, others to develop contact in EU - participate in development of states information clearinghouse - explore options for obtaining federal data	
Identify CBI (confidential business information) limitations and methods for resolving potential issues - research California's relevant CBI rules and identify needed modifications - research EU and Canada CBI requirements and identify conditions that must be met to obtain this information and assess whether California, as a state would be eligible to obtain CBI data	
Identify information needs including specific data, background information, and developmental/decision criteria - research available information to determine specific data needs not made publicly available	
Develop draft international agreements - depending on the EU requirements on sharing confidential business information with a State	Sep 2008 - Oct.2008
Finalize agreements	Nov 2008 – Dec 2008

Linkage to overall framework

Because this key element centers around the tasks of gathering and communicating information in support of sustainable decisionmaking, it is essential to any comprehensive effort to transition the consumers, retailers and manufacturers of California toward a "Cradle to Cradle" framework. Collectively, the three aspects of this key element incorporate the planning and communication that must take place to achieve the overall green chemistry goal of encouraging innovation, use and manufacture of safer more environmentally benign products and processes. Much of the success of green chemistry will hinge on an effective consumer outreach effort and on the collection and presentation of useful information about chemicals and products to everyone likely to use them, from the general public to product designers, and everyone in between.

Outreach and marketing is needed to raise awareness and impart enough valuable information about products and chemicals to enable everyone, including those who make, sell and purchase those items, to make more informed decisions. In addition to learning about products and their ingredients, the public needs to know why green chemistry is important and how it can seamlessly provide safer, more sustainable products along with a safer, more sustainable world.

Information management and technology development is needed to help manage the information gathered about products and chemicals, and make it available to the widest possible audience in a form that benefits the user . In particular, it helps make information readily accessible to stakeholders and as a result helps to protect consumers and the environment. It also helps to provide a means to more easily identify information gaps and hence to prioritize the need to address such gaps.

Forging strategic partnerships is needed to exchange information with other green chemistry partners and governments to maximize the amount and effectiveness of information available. Because the EU and Canada are the international communities

with the most promising and potentially useful information, they will be the primary focus of international partnerships early on. However, as other international, national and state programs begin to take shape and indicate a willingness to collect and share data, this component can be expanded to include relationships with U.S. EPA, other states and other international communities.

Resource considerations

For an outreach and marketing campaign, much of the scoping, development and implementation planning can occur as collaborative efforts among Cal/EPA BDOs using existing resources, given the expertise of some agencies with outreach and surveying activities. In addition some aspects of information dissemination, especially through existing internal and external IT infrastructure such as the use of innovative notification approaches, are likely to consume minimal resources. Similarly, the meetings and negotiation required to establish information-sharing partnerships can occur using existing resources.

Depending on the size, extent, design and intended outcome of consumer surveys, costs can vary widely from $50,000 for telephone surveys of around 2,000 individuals to nearly two million dollars for surveys of 28,000 households. Similarly, the costs associated with an outreach campaign depend largely upon the media outlets used and the format, design, and intended outcomes and messages of the campaign. A sixty second radio ad that is aired once may cost $150.00, whereas a more comprehensive broadcast media campaign that includes creative development, production costs, placement costs and air-time, such as tobacco media campaigns, can range from $12 to over $20 million.

The cost to evaluate, summarize and recommend final information management alternatives, such as decentralized database system or centralized clearinghouse can be accomplished with existing funding levels. However, the resources required to develop the infrastructure to upload information from various data sources is not known and will need to be determined during scoping and evaluation. California can pursue collaborative partnerships to augment existing resources and avoid duplication of effort.

Institutional structure

The implementation of this key element will require a variety of expertise, particularly in the areas of marketing and outreach, and in organizing and presenting information management, presentation and technology options. The key element would benefit from collaboration with participants from public and private entities with prior experience and innovative ideas, especially for outreach and IT implementation.

It is anticipated that a number of the functions associated with the three aspects of this key element may be stimulated by governmental activities, but the implementation and activities may be most effectively conducted by private entities or non-governmental organizations (NGOs) with support from state agencies, or vice versa. For example, a decentralized database of chemicals and products could be maintained by an NGO or non-profit organization with financial support from the state, or the state could host such a database with technical assistance and support from private IT consultants. Similarly, the state may develop the objectives and requirements for a marketing and outreach campaign, which an NGO or non-profit could subsequently implement, or the state

could implement an outreach campaign and help private organizations to measure the success of the outcome and respond to changes in product demands.

The structure of these aspects of this key element can, and likely will, be flexible, reflecting the detailed development of the tasks associated with phases and components of the elements.

Metrics

The overall goal of the three aspects of the key element addressed in this report is to facilitate demand in the marketplace for greener products as a result of increased awareness and knowledge regarding the safety and toxicity of various chemicals used in consumer products. Given the cutting-edge nature of the Green Chemistry Initiative and the broad goal of designing products and processes to reduce or, ideally, eliminate substances hazardous to human health and the environment, it is important to evaluate and demonstrate the impact of the program and to sustain the program and facilitate its replication by other states and countries.

While a traditional randomized control study is not feasible, an evaluation can be designed to measure the impact of the Initiative and assure accountability for the use of public resources. However, attribution of changes in consumer attitudes, knowledge, and behaviors and ultimately changes to consumer product labeling or composition to the Green Chemistry Initiative will be challenging. Manufacturers and large retailers are already capitalizing on consumer interest in green products and filling the media environment with their own green-focused messages. The evaluation will have to be carefully planned and executed to separate the impact of the Green Chemistry Initiative.

Key to designing an appropriate evaluation will be development of key outcome indicators that are specific, observable, and measurable characteristics or changes that represent achievement of an outcome. For example, if a key outcome of the California Green Chemistry Initiative is, “increased knowledge of and preference for green products, and increased support for policies that promote the manufacturing, sale, and labeling of green products,” then the following are examples of indicators that the evaluation might measure:

- Level of confirmed awareness of California Green Chemistry Initiative media messages.
- Level of receptivity towards green chemistry messages
- Proportion of the population that perceives the use of specific products in consumer products as harmful
- Attitudes about purchasing preference for consumer products that are lower in toxicity
- The proportion of household cleaning products within grocery stores labeled as to their safety and toxicity
- Proportion of window cleaning products sold that are considered low in toxicity
- Proportion of state and local governmental agencies that adopt policies that require the purchase of green products

The goal of the Green Chemistry Initiative is to lead producers and consumers in the state to the design, manufacture and use of products and processes that will reduce or even eliminate substances that are hazardous to human health and the environment.

Given the broad goals, it is important that the metrics developed to assess and demonstrate the impact of the Initiative focus on the specific efforts that advance green chemistry. In addition, the metrics will help support new investments to sustain the green chemistry initiative and help expand its impacts beyond the borders of California to other states and countries.

Potential metrics include:

- Increase in awareness of green chemistry principles by consumers by 50% by 2010.
- Reduction in the purchase of consumer goods with hazardous substances by 25% by 2010.
- Close the information/data gap by 25% by 2015.
- International data-sharing agreements by ?

Methods used to evaluate the Initiative will include: 1) consumer surveys to assess the reach and impact of the consumer outreach campaign and its impact on attitudes, knowledge, intentions to change behaviors, and behavior change; 2) tracking consumer purchasing data; 3) store observation surveys, and 4) monitoring public policies at the state and local level related to green chemistry. The approach includes a process for evaluating program impacts and using the evaluation to refine the program implementation. Ideally, evaluation, tracking, and monitoring efforts will collect and analyze data in a manner that allows the program evaluation to attribute changes in consumer behavior and other outcomes to the efforts of the Green Chemistry Initiative.

RECOMMENDATIONS

To successfully disseminate information about chemicals in products and empower consumers to make informed choices the key element team recommends that California concurrently pursue the following activities:

- Design and implement an outreach, marketing and communication plan:
    - Determine the intended message(s), the target audience(s), the receptivity of the audience, and the information to be communicated
    - Identify and evaluate method(s) to deliver product and chemicals information
    - Monitor the results of the outreach campaign and make necessary adjustments
    - Convene an outreach team to advise design and implementation
- Facilitate an information management and technology infrastructure for chemicals and product information:
    - Determine types, amount and quality of available information and identify and evaluate data translation needs and options
    - Evaluate, summarize and recommend the best alternatives for managing chemical information and making it accessible to stakeholders
    - Establish contacts and begin discussions with potential public and private information management and technology partners, such as Google
    - Convene an information task force to advise on development, evaluation and implementation of available options

- Form strategic relationships with international, national, and state and local governments and private organizations to advance green chemistry:
    - Establish contacts with and open negotiations for MOU-type agreements with Canada, the EU, Massachusetts, Maine and other western states to share product and chemical information

APPENDIX D-2

KEY ELEMENT

STRENGTHENING CONSUMER PROTECTION LAWS

Team Leader: Gale Filter, DTSC

Laws to protect consumers are scattershot. Some lack standards, other lack enforcement mechanisms. An effective system is needed to protect consumers from hazardous substances in products.

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Executive Summary

Laws to protect consumers from hazardous substances in products are numerous at both the federal and state level. While some hazardous chemical restrictions have thresholds specifically set in law, others have yet to be determined or lack specificity. There is a sense of inconsistency, confusion and the overall perception that consumer protection laws are ineffective because laws overlap and regulate the same product, although many consumer products are not covered.

Although enforcement mechanisms vary widely and may include tools such as specific sampling and product embargo authority, records review and facility access, as well as penalty calculation and the ability to enforce in court via administrative, civil or criminal processes, these mechanisms are not applied consistently across the universe of consumer product laws.

Through an extensive public process to gather input from an interagency team, public workshops, and stakeholder feedback, options to create a more effective system to protect consumers from hazardous chemicals in products were developed and include

two stop gap measures that can be implemented in the short-term to improve *current efforts* for consumer protection from hazardous chemicals in products. The first would establish an interagency consumer products workgroup to establish a cooperative and coordinated working relationship in those instances where consumer products authorities overlap; the second would expand this relationship to share resources for compliance and investigative work.

The public workshops and stakeholder responses also brought out ideas for a cradle to cradle system for hazardous chemicals in consumer products, resulting in two additional more long-term options that form a logical stepwise method to build a cradle to cradle system. The third option would set the stage by filling in the consumer product gaps in the current system by covering consumer products absent from the regulated universe of currently identified chemicals of concern. The fourth would complete the cradle to cradle system by expanding the assessment and regulatory actions of the third option to all chemicals of concern, and would focus on criteria to identify and prioritize those chemicals of concern.

Problem Statement

Consumer protection from hazardous chemicals in products has taken a traditional “silo” regulatory approach. From product manufacturing, to consumer use, to disposal, the different stages of a product’s life cycle is overseen by a multitude of agencies in a traditional “cradle to grave” model. Green chemistry reinvents the traditional approach by using a “cradle to cradle” approach. The cradle to cradle approach examines a different way to reduce pollution and hazardous chemicals usage by engineering products that (1) are safer or less toxic for consumer use; (2) can be broken down easier for reuse; and (3) can be readily broken down in the environment.

Using a cradle to cradle approach would involve a more integrated approach since each stage impacts another stage of a product’s life cycle in a domino effect. In theory, the traditional independent “silos” (i.e., regulatory approach) should start blurring into each other as a product reaches its full potential for a cradle to cradle approach. For instance, the need to regulate product end of life disposal becomes minimal due to reuse of end of life waste materials as feedstock into new products. The traditional distinctions between waste and raw material are removed and become synonymous with each other. Consumer protection from hazardous chemicals in products becomes synonymous with less pollution, reuse and biodegradability.

Participants in the Green Chemistry Initiative Phase One indicated that that consumer protection in California could be strengthened. Specifically, the Phase One report indicated that one of the general themes identified as a “key element” was “Strengthening Consumer Protection Laws.”

"Laws to protect consumers are scattershot. Some lack standards, other lack enforcement mechanisms. An effective system is needed to protect consumers from hazardous substances in products."

Consumer Protection Laws Are "Scattershot"

Laws to protection consumers from hazardous substances in products are numerous at both the federal and state level. Although the emphasis placed in this key element is consumer protection in California, there is recognition that state law must be consistent with federal law in regards to any bans or restrictions on chemicals and products.

The main agencies involved with hazardous chemicals in consumer products in manufacturing, use and disposal are:

- Manufacturing: Department of Industrial Relations, Department of Consumer Affairs, and Department of Public Health
- Use: Department of Public Health, Air Resources Board, Department of Pesticide Regulations, Integrated Waste Management Board, and Department of Toxic Substances Control
- Disposal: Department of Toxic Substances Control, Integrated Waste Management Board, and State and Regional Water Quality Boards

Manufacturing
The Department of Industrial Relations (DIR), Division of Occupational Safety and Health oversees the worker health and safety, including protecting employees from unhealthy exposures to hazardous chemicals. The manufacture a consumer product containing a hazardous chemical would involve ensuring that proper precautions are taken to protect workers from hazardous chemical exposures. These precautions, including permissible exposure levels and personal protective equipment, are regulated by the DIR.

The Department of Consumer Affairs, Bureau of Home Furnishings and Thermal Insulation (BHFTI) protects consumers of upholstered furniture, bedding, and thermal insulation through licensing and inspection of businesses that manufacture and sell upholstered furniture, bedding and thermal insulation and enforces health and safety standards, product labeling requirements and truth in advertising laws enforces safety standards by testing products.

The Department of Public Health (DPH), Food and Drug Branch oversees the manufacture of cosmetics, in addition to foods, drug and medical devices ensuring that proper precautions are taken to protect consumers from adulterated, misbranded and falsely advertised products.

Use
Consumer use of products containing hazardous chemicals is overseen by a multitude of agencies, each with a slightly different intent, but with the same end result –

restricting or banning the use of hazardous chemicals in consumer products. Briefly summarized they are as follows:

The Department of Public Health (DPH) oversees hazardous chemicals in consumer products and its unhealthy impacts to consumers. Some of the hazardous chemicals and consumer products they have administering authority over are “adulterated” cosmetics; lead and cadmium in tableware; lead and soluble mercury, cadmium, antimony, selenium, arsenic, and barium; and lead in candy.

The Air Resources Board (ARB) oversees consumer products containing volatile organic compounds and its impacts to the air, which then impacts public health.

The Department of Pesticide Regulation (DPR) oversees the registration of pesticides in California. Manufacturers must demonstrate to DPR that their products can be used safely to protect workers, consumers and children, and others who may be exposed to pesticides before the pesticide can be registered and used in California.

Use and Disposal
The Integrated Waste Management Board (IWMB) oversees the disposal of nonhazardous waste. Because products at their end of life will be disposed in landfills and because available landfill space is shrinking, waste diversion through recycling waste is encouraged. In some instances, products restrictions and bans were placed within their authority with the primary purpose of controlling land disposal and potential soil contamination, but at the same time phase out hazardous chemical usage to protect public health threats due to soil contamination (e.g., batteries).

The Department of Toxic Substances Control (DTSC) traditionally oversees and controls the disposal of hazardous waste. Many products at the end of their life are hazardous waste and although the primary focus of DTSC is hazardous waste disposal and site cleanup, the hazardous chemicals are the same whether present in waste, soil, or products. Recently, DTSC received authority over toxics in packaging, which has a primary concern over the packaging’s end of life landfill deposition and its associated environmental and public health concerns. DTSC also recently received consumer protection authority over lead-tainted jewelry.

Disposal
The State and Regional Water Quality Boards (Water Boards) oversee and protect the California’s waters by controlling the discharges into waterways. By controlling the discharges, the Water Boards indirectly control the products used by industrial dischargers, or in the case of landfills, the type of waste (or end of life products) accepted.

<u>Consumer Protection Laws Lack “Standards</u>”

While some hazardous chemical restrictions have thresholds specifically set in law, others are yet to be determined. For example, the lead threshold for candy is “in excess

of the naturally occurring level," and the Office of Environmental Health Hazard Assessment (OEHHA) initiated public workshops in March 2008 to gather information and data to begin the determination process. Other "standards" lack specificity. For instance, an "adulterated" cosmetic is banned from manufacture and sale in California; "adulterated" is defined as poisonous or deleterious substance. Without further specificity, "adulterated" may include a limited or a very wide of the hazardous chemicals.

Consumer Protection Laws Lack "Enforcement Mechanisms"

Enforcement mechanisms may include tools to ensure compliance, such as specific sampling and product embargo authority, records review and facility access, as well as penalty calculation and the ability to enforce in court via administrative, civil or criminal. In the Enforcement column of Table 1: California Lead Restrictions, the various enforcement mechanisms and tools are listed. They vary widely and without the appropriate enforcement mechanisms in place to ensure compliance with hazardous chemical bans and restrictions in consumer products, repeated offenses may occur.

"Scattershot," Lacking "Standards" and Lacking "Enforcement Mechanisms"

Table 1: California Lead Restrictions provides an overview of some of the lead bans and restrictions in products and exemplifies how Green Chemistry Initiative participants found consumer protection laws confusing.

Table 1

California Lead Restrictions for Products

Legend
DPH – Department of Public Health
DTSC – Department of Toxic Substances Control
OEHHA – Office of Environmental Health Hazard Assessment

Product	Lead standard	Authorized Oversight Agency	Enforcement
Tableware	California law prohibits manufacturing, processing, importing, selling, deliver, hold for sale, supply, or offer for sale in California of tableware that leaches lead in excess of: - 3.0 ppm flatware - 2.0 ppm small hollowware - 1.0 ppm large hollowware - 0.5 ppm cups, mugs, large pitchers, and jugs	DPH	Civil Criminal Administrative Civil penalties up to $5,000 per day Authority to enter, inspect, obtain samples, access records, and embargo
Candy	The sale of adulterated candy to California consumers is prohibited. Adulterated candy means any candy with lead in excess of the naturally occurring level. OEHHA is tasked with developing standards for the naturally-occurring level of lead in candies.	DPH OEHHA	Intentional sale of adulterated candy is subject to a civil penalty of $500 per violation Authority to enter, inspect, obtain samples, access records, and embargo

Table 1

California Lead Restrictions for Products

Legend
DPH – Department of Public Health
DTSC – Department of Toxic Substances Control
OEHHA – Office of Environmental Health Hazard Assessment

Product	Lead standard	Authorized Oversight Agency	Enforcement
Candy wrapper	The sale of adulterated candy to California consumers is prohibited. Candy is considered adulterated if its wrapper or the ink on the wrapper contains lead in excess of standards to be developed by OEHHA. Wrapper does not include any part of the packaging that lead will not leach from.	DPH OEHHA	Intentional sale of adulterated candy is subject to a civil penalty of $500 per violation Authority to enter, inspect, obtain samples, access records, and embargo
Faucets, pipes, fittings	California law prohibits the introduction into commerce any pipe, pipe or plumbing fitting, or fixture that is not "lead free," except for a pipe that is used in manufacturing or industrial processing. Until December 31, 2009 "Lead free" plumbing materials means not more than: - 0.2% lead in solder and flux - 8% lead in pipes and pipe fittings - 4% lead by dry weight plumbing fittings and fixtures Beginning January 1, 2010, the standards for "Lead free" change.	DPH	Civil Criminal Administrative DPH is required to adopt building standards to implement this law. The standards shall be enforced by the appropriate state and local building and health officials.
Bottled, Vended, Hauled and Processed Water	5 ppm	DPH	Authority to enter, inspect, obtain samples, access records, and embargo Re-inspection cost $100/hr
Wine	CA Health & Safety Code 110597. (a) It contains lead in concentrations exceeding 150 parts per billion (b) A metal foil capsule containing lead in excess of 3,000 ppm by dry weight is affixed or attached to its container, unless it can be shown by the producer, or if not produced in California, by the licensed importer, that the wine was bottled before January 1, 1994.	DPH	Criminal Misdemeanor for manufacture, sale, exchange, of adulterated food with up to $1,000 fine and up to one year in jail Embargo authority
Painted or lacquered children's toys	Toys coated with paints and/or lacquers containing compounds of lead in excess of 600 ppm, or toys contaminated with any toxic substance cannot be manufactured, sold, or exchanged.	DPH	Criminal It is a misdemeanor criminal offense to manufacture, sale, exchange lead-tainted toy with up to $1,000 fine per violation and up to one year in jail. Embargo authority

Table 1

California Lead Restrictions for Products

Legend
DPH – Department of Public Health
DTSC – Department of Toxic Substances Control
OEHHA – Office of Environmental Health Hazard Assessment

Product	Lead standard	Authorized Oversight Agency	Enforcement
Children and Adult Jewelry	Jewelry designed or marketed for use by children aged six and under cannot be manufactured, shipped, sold, or offered for retail sale in California if the jewelry is made using materials that exceed the limit of either 200 ppm or 600 ppm or more of lead depending on the material. Statute provides alternative standards for jewelry intended for older children and adults.	DTSC	Civil Administrative Penalties up to $2,500 per day for each violation. Inspection and records review
Packaging and Packaging components	The intentional introduction of lead into packaging or packaging components is prohibited. Also the sum of the total incidental concentrations levels of regulated metals, one of which is lead, cannot exceed 100 ppm . Statute provides limited permanent and temporary exemptions.	DTSC	Civil Criminal Administrative Penalties up to $25,000 per day for each violation. Inspection and records review

Table 1 illustrates that while lead standards exist, they vary in allowable concentration from product to product and in some cases vary in the way the lead concentration is analyzed in the laboratory to determine compliance. For example, the amount of lead present in jewelry is determined by using an analytical method specified in law and is expressed as total concentrations of lead; that is, the entire amount of lead is determined in the jewelry. In contrast, the amount of lead in tableware is determined by a laboratory test in which the food-bearing part of the dish is exposed to a mildly acidic solution (vinegar) for a specific period of time. The acidic solution is then tested to see how much lead it contains. The test does not measure how much lead is in the dish, but rather how much lead can leach into food (leachable lead) when the dish is used.[1]

Looking at the same two products, the enforcement tools differ as well. The enforcement mechanism for tableware provides specific statutory authority and allows the enforcement agencies (DPH and local health officers) the flexibility to sample and embargo suspect tableware and follows the distribution chain to remove lead-tainted tableware from the stream of commerce as quickly as possible.

Lead-tainted jewelry, however, does not provide the same statutory authority to the administering agency (DTSC) and there is no specific embargo authority. Without embargo authority, the administering agency does not have any assurances that the

[1] http://www.dhs.ca.gov/childlead/tableware/twregs.html

tainted jewelry is removed from the commerce stream; the tainted jewelry may find its way back into a retail establishment, such as a discount store. *Lead-tainted jewelry is lacking enforcement mechanisms in comparison to lead-tainted tableware.*

While the lead standards are set in tableware and jewelry, they are measured differently and the enforcement mechanisms are vastly different. In addition, a violator is subject to criminal prosecution for lead-tainted tableware, while lead-tainted jewelry expressly does not allow criminal prosecution. The fines are different and calculated differently; yet the hazard for lead is ingestion for both products.

A lead-tainted product may be regulated under several different lead laws, which further complicates compliance. For example, lead-tainted candy wrappers falls under two laws: (1) lead-tainted candy and the potential ability of the wrapper to leach lead into the candy it holds; and (2) toxics in packaging components, where lead is one of four metals in which the total concentration cannot be intentionally added or exceed 100 parts per million (ppm) in a packaging component. The same candy wrapper: two different administering agencies, two different lead standards, two different methods to analyze for lead, two different sets of enforcement tools, and two different types of potential penalties.

To complicate this example further, lead-tainted candy (e.g., ring pops) may fall under two laws: (1) lead-tainted candy; and (2) lead-tainted jewelry. There is the potential of overlapping authorities if the candy is considered a part of the jewelry and therefore, a jewelry component. The candy clearly falls within the authority of the law for lead-tainted candy, but also may fall under the lead-tainted jewelry. Both laws are intended to address risks to children and lead exposure through ingestion – through candy or from jewelry components. The same piece of candy: potentially regulated by two different administering agencies, two different lead standards, two different methods to analyze for lead, two different sets of enforcement tools, and two different types of potential penalties.

In total, the candy and the candy wrapper in certain instances may fall under three laws: (1) lead-tainted candy, which includes the candy wrapper, (2) lead-tainted jewelry, if the candy is considered a jewelry component, and (3) lead in packaging which is applicable to the candy wrapper.

Although there are differences in lead standards and analytical methods, in some sense these differences are rational because the intents of the laws are different, but there is nevertheless, *a sense of inconsistency, confusion and the overall perception that consumer protection laws are ineffective because laws overlapping and regulate the same product as stated in the Green Chemistry Phase One Report.*

To further illustrate frustration in the seemingly lack of consumer protection from hazardous chemicals in products, an unprecedented number of California legislative bills were introduced in 2008 to address consumer safety that legislators believe is not adequately addressed at the federal level. To name a few, Senate Bill (SB) 1334

(Calderon) requires plumbing materials to be certified for compliance with lead-free provisions by an independent third party. SB 1395 (Corbett) requires DTSC to establish lead plumbing monitoring and compliance testing as a part of the department's ongoing program to reduce toxic substances from the environment. AB 1879 (Feuer and Huffman), would expand the authority of DTSC to regulate chemicals of concern, including lead, in all consumer products. Others too numerous to specifically name were introduced with the intent to fill the consumer protection gap in California.

Of particular concern are the consumer products that are <u>not</u> covered under the current regulatory scheme for lead or other commonly accepted hazardous chemicals. For instance, children's insulated vinyl lunch boxes, backpacks, toddler vinyl or cloth books, and food storage containers are products where current hazardous chemical restrictions or bans may not apply. *Whether the introduction of a hazardous chemical in a product is by accident or by design, if its presence is a public or environmental health risk, the tainted-product needs to be dealt with accordingly.*

(Note: This discussion does not include assessment of risk based exposures. For example: Proposition 65 labeling requirements.)

Challenge

The Green Chemistry Phase One report indicates that an effective system is needed to protect consumers from hazardous chemicals in products. Based on Table 1 and the examples described above, the description: *"Laws to protect consumers are scattershot. Some lack standards, other lack enforcement mechanisms"* are, to an extent, justified.

This objective of this key element is to develop *"An effective system is needed to protect consumers from hazardous substances in products."*

Approach

To begin the development of an effective system for consumer protection, DTSC

1) formed a Consumer Protection Interagency Team consisting of member representing the main agencies that have authority over restrictions and bans of hazardous chemicals in products (see Attachment A for the Interagency Team members);

2) conducted two public workshops to obtain feedback; and

3) solicited feedback from stakeholders by asking questions regarding consumer protection from hazardous chemicals in consumer products via the Green Chemistry listserv. (Note: we recognize that outreach was limited and that stakeholder feedback may not be entirely representative of the general public).

Section IV: Dialogue summarizes the salient points of the workshop discussion and feedback from stakeholders while the Consumer Protection Interagency Team provided guidance.

III. Background

To provide additional context to strengthening consumer protection, research and cursory review was conducted on laws regarding consumer products and their hazardous chemical bans or restrictions. Table 2: Products and Regulated Chemical(s) of Concern provides a summary of findings. While every effort was made to ensure accuracy, Table 2 should not be considered a comprehensive list all consumer products, their hazardous chemical(s) of concern, and administering agency.

Table 2 shows that there are a number of federal and California agencies that oversee hazardous chemical restrictions and bans in products. While this is not an exhaustive list of products and hazardous chemicals, the number shown in Table 2 is quite daunting, and if the current trend in legislature continues, will continue to grow. This table also shows the number of different oversight agencies involved with hazardous chemicals in consumer products as assigned by law.

Table 2

Products and Regulated Chemical(s) of Concern

AG: Attorney General
ARB: Air Resources Board
CPSC: Consumer Product Safety Commission
DPH: Department of Public Health
DPR: Department of Pesticide Regulation
DTSC: Department of Toxic Substances Control
FDA: Food and Drug Administration
IWMB: Integrated Waste Management Board
LHO: Local Health Officer
OEHHA: Office of Environmental. Health Hazard Assessment
USEPA: Unites States Environmental Protection Agency

Administering Agency	Product	Chemical(s) of Concern (COC)																			
		Lead	Mercury	Cadmium	Hexavalent Chromium	Antimony	Arsenic	Selenium	Barium	Adulterated[2]	Halogens & Aromatic Hydrocarbons	Intentionally Added Hg	Metals	Non Biodegradable Toxic Chemicals	PCB	Penta- and Octa-BDE	Phthalates (DEHP, DBP, BBP)	Phthalates (DINP, DIDP, DnOP)	Pesticides	VOCs	Other[3]
DPH LHO	Toys	X	"Soluble"[4]			"Soluble"															
DTSC	Packaging and Packaging Components	X	X	X	X																
DTSC	General Purpose Lights	X	X																		
DTSC	Incandescent and enhanced spectrum lamps	X	X																		
DTSC	Covered Electronic Devices	X	X	X	X																
ARB	Gasoline	X																			
CPSC	Paint	X																			
DPH State/ Local Building Agencies LHO	Solder in plumbing fittings or fixtures	X																			
DPH	Pipes	X																			

[2] "Adulterated" equals a poisonous or deleterious substance
[3] Presumption of toxicity if the art or craft material contains as an ingredient 1% or more by weight of the mixture of the product a toxic substance causing chronic illness
[4] "soluble" is defined as quantities of metals > 0.1% are dissolved by 5% HCl after stirring for 10 minutes at room temperature

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DPH	Water coolers / refrigerated water fountains	X										.									
DPH AG FDA CPSC	Candy	X																			
DPH LHO	Tableware	X		X																	
DPH LHO CPSC	Toys with Lead Paint	X																			
DTSC	Jewelry - Children	X																			
DTSC	Jewelry -Adult	X																			
DTSC	Vitrified or painted labels on glass containers	X																			
Board of Pharm.	Thermometers		X																		
DPH	Novelty Items		X																		

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DTSC	Barometer Esophageal dialtor, bougie tube or gastrointestingal tube Flow meter Hydrometer Hydroometer or psychometer Manometer Pyromoeter Sphygmanometer Thermometer		X																		
DTSC	Mercury diostats and ovens or gas ranges with mercury diostats		X																		
DTSC	Switches and relays		X																		
DTSC	Thermostats		X																		
IWMB	Batteries (Household alkaline and carbon-zinc dry cell)		X																		
IWMB	Batteries (Zinc-Carbon)		X									X									
IWMB	Batteries (Alkaline manganese)		X																		
IWMB	Switches in Cars		X																		

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IWMB	Chemicals and measurement devices in school labs		X																		
ARB	Consumer Products Aerosol Coatings Antiperspirants & Deodorants Portable Fuel Containers Indoor Air Cleaners																			X	
DPH	Food									X											
DPH	Drug or Device									X											
DPH	Cosmetic									X											
DPH	All products															X					
DPH	Toys and child care articles																X				
DPH	Toys and child care articles for 3 year olds and under																	X			
DPH OEHHA	Art or Craft Material																				X
DPR USEPA	Pesticides																		X		

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DTSC	Sewage disposal unclogging products										X										
DTSC	Chemical Toilet Additives													X							
IWMB	Batteries (Small, nonvehicular, rechargeable)												X								
IWMB	Cell Phones												X								
IWMB	Batteries (Button, coin, cylindrical, or rectangular, and of a liquid starved or gel electrolyte, that is designed for commercial industrial, medical, institutional, or household use.)												X								
US EPA	Oil														X						

While Table 2 demonstrates the number of administering agencies that are tasked with implementing chemical restrictions and bans in products, enforcement and compliance measures for them are not listed since they has not been confirmed. Some agencies, such as DPR, DPH and ARB have programs for consumer product compliance, some are more active than others based on resources available. Many, if not all, agencies have a complaint system in place where consumers may lodge a complaint and a follow up investigation will ensue. DTSC in its recent authority over lead in jewelry and toxics in packaging have conducted focused initiatives to determine the rate of compliance and whether enforcement actions are necessary.

Table 2 does not list the hazardous chemical threshold that makes the product banned or restricted; however, Table 1: California Lead Restrictions illustrates that the thresholds can vary from total concentrations to leachable concentrations and from allowable concentrations to no allowable concentrations above naturally occurring levels in the environment.

Table 2, also provides an indication of the common regulated chemicals of concern: lead, mercury, cadmium and hexavalent chromium. Other (soluble) metals are also restricted in toys; i.e., antimony, arsenic, selenium, and barium. However, perhaps the most commonly of recognized toxic metal is arsenic. Table 2 also shows that penta- and octa - polybrominated diphenyls are hazardous chemicals with the broadest product scope since the fire retardant chemicals are banned in <u>all</u> consumer products. Phthalate restrictions in child care articles and toys are the most recent consumer product and hazardous chemical restriction and become effective on January 1, 2009.

Also note that by looking through the list of products in Table 2, there are products that are regulated for one hazardous chemical, but not for others. This at first blush seems insignificant, but upon reflection, the other hazardous chemicals are not regulated <u>in this particular product</u>, and may present a consumer hazard. *Products with known chemical toxicity may be present in non-regulated products.*

By providing this basic background information and examining the different components necessary to protect consumers from hazardous chemicals in products, the challenge to develop an effective system that keeps hazardous products from the stream of commerce may begin.

IV. Dialogue

The process to engage participants in a dialogue to provide input for developing an effective system to protect consumers from hazardous chemicals in products is briefly summarized below.

Interagency Team

The objective of the Interagency Team was to provide a forum for its members to share information on each agency's consumer product regulatory program while planning for the public workshops. Noted in particular were comments to increase cooperative efforts with restrictions and bans in overlapping consumer product authorities.

Several members of the Interagency Team were able to attend the first public workshop. Valuable insights were gained from the Interagency Team and the first workshop which was utilized to revise the format of the second public workshop. Members of the Interagency Team also provided comments on this Key Element Implementation Plan.

Workshop 1

The first public workshop was held in Sacramento on April 25, 2008. The objective of the workshop was to obtain input on the following options to strengthen consumer protection in California:

- Increase consumer awareness of existing laws
- Enhance enforcement authority
- Improve coordination among existing consumer protection agencies
- Should California have a single consumer product compliance and enforcement agency?
- Other Options

The following represents the themes, questions and miscellaneous observations that were received during the first public workshop.

I. Themes

- Laboratory Capabilities/Resources
- Agency Consolidation/Coordination
- Market-Driven Changes = Opportunities
  - Green Chemistry - Better bottom line $
- Increased Consumer Awareness
  - Product Ingredients/Hazards (All)
- Models: Build on Existing Models
  - Air Resources Board Perchloroethylene & Dry Cleaners Rule
  - Arts & Crafts Materials Program
  - Voluntary Registration of Safe Products
  - Department of Pesticide Regulation's – Pesticide Re-evaluation Process

- Design for the Environment
  - AKA Extended Producer Responsibility
  - AKA Product Stewardship/Life Cycle Analysis
- Authorities
  - Recall
  - Embargo
  - Complaints (law suits)

II. Questions

- Are there existing State models?
  - Department of Public Health
  - Air Resources Board
  - Department of Pesticide Regulation
- What are the hindrances to using full authority given (e.g. politics, resources)?
- Should State regulate by Chemical or by Commodity?
  - Example Food
    - Microbial
    - Chemical
    - Physical Hazards
- How does the State become more proactive?
  - Example CFCs
- How do we frontload the green process?
- Should there be one central laboratory to test all products?
- What are some of the processes industry currently uses that can be shared and feed into Green Chemistry?

III. Miscellaneous Observations

- Resolving enforcement cases may be/is more difficult if multiple agencies are involved
- Chemical bans create innovation for alternatives
- System in place now is reactive, not proactive
- Alternative manufacturing ingredients need to be equally functional with original ingredients
- Information fatigue
  - Consumer Product Safety Commission alerts
  - Prop. 65 warnings
  - Labels
- Industry performs risk evaluations
- Good manufacturing processes

<u>Workshop 2</u>

The second public workshop was held in El Segundo, CA on May 8, 2008. The second workshop built upon the responses from first workshop and as a result three questions were posed to stakeholders.

Questions posed at Workshop 2:

1. How big should the universe be?
2. What attributes would make the current system more effective?
3. If a new model were to be created, what should be the focus?

- Focus only on COC in terms of Green Chemistry
- Should prioritize chemicals and focus on their hazardous traits
- Shouldn't forget about the physical hazards though
- Considering both chemical hazards and physical hazards may be too big of a universe to look at
    - If the universe is too big, how will you be able to enforce it?
    - Focus just on chemistry and COC
- The State should be more involved regarding recalls with consumer products
- No one present at the workshop became aware of the existing consumer protection laws through the governments education and outreach efforts
- With limited resources, is there an opportunity for government and NGO's to work together and partner up and even a way for government and industry to partner up and work together.
- Independently of what the government/NGO's are doing industry is beginning to jump on the Green Chemistry band wagon.
- It is important not to duplicate efforts. We can work together and still acknowledge each others own interests.
- Create a win/win partnership
- We have only done forced partnerships with industry.
- Approach trade associations for education and outreach.
- Objectives to get industry involved – better bottom line and PR opportunities
- Disagreement between labs is a problem. Different methods are being used for testing. We need a lab accreditation program in place.
- Involve companies that may have money and want to be leaders.
- What about all the small Mom & Pop providers and manufacturers – we need to reach out them somehow too.
- The past has shown that partnerships have not worked by themselves – we need regulatory standards with teeth too.
- Look to OEHHA for chemical testing methods.
- Europe is moving on this – we need to get up to speed.
- Chemical producer should be proving that the product is safe rather than us having to prove that the product is unsafe.
- TSCA: over 80,000 chemicals, only 1/3 of them are tested for hazardous traits, it is a broken process
- We need a process to ban bad chemicals that we are already aware of.
- What type of enforcement tools is necessary? Search and inspection, certification of compliance by manufacturer/lab that is signed under penalty of perjury.
- Large retailers can put pressure on the manufacturer.
- Campaigns looking at shareholder agreements

- Campaigns looking at chemical policy reform – create public awareness of baby bottles, toxic in products, etc.
- Use indirect pressures as another tactic – we still need a comprehensive chemical reform policy.
- What role should the retailer have? Retailers don't usually know what is in their products.
- Make contracts between the retailer and their distributor/producer contain the laws (producers should provide the information).
    - What levels of COC cause dangers?
    - Can I sell the product in my store?
    - Is it compliant?
- Require a Certificate of Compliance – fix the problem at the manufacturer level.
- What happens to recalled products? What are the safeguards?
- There needs to be more clarity about what chemicals are in the products, is their information regarding hazardous traits of those chemicals – if not we need to start there.
- Product stewardship model
- Need to set a standard for green – what does green mean?
- We can get the big companies on board, but how are we going to get the small guys on board?
- What about people who use recycled products in their products? What if the recycled products were bad? You could assure that the recycled product wasn't bad by looking and testing it, but that price would only get passed down to the consumer.
- Is testing the only answer to really assure compliance?
    - Push for product stewardship
    - Need enforcement too
    - Green certification – what are the standards?
- Do we need a comprehensive policy to handle this?
- What about looking at Japan's current system?
- If we are going to have any impact we are going to have to show that our actions are actually improving the quality of the environment and the quality of life. The standards in place have to bring about results.
- Education and outreach
    - Partner with groups that can reach to the communities that need to get the information.
- The new regulatory framework/model should be flexible to include new products and new COC.
- Determining the hazardous traits of chemicals needs to happen first.
- Consolidate particular concerns regarding consumer products and coordinate better with others. Have a czar type person overlooking the different agencies involved.
- Can the feds do more? CPSC does not give the state authority over federal laws. The feds can give grants.

Public/Industry Questionnaires

To broaden stakeholder input regarding strengthening consumer protection, the Green Chemistry listserv was used as a vehicle to collect information to determine how to protect consumers from hazardous chemicals in products better. A number of questions were asked to ascertain the status of consumer, industry and nongovernmental organization knowledge regarding hazardous chemicals in consumer products. A summary of responses as well as actual responses are found in Attachments B to H.

The general consensus between respondents regarding enforcement was that enforcement was not adequate. Some respondents thought that the standards for hazardous chemicals were enforceable, but that enforcement was inconsistent and thus does not provide a level playing field to businesses. (I.S.9, I.S.6, I.S.4) Additionally, industry does not believe they are being consistently regulated in regards to hazardous chemicals in products. (I.S.10) The public respondents generally felt that there was not adequate protection from hazardous chemicals in products (C.S.3).

Ancillary to enforcement were general responses that the regulation of hazardous chemicals in products should be a joint responsibility between federal and state agencies and that in the absence of federal regulation, California should step up. At the same time, there is an indication that manufacturers should be responsible for the hazardous chemical(s) in the product and that they should self regulate themselves, while the government agencies should focus on the irresponsible manufacturers to protect the environment and consumers from harm (C.S.7).

There is a general consensus that a balanced chemical policy is needed to regulate hazardous chemicals, but in some instances respondents differed in opinion with the need to restrict more chemicals and noted that in some cases chemicals are over-regulated while others are under-regulated (I.S.5, I.S.10., C.S.3, C.S.5).

Lastly, although there is general consensus that industry and government have public education and outreach programs about hazardous chemicals in products, the public feels that information about current bans and product ingredients is lacking. (I.S. 7, I.S.8, C.S.1, C.S.2, C.S.4). The public indicated that the media and labeling were effective means of providing information to consumers. (C.S.4)

Strengthening Consumer Protection Foundational Questions

To broaden stakeholder input for the questions asked in Workshop 2, the Green Chemistry listserv was again used as a vehicle to collect information to determine how to enhance consumer protection. The questions were modeled after the questions in Workshop 2.

Scope

In general, respondents indicated that the scope of consumer products should be limited to hazardous chemicals in products, rather than mechanical safety, food and drugs. There seemed to be general agreement that limiting the scope of hazardous chemicals and products seemed reasonable to also limit any potential negative economic impact. Other hazardous chemicals and products could be added into the scope as deemed necessary. (F.S.1) This consensus was also reached in Workshop 2.

Making the Current Consumer Protection System More Effective
There was no clear consensus on enhancing enforcement authorities to make the current consumer products regulatory scheme more effective – respondents were split on this matter. A respondent indicated that product enforcement is necessary, while other asked the question "why is it not enforced now?" (F.S.2)

Only a slight majority of respondents indicated that increased consumer awareness of existing laws would make the current system more effective, which falls in line with the general statement that existing education and outreach from industry and government is lacking. (F.2, C.4) Overall, the consensus seems to indicate that better education and outreach is needed when considering a new regulatory model. (F.S.3)

There was no clear consensus from respondents regarding enhancing enforcement tools to make the current system more effective. Comments varied from using market recognition as an incentive to chemical bans with penalties to making sure what is being regulated now is working adequately. (F.S.2)

New Regulatory Model
Only a few respondents commented on the flexibility of a new regulatory scheme. Of those that responded, the general consensus was in agreement regarding a new regulatory scheme that includes the flexibility to add in additional product bans and to establish standards for hazardous products in commerce. However, comments were somewhat mixed regarding establishing specific regulatory thresholds for hazardous chemicals in products. One respondent commented that too many laws would be burdensome and create sensory overload to consumers, while another respondent commented that any regulatory thresholds established must be in an "active" system to accommodate changes more quickly than through changing laws. (F.S.3)

Overall, the majority of respondents were agreeable to the concept of a single consumer product compliance and enforcement agency as long as the model did not add to existing enforcement authorities in other agencies. (F.S.3)

V. Options

Through the input gathered from the interagency team and the public workshops, and stakeholder feedback, options for a more effective system to protect consumers from hazardous chemicals in products were developed. Through varying degrees of complexity and interagency cooperative effort, the following options are presented.

Stop Gap Measures

Option 1 and Option 2 were developed as stop gap or bootstrap measures to increase consumer protection in the current regulatory scheme for consumer protection and hazardous chemical bans and restrictions in products. The two options describe measures that can be done to enhance or improve *current efforts* for consumer protection from hazardous chemicals in products.

Option 1: Interagency Consumer Products Workgroup

Discussions held in the Interagency Team and in Workshop 2 led to the development of Option 1. The Interagency Team had an interest to communicate and coordinate with each other in their current consumer products efforts and with common or overlapping chemicals of concern. Workshop 2 concluded that the scope of consumer product safety should only involve chemicals of concern, rather than mechanical or physical safety hazardous. Melding the two concepts together, Option 1 was developed.

This goal of the Interagency Consumer Product Workgroup would be to:

- Increase understanding of each agency's program and authority;
- Establish a cooperative working relationship in those areas where overlapping authorities exist; and
- Coordinate consumer product activities to provide consumers with assurance that the agencies charged with hazardous chemical bans or restrictions are protecting consumers from hazardous chemicals in products.

Working towards these goals, the agencies will be able to share with each other successes and lessons learned to increase consumer protection through different strategies. Agencies with successful and self contained programs may be identified as potential models for other agencies to use to improve consumer protection from hazardous chemicals in products within each agency's authority.

The Interagency Consumer Product Workgroup would also coordinate efforts on hazardous chemicals in consumer products that crossover into other agencies' oversight. This would provide a unified and consistent message to manufacturers, distributors, and retailers that consumer protection is a high priority.

Option 2. Interagency Workgroup - Compliance Resources for Consumer Protection

Option 2 was developed as an outgrowth of observations of recent events with consumer product recalls and alerts about hazardous chemicals in consumer products

and a way to increase consumer protection. Option 2 is a method to enhance compliance and investigative efforts for tainted consumer products. While this topic was not brought up or discussed at the public workshops, the Interagency Team briefly touched on this concept of cooperatively working together on products with overlapping authorities. Option 2 builds on that concept.

The goal of this Interagency Workgroup builds on Option 1 goals. In addition to the goals identified in Option 1, Option 2 envisions a working relationship that involves sharing resources for compliance and investigative work. This would involve developing strategies to investigate hazardous chemicals in consumer products, sampling, laboratory analysis, and developing enforcement case work. The focus is to provide specialized expertise to agencies that may not have them to ensure compliance with existing hazardous chemicals bans and restrictions in consumer products.

Cradle to Cradle System for Hazardous Chemicals in Consumer Products

The public workshops and stakeholder responses brought out many ideas and specific thoughts for a cradle to cradle system for hazardous chemicals in consumer products. Fleshing out the details of a holistic cradle to cradle model from stakeholder input cannot be done in a vacuum, but broad concepts and general themes can be brought together to describe the basic components for a cradle to cradle system for consumer protection. Option 3 and Option 4 may be viewed as a logical stepwise method to build a cradle to cradle system.

Option 3 would stage the first steps by filling in the consumer product gaps in the current system with a limited scope of chemicals of concern. As noted earlier, *there may be consumer products that are not covered under the current regulatory scheme for hazardous chemicals. Whether the introduction of a hazardous chemical in a product is by accident or by design, if its presence is a public or environmental health risk, the tainted-product needs to be dealt with accordingly*.

Once Option 3 details were flushed out as outlined in more detail below, Option 4 would complete the cradle to cradle system by developing criteria for the last component. The options are described in more detail below.

Option 3. Limited Scope: Cradle to Cradle System for Hazardous Chemicals in Consumer Products

Option 3 would include a limited scope of chemicals of concern. Table 3 lists chemicals of concern that the California legislature has specifically acted upon and looks at their potential restrictions in other products. The legislatively restricted and banned chemicals of concern are: mercury, lead, arsenic, cadmium, hexavalent chromium, phthlates and polybrominated diphenyl ethers. While there are many other chemicals of concern to consider, these have been specifically acted upon legislatively and are a logical starting point to limit the scope of hazardous chemicals to consider. Pesticides and VOCs, although are chemicals of concern, were not included in Option 3 since DPR

and ARB have a fleshed out programs for those hazardous chemicals in consumer products.

Option 3 would fill the consumer product gaps left by Table 2 by covering consumer products, not currently in the regulated universe, and looking for the presence of one or more of the seven hazardous chemicals. The other chemical restrictions, bans and oversight agencies in Table 2 would not change.

An agency would be given the authority to devise a cradle to cradle system to assess the chemical hazard in other consumer products and if found necessary, restrict or ban their use in those consumer products.

Establishing a system for the seven hazardous chemicals in unregulated consumer products would include the following components:

- Criteria to prioritize the type of products.
- Restrict, ban or establish chemical thresholds in consumer products
- Consumer protection through compliance efforts including the ability to:
  - enter establishments where products are sold or held
  - embargo or quarantine products
  - take samples of suspect products for examination or testing
  - examine product documents to establish the flow into the stream of commerce
  - establish fines and penalties to ensure that the punishment meets the crime
  - compliance strategies for regulated industry to establish clear expectations
  - adequate laboratory support
- Education and outreach to public and industry including:
  - consumer information about chemicals in products – both recalled products and products on the market
  - product labeling
- Alternatives to hazardous chemical in the product.
- Product design to remove the seven hazardous chemicals from products for the ease of recycling and safe management.
- Self funding mechanism

<u>Option 4. Full Scope: Cradle to Cradle System for Hazardous Chemicals in Consumer Products</u>

Option 4 builds on Option 3 by incorporating all chemicals of concern and thus complete an effective system for consumer protection from hazardous chemicals in products. In addition to components in Option 3, this system would include the last component:

- Criteria to identify and prioritize the chemicals of concern.

VI. Implementation Plan

Option 1: Interagency Consumer Products Workgroup

To implement Option 1, an agreement with the oversight agencies must first occur, whether through agreement between directors of affected agencies or through a directive from the Governor.

The specific tasks for the Interagency Consumer Products Workgroup would include:

- Developing an interagency charter with roles and responsibilities.
- Identification of existing statutory authorities and responsible agencies.
- Identification of current resources to implement and enforce bans and restrictions.
- Recommendation for ongoing interagency coordination.

Option 2. Interagency Workgroup - Sharing Resources for Consumer Protection

Option 2 builds on Option 1's tasks and adds the following:
.
- Identification of compliance "gaps"
- Identification of specialized resources for investigation and compliance
- Recommendation for mechanisms to share resources

Cradle to Cradle System for Hazardous Chemicals in Consumer Products
Option 3. Limited Scope
Option 4. Full Scope

Specific tasks for Options 3 and 4 are the same. The tasks for Options 3 and 4 are limited in nature and require additional stakeholder input to flush out the details for Options 3 and 4. Specific tasks include:

- Scope out specific information needed from other agencies and stakeholders
- Plan and organize interagency workgroups and stakeholder meetings
- Develop recommendations for a Limited Scope or Full Scope Cradle to Cradle System for Hazardous Chemicals in Consumer Products

VII. Recommendations

Developing an effective system to protect consumers from hazardous chemicals in products, as mentioned previously, cannot be developed in a vacuum. The two workshops that were held as well as the questions posed to stakeholders through the listserv and on the Strengthening Consumer Protection Laws website, http://www.dtsc.ca.gov/PollutionPrevention/GreenChemistryInitiative/CP_Laws.cfm, indicate the level of outreach made to stakeholders for this key element. The responses to the questions posed are summarized and presented as received in Attachments B to H.

The options presented in this document do not delve into the specific details of stakeholder comments, but taken in total, numerous ideas and concepts were brought out for consideration that could be developed into a Cradle to Cradle System for Hazardous Chemicals in Consumer Products, either through Option 3: Limited Scope or Option 4: Full Scope. Some of the comments could be taken as a starting point and a basis for additional focused workshops to further develop the cradle to cradle system.

Comments were mixed in terms of current or enhancing enforcement. This mixed message is perplexing in that an unprecedented number of consumer alerts and product recalls regarding children's items tainted with lead were issued in the last year. A measure of confidence is needed, whether the responsible lies at the industry or government or both.

Stakeholder comments and responses were indicative that a better system for consumer protection from hazardous chemicals is needed, but there was no general consensus on how that might be achieved. The Interdepartmental Team suggested that they would benefit with a better understanding of other agencies program as well as a coordinated effort to address authority crossovers in hazardous chemicals in consumer products. Option 1: Interagency Consumer Products Workgroup reflects the Interdepartmental Team consensus.

Option 2: Interagency Workgroup - Sharing Compliance Resources for Consumer Protection melds the Interdepartmental Team's consensus as well as in some regard, a measure of confidence needed to ensure compliance to current hazardous chemical bans and restrictions are occurring.

However, Option 3 is recommended in that to develop a more effective system to protect consumers from hazardous chemicals in consumer products, more work is needed to develop an *efficient* model. Options 1 and 2 are stop gap measures. Option 3 builds on the current system of hazardous chemicals in consumer products with a limited scope of chemicals of concern and sets in place many of the components to build the system into a full scope envisioned in Option 4 for protecting consumers from chemicals of concern in products.

Attachment A
Key Element: Strengthening Consumer Protection Laws

Acknowledgements

On behalf of the Department of Toxic Substances Control and as the team leader for the California Green Chemistry Initiative Key Element - Strengthening Consumer Protection Laws, Gale Filter would like to thank the following individuals for their hard work in summarizing the consumer protection laws currently in place in California, discussing how our existing authorities operate and can be strengthened, conducting workshops, gathering ideas and comments from participants, and developing possible options for creating a new comprehensive and effective system to ensure consumer protection in California.

California Green Chemistry Initiative Key Element - Strengthening Consumer Protection Laws Team
(In alphabetical order)

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Erika Giorgi, Department of Toxic Substances Control
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Mark Rentz, Department of Pesticide Regulation
Robert Schlag, Department of Public Health
Ingeborg Small, Department of Public Health
Kristen Smeltzer, Department of Toxic Substances Control
Peter Wood, Department of Toxic Substances Control
Corey Yep, Department of Toxic Substances Control

Attachment B
Key Element: Strengthening Consumer Protection Laws

Consumer Questionnaire Response Summary

Question 1: To your knowledge, does the state of California regulate the following classes of consumer products: jewelry, toys, cosmetics, pesticides, drugs, product packaging, and aerosol products?

C.S.1: Responses were evenly spilt between agreeing and disagreeing with this question. However, several individuals were uncertain as to the extent consumer products were regulated in California.

Question 2: If you answered yes to "Question # 1," please indicate which classes of consumer products you are aware of and to your knowledge, please describe how the State regulates that particular product (Do you know why the State regulates that particular product?).

C.S.2: Those individuals that answered “yes” to question 1 generally lacked specific knowledge on what consumer products are regulated in California with the exception of pesticides and VOCs in aerosols.

Question 3: In your opinion, do California's consumer protection laws provide you with adequate protection from harmful products (or products that contain toxic chemicals)?

C.S.3: The general consensus answer to this question was “no.” One responder wrote, “No they do not. I am especially concerned about the piecemeal nature of the regulations - the time has come to stop worrying about one chemical at a time, and develop a comprehensive new chemical policy for the state that puts first priority on human health, that emphasizes creative solutions, and that we need to seriously consider cumulative impacts from multiple chemical exposure[s].”

Question 4: Do you agree or disagree that Californians need to be better informed about toxics in products? What are the three best ways to inform you about toxics in products?

C.S.4: The overwhelming majority of responders indicated that Californians need to be better informed about toxics in products. One responder wrote, “Yes - All people, not just Californians, need better information about toxics in products, including food, which is noticeably absent in your group above - possibly because it falls under the Federal and State Departments of Agriculture, where DTSC has not yet reached out, or overlapped into ....yet?” Another responder wrote, “Yes, I agree that we need to be better informed. Media and labeling are the two ways I would like to be

informed. Perhaps developing an eco-label that is certified by the state that products are free from XYZ categories of harmful chemicals?"

Question 5: Do you agree or disagree that California needs to restrict more chemicals and/or compounds in products?

C.S.5: The majority of responders agreed that California needs to restrict more chemicals and/or compounds in products. One responder wrote, "California needs to be more restrictive", while another indicated, "Yes, there should be restrictions on known hazardous chemicals in products, with a balanced approach of providing incentives to design and offer safer alternatives." Another responder wrote, "I disagree. The state over-regulates some toxics already, such as VOC's and under-regulates others, such as lead…."

Question 6: Do you agree or disagree that California lacks sufficient funding to adequately regulate toxics in consumer products?

C.S.6: A slight majority of responders agree that California lacks sufficient funding to adequately regulate toxics in consumer products. One responder wrote, "Absolutely agree CA lacks adequate funding and regrettably policymakers are swayed from best-practices and preventive public health by chemical, cosmetic, drug special interests and campaign contributions." However, a significant number of responders disagreed with this question. One responder indicated, "I do not agree that California lacks sufficient funding. Such funding can be obtained."

Question 7: In your view, who is ultimately responsible for the regulation of toxic chemicals in products?

C.S.7: There was no clear consensus response to this question. Several responders thought this issue was the sole responsibility of the federal government, while others felt it should be a cooperative effort between the appropriate federal and state public health agencies. One of the latter responders wrote," This should be a combined effort of the federal government and the states. But in the absence of federal leadership, CA has a responsibility to protect its communities and to send the right signals to the marketplace." Finally, a couple of responders felt that the manufacturers were ultimately responsible for the regulation of toxic chemicals in products. One wrote "Ultimately, the manufacturer responsible for placing the toxic in the products in the first place is responsible to regulate itself. The US government, the State governments, and local governments are responsible to prevent irresponsible manufacturers from polluting, injuring, maiming, and killing their citizens."

Question 8: What is the best way to get toxics out of products?

C.S.8: There was no consensus in any of the responses that were received. The responses varied from “Design and redesign safer alternatives.” to “Prohibit them in the first place.” However, one responder wrote “Education and regulation at the source (manufacturers) and at retailers by the Federal Government. A state by state approach will result in a patchwork of laws, confusion, higher product prices, limited availability of product choices and greater size of overall government than necessary to protect consumers.”

Question 9: As a consumer, who do you feel is most responsible for testing for toxics in products - retailers, distributors, manufacturers or the government?

C.S.9: The vast majority of responders identified manufacturers should be responsible for bearing the cost for product testing, but that the government should responsible for developing the test methods and conducting the testing.

Attachment C
Key Element: Strengthening Consumer Protection Laws

Responses to Consumer Questionnaire

QUESTION 1: To your knowledge, does the state of California regulate the following classes of consumer products: jewelry, toys, cosmetics, pesticides, drugs, product packaging, and aerosol products?	
Katie Maynard	jewelry, - no; toys, -no; cosmetics, - federal? FDA?; pesticides, -no; drugs, - yes; product packaging, -federal? FDA?; and aerosol products - federal?
pine@shocking	No or inadequately.
Susan Browne Rosenberg	No, these are all regulated Federally.
Fred Klammt	Yes. Additionally, cities and the Feds have other various regulations.
George Dearmin	Yes, pesticides have historically been regulated from formulation plant to ultimate consumer user within the jurisdiction of the U. S. E. P. A., the Department of Industrial Safety, and the Department of Pesticide Regulation in concert with the County Agricultural Commissioner's staffs and U. S. Fish and Wildlife and the Department of Fish and Game.
Colleen Hunt	I DO NOT KNOW.
Todd Wirdzek	Yes I believe there are regulations on most consumer products.
sleethn@alltech1.biz	Yes, however off-base in results (China Imports).
Barbara J. Massey	Yes.
Ken Forbes	Yes, some products, such as aerosols, are regulated by the state of California. Others are regulated at the Federal level.
Marilyn Johnson	To some degree, yes. Still more opportunity to do better, since we know that there are many products out there that are nasty.
Jo Rupert Behm, M.S., RN	Some of them. I am aware of fairly recent legislation to inform the public of presences of dangerous chemicals in cosmetics & other personal care products, but not aware of laws to prohibit known carcinogens, endocrine disruptors, etc. in these products. Yes, to regulation on pesticides [but not strict enough] Not aware of any protection/regulation on jewelry, product packaging, aerosol household products. Yes, to regulation on industrial aerosols, but not strict enough.
Carol Massey	No, I thought this was only done at the federal level.
Lena Brook	My understanding is that CA regulates some chemicals in some product categories but not comprehensively and often after a exposure occurs, not proactively.
Jen Jackson	Yes. However, it seems that some of these things might only have warning labels for Prop 65, but other than that many things get on the market without adequate screening.
Lynnette Renfer	NO.
QUESTION 2: If you answered yes to "Question # 1," please indicate which classes of consumer products you are aware of and to your knowledge, please describe how the State regulates that particular product (Do you know why the State regulates that particular	

product?).	
Katie Maynard	See answer to question 1.
pine@shocking	
Susan Browne Rosenberg	
Fred Klammt	Its way too complicated and way too many regs to remember! Here's what comes to my mind: Pesticides: Air spraying over ag workers not permitted, other various limitations. Drugs: various FDA approvals, etc. Toys: Mostly I remember the City of San Fran outlawing chemicals, lead, etc. Aerosol: Follows the Montreal Protocol, Feds on CFC's etc.
George Dearmin	Health, safety and product uniformity.
Colleen Hunt	
Todd Wirdzek	I don't know the specifics.
sleethn@alltech1.biz	All hazmat & prop 65 listed, only after is already within jurisdiction.
Barbara J. Massey	Pesticides, toys, cosmetics, jewelry, drugs, product packaging and aerosol - with the exception of cosmetics which are not really regulated except under prop. 65 if applicable, all of the other categories except product packaging are regulated for lead or other toxic substances and are subject to the regulations of the department of toxic substances or the California water board. Product packaging must not be misleading and in some cases must contain warnings of toxic substances- certain packaging such as bottles and cans are subject to certain charges and fees.
Ken Forbes	In aerosols, the VOC content is regulated to reduced ozone forming precursor emissions.
Marilyn Johnson	Pesticides are of course regulated, with restricted use, banned, etc. This is due to the hazard they present both in the short and long term. Drugs to my knowledge are regulated through the FDA requirements. Aerosol products are regulated, but I believe it is more on the safety side.
Jo Rupert Behm, M.S., RN	Know there is some regulation to toys, cosmetics, drugs, pesticides, and industrial aerosols, but have no idea of details.
Carol Massey	
Lena Brook	There is some regulation of lead in jewelry, and mercury in many consumer products; only notification for cosmetics; I believe drugs are regulated primarily by the FDA and drug disposal into water is a critical emerging issue. Pesticides are regulated by DPR, but that agency often sides with sprayers and agribusiness rather than consumers. I am not familiar with product packaging regulations.
Jen Jackson	Pesticides are regulated by CA DPR, aerosols by CARB. Cosmetics, drugs and toys seem to me to fall under federal FDA jurisdiction.
Lynnette Renfer	
QUESTION 3: In your opinion, do California's consumer protection laws provide you with adequate protection from harmful products (or products that contain toxic chemicals)?	
Katie Maynard	See answer before.

pine@shocking	No! Not only are unsafe items allowed for sale, even if I don't buy them my children are exposed to toxic heavy metal trinkets, automotive byproducts, chemicals of convenience (pesticides). I am aware of being surrounded by chemical drift, residue and exhaust.
Susan Browne Rosenberg	Yes.
Fred Klammt	No - not even close! Even the most basic measurement tools that state has available (incl. private labs) can't measure needed low thresholds.
George Dearmin	Only as long as the regulatory action is uniform and consistent.
Colleen Hunt	NO.
Todd Wirdzek	No.
sleethn@alltech1.biz	No.
Barbara J. Massey	No.
Ken Forbes	Yes. Any additional regulatory protections should be created at the Federal level to avoid barriers to trade and to form a consistent national policy.
Marilyn Johnson	Seemingly not, as there remain many products that are not inherently 'benign'.
Jo Rupert Behm, M.S., RN	Definitely not. Otherwise, we would not see such huge disproportion of illness [asthma, cancer] in poor, crowded communities and among specific classifications of workers [salon workers, farm workers, autobody/paint workers etc.]
Carol Massey	No.
Lena Brook	No they do not. I am especially concerned about the piecemeal nature of the regulations - the time has come to stop worrying about one chemical at a time, and develop a comprehensive new chemical policy for the state that puts first priority on human health, that emphasizes creative solutions, and that we need to seriously consider cumulative impacts from multiple chemical exposure.
Jen Jackson	Absolutely not. With 62,000 chemicals grandfathered in under TSCA, many chemicals have not been adequately tested or reviewed for toxicity, endocrine disruption or environmental safety.
Lynnette Renfer	NO.
QUESTION 4: Do you agree or disagree that Californians need to be better informed about toxics in products? What are the three best ways to inform you about toxics in products?	
Katie Maynard	Agree. 1. Labeling Requirements on the Packaging 2. Education of Children (because the children teach their parents) 3. Easily navigable websites
pine@shocking	Agree. Products should undergo rigorous testing prior to being released to consumers. CalEPA should have an online information site. Schools should educate citizens of the importance of avoiding toxic consumer items.
Susan Browne Rosenberg	We get plenty of information already from the CSPC.

Fred Klammt	AGREE - a difficult topic. Rather than overwhelming consumers with data + info; ID the worst top 10 and start informing on those. Ban the worse top 3 toxins altogether. Three Ideas: 1. A numerical value (or color) on each shelf product. 2. Leverage cell phone technology for numerical (safety) score. 3. Internet, commercials, etc. Leverage existing media outlets.
George Dearmin	Yes, (1) label information requirements (2) product testing and (3) toxics elimination standards.
Colleen Hunt	AGREE. INFORMATION DIRECTLY ON THE PRODUCT, ENVIRONMENTAL SCIENCE COURSE FOR HIGH SCHOOL STUDENTS, MAILING INFORMATION.
Todd Wirdzek	Disagree.
sleethn@alltech1.biz	Agree. Engage in outreach & public service announcement programs.
Barbara J. Massey	I agree. 1. Place the information IN LEGIBLE TYPE not 3pt type on product packaging. 2. News releases. 3. Community activities such as collection of products that contain toxic. Information alone is not sufficient. Neurotoxins in plastics, lead in lipstick and other toxics that are harmful and unnecessary should be banned.
Ken Forbes	Yes - All people, not just Californians, need better information about toxics in products, including food, which is noticeably absent in your group above - possibly because it falls under the Federal and State Departments of Agriculture, where DTSC has not yet reached out, or overlapped into ....yet?
Marilyn Johnson	I agree that information about products (not the regulations) is what is needed. Provide choices and allow consumers to make informed decisions.
Jo Rupert Behm, M.S., RN	1. Environmental safety tips in multiple languages that target specific segments & locations where they would be expected to be: 2. Parents in clinics, daycare centers
Carol Massey	Notices where chemicals exist, websites, email.
Lena Brook	Yes, I agree that we need to be better informed. Media, and labeling are the two ways I would like to be informed. Perhaps developing an eco-label that is certified by the state that products are free from XYZ categories of harmful chemicals?
Jen Jackson	Get products off the market that contain ingredients that harm human or environmental health. 2) Label products that may harm human or environmental health.
Lynnette Renfer	AGREE. PRESS: PRINT AND TELEVISION. PROFESSIONAL BOARDS: PHARMACY, MEDICAL ETC.
QUESTION 5: Do you agree or disagree that California needs to restrict more chemicals and/or compounds in products?	
Katie Maynard	Agree.

pine@shocking	
Susan Browne Rosenberg	Disagree.
Fred Klammt	AGREE.
George Dearmin	If it is done rationally, based on sound scientific basis, and truly represents a "real" hazard in normal use situations.
Colleen Hunt	AGREE
Todd Wirdzek	Disagree.
sleethn@alltech1.biz	Agree.
Barbara J. Massey	California needs to be more restrictive.
Ken Forbes	Disagree - with very few exceptions, such as lead, at the present time.
Marilyn Johnson	Yes, there should be restrictions on known hazardous chemicals in products, with a balanced approach of providing incentives to design and offer safer alternatives.
Jo Rupert Behm, M.S., RN	Absolutely agree.
Carol Massey	No, this should be done at the federal level.
Lena Brook	Agree! But also encourage development of SAFER alternatives
Jen Jackson	Yes. TSCA has not adequately screened chemicals. Only 4 have been removed from the approved list since the 70s!
Lynnette Renfer	AGREE.
QUESTION 6: Do you agree or disagree that California lacks sufficient funding to adequately regulate toxics in consumer products?	
Katie Maynard	Agree, though I think this should be a priority for the funding we do have.
pine@shocking	Agree.
Susan Browne Rosenberg	Agree.
Fred Klammt	Agree.
George Dearmin	I believe adequate funding exists; it just isn't being used for these issues.
Colleen Hunt	AGREE
Todd Wirdzek	Disagree.
sleethn@alltech1.biz	Disagree - we need to look at the front end.
Barbara J. Massey	I do not agree that California lacks sufficient funding. Such funding can be obtained.
Ken Forbes	I disagree. The state over-regulates some toxics already, such as VOC's and under-regulates others, such as lead. But then the question is should the state be doing this regulation of lead, or should the Feds? I see this Green Chemistry initiative, as being unveiled so far, as the genesis of another bureaucracy that should be pursued at the Federal level with state implementation through existing agencies.
Marilyn Johnson	I don't know.
Jo Rupert Behm, M.S., RN	Absolutely agree CA lacks adequate funding and regrettably policymakers are swayed from best-practices and preventive public health by chemical, cosmetic, drug special interests and campaign contributions.
Carol Massey	Not sure.

Lena Brook	Probably, but the chemical industry is vast in resources and benefits substantially from the lack of regulation. They should be expected to fund new programs in the future.
Jen Jackson	Probably. CA should enter into agreements with Canada and the EU to obtain data. In addition, CA could require producers/manufacturers to provide toxicity/risk studies that have been conducted by independent, authorized labs.
Lynnette Renfer	AGREE.
QUESTION 7: In your view, who is ultimately responsible for the regulation of toxic chemicals in products?	
Katie Maynard	Everyone. DTSC should be responsible for setting regulations.
pine@shocking	Cal and US EPA.
Susan Browne Rosenberg	The EPA, FDA and Ag Dept.
Fred Klammt	Manufacturers (management) + designers (scientists) of products
George Dearmin	The USEPA and CAL-EPA.
Colleen Hunt	FEDERAL GOVERNMENT.
Todd Wirdzek	Federal EPA, FDA, and other Federal agencies.
sleethn@alltech1.biz	Product manufacturer - with oversight by the regulatory community.
Barbara J. Massey	Ultimately, the manufacturer responsible for placing the toxic in the products in the first place is responsible to regulate itself. The US government, the State governments, and local governments are responsible to prevent irresponsible manufacturers from polluting, injuring, maiming, and killing their citizens.
Ken Forbes	The Federal Government.
Marilyn Johnson	Agencies responsible for the health of people and the environment.
Jo Rupert Behm, M.S., RN	
Carol Massey	The federal government.
Lena Brook	This should be a combined effort of the federal government and the states. But in the absence of federal leadership, CA has a responsibility to protect its communities and to send the right signals to the marketplace.
Jen Jackson	The federal government, but we won't get there without the states stepping up, making their own regs and then ultimately the feds adopting them.
Lynnette Renfer	FEDERAL GOVERNMENT AGENCIES TO ENSURE NATIONWIDE STANDARDS.
QUESTION 8: What is the best way to get toxics out of products?	
Katie Maynard	Education of future industry leaders - both undergraduates and graduates in College.
pine@shocking	Get industrialist out of Govt. (campaign contributors, lobbyists and appointees).
Susan Browne Rosenberg	Stop buying products from China.
Fred Klammt	Encourage market forces, not regulate (no command + control).

George Dearmin	Consistent, uniform, and meaningful regulation on all levels of product use (cradle to grave).
Colleen Hunt	RESEARCH ALTERNATIVES.
Todd Wirdzek	Offer better performing and economically feasible alternatives.
sleethn@alltech1.biz	Design in process, regulation of manufacturer use.
Barbara J. Massey	Prohibit them in the first place.
Ken Forbes	Education and regulation at the source (manufacturers) and at retailers by the Federal Government. A state by state approach will result in a patchwork of laws, confusion, higher product prices, limited availability of product choices and greater size of overall government than necessary to protect consumers.
Marilyn Johnson	Design and redesign safer alternatives.
Jo Rupert Behm, M.S., RN	
Carol Massey	Ban them.
Lena Brook	To make products that are safe!
Jen Jackson	Require independent screening of chemicals by authorized labs. Those that are found to be toxic, endocrine disrupting or environmental hazards should be initially labeled and then after a grace period, banned from use. The grace period gives producers/formulators time to find an alternative chemical. "New chemicals" should be screened prior to being allowed on the market.
Lynnette Renfer	RESEARCH TO FIND NON TOXIC ALTERNATIVES ALONG WITH GOVERNMENT REGULATION.
QUESTION 9: As a consumer, who do you feel is most responsible for testing for toxics in products - retailers, distributors, manufacturers or the government?	
Katie Maynard	Manufacturers in collaboration and with oversight from the government. Retailers and distributors should be responsible for knowing what is in their products and making sure the products were tested and are sustainably made.
pine@shocking	Manufacturers should pay, agencies should test.
Susan Browne Rosenberg	Manufacturers.
Fred Klammt	Independent 3rd parties, Government.
George Dearmin	Any other testing than Government's is potentially "tainted fruit".
Colleen Hunt	TO SOME DEGREE ALL HAVE A RESPONSIBLITY, BUT COST SHOULD COME FROM MANUFACTURER.
Todd Wirdzek	Manufacturers.
sleethn@alltech1.biz	Manufacturer. Government for enforcement activities.
Barbara J. Massey	Manufacturers and suppliers to the manufacturers and the government. One cannot be solely responsible.
Ken Forbes	Manufacturers primarily and the Federal Government secondarily.
Marilyn Johnson	Those who make the products should be responsible. The government can play an oversight role. If you come to my house for dinner, it is my responsibility that you have healthy food to eat that tastes good.
Jo Rupert Behm, M.S., RN	
Carol Massey	Manufacturers.
Lena Brook	Manufacturers and government should develop a testing program with an audit

	process. This should be done in conjunction with consumer advocacy groups.
Jen Jackson	Manufacturers.
Lynnette Renfer	ALL.

Attachment D
Key Element: Strengthening Consumer Protection Laws

Industry Questionnaire Response Summary

Question 1: Do you represent industry, government, or a non-governmental organization?

I.S.1: Responders included industry representatives, local government, various trade associations and a consultant.

Question 2: Do you agree that there are consumer exposure risk(s) associated with Chemicals of Concern in consumer products? If so, what entity/entities (e.g. industry, academia, federal and/or state agencies) is/are/should be responsible for identifying the risk(s)?

I.S.2: The majority of responders agreed that there is consumer exposure risk(s) associated with Chemicals of Concern in consumer products. However, there was no consensus regarding what entity/entities is/are/should be responsible for identifying the risk(s). Responses ranged from "All listed entities" to "Industry should identify the risks." However, one responder noted, "…regulatory programs must be quick to respond to new information and consumer interests, and regulators must address these concerns in a timely manner, in cooperation with stakeholders." Another responder indicated, "To analyze the associated risk with chemicals of concerns in consumer products, you must consider both the hazardous properties of a chemical and the likelihood of exposure to that chemical. " Finally, another responder wrote, "The manufacturers of formulated consumer products are in the best position to assess the consumer risk associated with exposure to a given product because they are most familiar with the composition, the intended use, the distribution and the level of knowledge and sophistication of the end user."

Question 3: Are you aware of any standards/permissible levels, established either in statute or regulation, for consumer products related to Chemicals of Concern? Are the standards voluntary or mandatory?

I.S.3: While the majority of the responders were aware of regulatory thresholds for certain Chemicals of Concern in consumer products, only one responder was aware of regulatory thresholds for several Chemicals of Concern. Several responders indicated that the existing standards were mandatory.

Question 4: In your opinion, do you think that the mandatory standards/permissible levels for chemicals of concern in consumer products are enforceable?

I.S.4: The majority of responders indicated that they believe that the mandatory standards/permissible levels for chemicals of concern in consumer products are enforceable. However, one responder noted, “Yes, but not enough enforcement staff and system is rigged against successfully regulating.” Another responder indicated, “Yes, provided enforcement is visible, is made public, and actually occurs.” Finally, a third responder stated, “Yes. Especially when exposure to infants, children and other sensitive group[s] are the recipients.”

Question 5: In your opinion, do you think that the established standards/permissible levels for chemicals of concern in consumer products are based on sound science and are tailored to the consumer exposure risk(s) that they may impose?

I.S.5: Not every responder answered this question. Those that did were evenly split between answering the question either “yes” or “no.” One responder wrote, “No, they have no basis in science, detection limits, production limits, existing ASTM or other material standards, or anything else as far as I can tell.” While another responder indicated, “Yes, to the extent practicable current standards and regulatory programs take into consideration consumer exposure risks…Therefore, any new program being considered by California, including and especially the Green Chemistry Initiative, must recognize that state-of-the-science is not static and must be robust enough to allow for the timely evaluation, and re-evaluation, of chemicals.” Finally, a third responder indicated, “In many cases, an established standard includes arbitrary safety factors, unrealistic worst-case assumptions or over simplified exposure scenarios.”

Question 6: From your perspective, is there an adequate enforcement and compliance infrastructure in place (e.g. staff, equipment, lab resources, funds, etc.) for the Chemicals of Concern in consumer products?

I.S.6: The majority of responders do not believe that there is an adequate enforcement and compliance infrastructure in place for the Chemicals of Concern in consumer products. One responder wrote,” However, I do NOT believe that there is adequate enforcement and compliance infrastructure in place for industrial products and therefore it is also probably true for consumer products.” Alternatively, a responder who answered “yes” to this question wrote, “Before additional enforcement mechanisms are developed for “chemicals of concern” the agencies should first fully understand their own regulatory authority and that of other jurisdictions, and work with those jurisdictions and the industry on clear guidance and communication of its regulatory objectives.”

Question 7: Does an education and outreach program exist (e.g. webpage(s), fact sheets, conferences, etc.) for the regulated industry? If so, do you believe the existing program is effective?

I.S.7: Most responders were aware of the existence of an education and outreach program for the regulated industry, but many went on to say that these efforts were either ineffective or under utilized. One responder wrote, “The education and outreach is available, but under utilized. “

Question 8: Does an education and outreach program exist (e.g. webpage(s), fact sheets, sample school curriculum, media events, press releases, etc.) for the public consumer? If so, do you believe the existing program is effective?

I.S.8: The majority of the responders that answered this question do not believe that there is an adequate education and outreach program for the public consumer. One responder wrote, “No. Most consumers are clueless.” Another responder indicated, “Only when there is a problem.”

Question 9: Do you think that a level playing field exists for Chemicals of Concern in consumer products? If yes, do you believe the standards/permissible levels for the Chemical of Concern are consistently applied to all uses/products?

I.S.9: The majority of responders do not believe that a level playing field exists for Chemicals of Concern in consumer products. One responder wrote, “No, I believe that is area that will come with much effort and maybe enforcement.” Another responder indicated, “Industry is regulated in an inconsistent and piecemeal approach regarding chemicals of concern in products.” Finally, a third responder noted, “All chemicals of concern and consumer products have regulatory oversight to ensure their safety. However, the intention for oversight has not always been exercised by regulatory agencies and, at times has been inconsistent.”

Question 10: Do you believe that the industry is regulated consistently regarding Chemicals of Concern in consumer products?

I.S.10: The vast majority of responders do not believe that the industry is regulated consistently regarding Chemicals of Concern in consumer products. One responder indicated, “There is no consistency, and no sense, and no way for industry or anyone else to plan. This is a general problem with US chemical policy, not just California chemical policy.” Another responder wrote,” No. I believe "the industry" is over-regulated with regard to VOC, aromatic and some chlorinated content in these products and under regulated with regard to lead and other toxic heavy metals of concern.”

Attachment E
Key Element: Strengthening Consumer Protection Laws

Responses to Industry Questionnaire

QUESTION 1: Do you represent industry, government, or a non-governmental organization?	
Michael Kirschner	Industry
Ken Forbes	Yes - Industry.
Jerry Munoz	I'm a government rep.
sleethn@alltech1.biz	Yes, consult for all.
All American Facility Services	Industry
IPC - Association Connecting Electronics Industries and the California Circuits Association (CCA)	IPC is a global trade association for the electronic interconnection industry, and represents more than 2,600 member companies around the world, including 347 in California. IPC members manufacture printed circuit boards and electronic assemblies, which are used in a variety of electronic devices including computers, cell phones, pacemakers, and sophisticated missile defense systems. The industry is vital to the U.S. economy, employing more than 350,000 people and exceeding $44 billion in sales. Although IPC members include electronic giants, sixty percent of IPC members meet the Small Business Administration's definition of "small business."
Smart Sonic - Bill Schreiber	We are a cleaning chemical supplier to the Printed Circuit Board Industry.
Consumer Specialty Products Association	CSPA is a national nonprofit trade association that represents approximately 250 companies engaged in the formulation, manufacture, distribution and sale of consumer, institutional and commercial products. CSPA member companies manufacture and market a wide range of products, including: cleaning products, disinfectants and sanitizers, candles and air care products, household pesticide products, automotive products used to clean and maintain vehicles, and polishes and floor maintenance products.
The Soap and Detergent Association	The Soap and Detergent Association is a 100 plus-member national trade association representing the formulators of soaps, detergents, and general cleaning products used in household, industrial, institutional and commercial settings, and the companies that supply ingredients and packaging for these products. Throughout our 82 year history, sound technical, risk-based research by SDA and its members has demonstrated the benefits of cleaning products and their ingredients, and our long-standing educational programs have provided consumers with credible information on the safe and proper use of these products. The cleaning products industry employs over 30,000 individuals across the United States with annual product shipments topping $17 billion.
Deborah Waite	Industry
QUESTION 2: Do you agree that there are consumer exposure risk(s) associated with Chemicals of Concern in consumer products? If so, what entity/entities (e.g. industry, academia, federal and/or state agencies) is/are/should be responsible for identifying the risk(s)?	

Michael Kirschner	Yes. Industry should identify the risks.
Ken Forbes	All listed entities, as well as general public input, should be responsible for risk identification.
Jerry Munoz	All listed in different responses the main are CalOSHA and Consumer Protection and DTSC.
sleethn@alltech1.biz	Industry ultimately responsible. State agencies will have to bear burden for identification & enforcement.
All American Facility Services	Yes, I agree. I see the risk associated with these chemicals every day. The use of chemicals that contain these hazardous agents are used in daily cleaning in almost all facilities I visit. In food mfg, our schools and daycares, in government procurement, our recreational facilities, and through out our commercial and industrial fields. I believe the risks have been identified and most end users take precaution. I think it's in the product makers realm of responsibility to disclose the agents in there chemicals but I am out there trying to educated business owners on the alternative products that work.
IPC - Association Connecting Electronics Industries and the California Circuits Association (CCA)	There may be the potential of consumer exposure associated with chemicals of concern in products. However, we caution DTSC against looking at only part of the picture, which can lead to inaccurate or misleading conclusions. The mere presence of a chemical of concern in a product does not mean that risk to human health or the environment is inevitable. To analyze the associated risk with chemicals of concerns in consumer products, you must consider both the hazardous properties of a chemical and the likelihood of exposure to that chemical.
Smart Sonic - Bill Schreiber	Yes, I agree that there are consumer exposure risks and potential environmental impacts associated with many cleaning chemicals used in various industrial applications.
Consumer Specialty Products Association	There are risks associated with all chemicals. State and federal programs have long sought to control these risks and we recognize that many consumers today have heightened concerns with certain chemicals based on new research and/or media attention. This does not necessarily mean all current regulatory structures are broken and should be abandoned for some new regulatory scheme. To the contrary, it highlights that regulatory programs must be quick to respond to new information and consumer interests, and regulators must address these concerns in a timely manner, in cooperation with stakeholders. As the consumer products industry develops and markets products it does so with the intent to meet or exceed safety requirements of all state and federal agencies in the United States and Canada charged with regulating those products, including the California Department of Pesticide Regulation, the California Air resources Board, and other state agencies, U.S. Consumer Product Safety Commission (CPSC), the U.S. Environmental Protection Agency (EPA), the Occupational Safety and Health Administration (OSHA), the U.S. Food and Drug Administration (FDA), Health Canada, and Environment Canada. All of these agencies have an important role on behalf of consumers, as does industry and academia. Industry has a role in developing the data to ensure the safety of ingredients and products and communicating that information to responsible interests, including consumers and regulators. State and federal agencies, with expertise in overall chemical management function share a role in evaluating use and exposure patterns in the context of overall chemical use (which can be information the individual company may not have). Academia is a beneficial resource; as it helps push the leading edge of scientific understanding to determine better methods to understand the fate and effects of chemicals in the marketplace and serve as a resource for the public good,

	and also for regulatory bodies and industrial sectors. Additional identification of risk can be done within this current scope of overlapping authority and should leverage the extensive risk-analysis that is done within each company before a product is brought to market.
The Soap and Detergent Association	SDA's members are committed to providing products that are safe andeffective when used as intended, and consumers have a right to expect thatthere will be no unacceptable risks associated with the products theypurchase. By and large, there are not unacceptable consumer exposure risksassociated with the "Chemicals of Concern" however, the list is ill-definedas several categories included are quite broad and it is unclear whatindividual chemicals may be included (halogens? other aromatichydrocarbons? VOCs?). There are a number of state and Federal agencieswith responsibilities for identifying risks associated with products andchemicals, and taking regulatory action when risks are unacceptable. Inmany cases, industry works with Federal or state agencies in developing theassessment of risk for a particular chemical use or exposure.The manufacturers of formulated consumer products are in the best positionto assess the consumer risk associated with exposure to a given productbecause they are most familiar with the composition, the intended use, thedistribution and the level of knowledge and sophistication of the end user.
Deborah Waite	This appears to be a leading question intended to elicit a pre-determined response. That said, I feel, that in today's litigious society, even the worst companies are smart enough to use only well studied chemicals. The manufacturers are responsible for the safety of products they put on the market. I am quite confident that academia will continue to study this area given the public interest continually being generated. Therefore, it is not a good use of resources to have the state government agencies involved, especially given the over-burdened state budget.
QUESTION 3: Are you aware of any standards/permissible levels, established either in statute or regulation, for consumer products related to Chemicals of Concern? Are the standards voluntary or mandatory?	
Michael Kirschner	Mandatory standards: California Electronic Waste Recycling Act specifies permissible levels in homogeneous levels for 4 heavy metals in certain electronics. AB1109, passed last year, likewise does in lighting.
Ken Forbes	I am aware of standard and permissible levels, specifically of VOC content as well as limits other chemical content in consumer products. Levels of VOC in many Consumer Products are mandatory. Others may not, or should not, yet be regulated.
Jerry Munoz	No, not aware.
sleethn@alltech1.biz	Yes. Mandatory - But prop 65 & CEQA need to be updated at the least.
All American Facility Services	It is common for products to be flammable or to contain warnings like, use in venalated areas. Safe handling of these products in voluntary but the warnings are mandatory.

IPC - Association Connecting Electronics Industries and the California Circuits Association (CCA)	Since US EPA is already engaged in a trilateral agreement between Canada, the U.S. and Mexico to assess and manage chemicals, EPA should be responsible for identifying any risks associated with chemicals of concern. Under ChAMP (Chemical Assessment and Management Program), EPA will screen, prioritize, and assess nearly all chemicals in U.S. commerce. EPA will develop hazard characterizations, risk characterizations, and risk-based decisions on how to manage these chemicals. EPA has already committed a significant amount of resources to meeting its ChAMP commitments. DTSC cannot justify expending the limited funding available to California to duplicate efforts already undertaken by the U.S. government. We are concerned that California's Green Chemistry Initiative could undermine the existing ChAMP Program.
Smart Sonic - Bill Schreiber	The South Coast AirQuality Management District (SCAQMD) has established the Clean Air Solventprogram to determine the presence and/or quantities of many hazardouschemicals such as VOCs. The main problem with this program is that it onlyevaluates the virgin product and does not evaluate the cleaning applicationfor hazardous substances or environmental impact. For example, if achemical is certified as a "Clean Air Solvent" and that chemical is used toclean solder paste containing poisonous lead and other heavy metals, thecleaning process becomes hazardous and the waste stream becomes hazardousand environmentally problematic.The EPA has the Environmental Technology Verification (ETV) Program which isexcellent, but under funded. The ETV evaluates complete processes from thevirgin chemical to the waste stream.
Consumer Specialty Products Association	All of the stipulated "chemicals of concern" (lead, mercury, cadmium, hexavalent chromium, antimony, arsenic, selenium, barium, halogens and other aromatic hydrocarbons, pesticides, PCBs, and VOCs) are regulated at some level. Specifically, these chemicals are regulated for exposure by U.S. Consumer Product Safety Commission (CPSC), the U.S. Environmental Protection Agency (EPA), the Occupational Safety and Health Administration (OSHA), and the California Department of Pesticide Regulation. Standards and permissible exposure limits exist for nearly all of these chemicals based upon their presence in specific product categories. Permissible Exposure Levels (PELs) are occupational standards developed for workplace exposures and, for the most part, not applicable to most consumer products sold at retail for household use. Other regulatory standards deal with consumer products sold at retail (e.g., CPSC, EPA, etc.). No standards, expressed in regulatory statutes, are voluntary in the sense that they can be ignored. For example the U.S. Department of Agriculture sets standards for the presence of arsenic in foods; while the U.S. EPA set standards for the presence of arsenic in drinking water. Likewise, the CPSC regulates and sets standards for the presence of lead in toys, OSHA sets standards for lead in products used by workers, and U.S. EPA sets standards for the presence of lead in drinking water and other products. Violations are subject to enforcement actions of the agency. Below is a summary listing of the relevant agencies that regulate the specified "chemicals of concern". **Lead** – U.S. EPA regulates environmental lead through seven principal statutes; TSCA, RCRA, the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), CAA, the Clean Water Act (CWA), SDWA and the Emergency Planning and Community Right to Know Act (EPCRA). **Mercury** – U.S. EPA regulates mercury under the Clean Air Act, Clean Water Act, and Resource Conservation and Recovery Act, EPA has the

	responsibility to develop regulations to control some mercury emissions to air, water, or from wastes and products. **Cadmium** - U.S. EPA regulates cadmium under the Safe Drinking Water Act, which requires EPA to determine safe levels of chemicals in drinking water which do or may cause health problems. **Hexavalent chromium** - The Occupational Safety and Health Administration (OSHA) regulates hexavalent chromium for workplaces and requires sets permissible exposure limits for workplaces. All industries must comply with the permissible exposure limit of 5 micrograms of hexavalent chromium per cubic meter of air (5 [micro]g/m3) for an 8-hour TWA. **Antimony** - U.S. EPA regulates antimony under the Safe Drinking Water Act, which requires EPA to determine safe levels of chemicals in drinking water which do or may cause health problems. **Arsenic** - U.S. EPA regulates arsenic under the Safe Drinking Water Act, which requires EPA to determine safe levels of chemicals in drinking water which do or may cause health problems. **Selenium** - U.S. EPA regulates selenium under the Safe Drinking Water Act, which requires EPA to determine safe levels of chemicals in drinking water which do or may cause health problems. The U.S. Food and Drug Administration also regulates selenium under the Agriculture, Rural Development, FDA, and Related Agencies Appropriations Act of 1994 and the Federal Crop Insurance Reform and Department of Agriculture Reorganization Act of 1994 and sets standards for the use of selenium in agricultural products and livestock supplements. **Barium** - U.S. EPA regulates barium under the Safe Drinking Water Act, which requires EPA to determine safe levels of chemicals in drinking water which do or may cause health problems. **Halogens and other aromatic hydrocarbons** – The California Air Resources Board regulates the emissions of aromatic hydrocarbons from various sources. **Pesticides** – regulated and registered by U.S. EPA, the California Department of Pesticide Regulation, and pesticide regulatory agencies in all 50-states. **PCBs** - U.S. EPA regulates PCBs under the Toxic Substances Control Act (TSCA). TSCA bans the manufacture, processing, use and distribution in commerce of PCBs. TSCA gives EPA the authority to develop, implement and enforce regulations concerning the use, manufacture, cleanup and disposal of PCBs. **VOCs** – Regulated by the California Air Resources Board, U.S. EPA, and more than 13 states in the East Coast and the Midwest

The Soap and Detergent Association	For VOCs, the California Air Resources Board has been developing mandatory standards for VOCs in consumer products for more than a decade. The U.S. EPA Office of Pesticide Programs (OPP) is responsible for determining the acceptable pesticide residues on foods under the Federal Food Drug and Cosmetic Act (FFDCA); those residue levels are mandatory. EPA OPP and the California Department of Pesticide Regulation may regulate the level and use of pesticides in pesticide products. Metal residue limits (e.g., lead, arsenic, mercury) are common for food additives and color additives regulated by the U.S. Food and Drug Administration under FFDCA.
Deborah Waite	I note that you have the term "Chemicals of Concern" capitalized. I think it would be very helpful to include a definition of this term in future mailings seeking input. For the record, my answers to this questionaire are based on what I am guessing you mean by "Chemicals of Concern." California Prop 65 is the strictest standard in the world for regulating carcinogens and reproductive toxins in all products, consumer or otherwise. I feel Prop 65 provides Californians with the best regulatory scheme available anywhere in the world and that it is adequate to address consumer concerns.
QUESTION 4: In your opinion, do you think that the mandatory standards/permissible levels for Chemicals of Concern in consumer products are enforceable?	
Michael Kirschner	Yes, provided enforcement is visible, is made public, and actually occurs. There are methods for both grossly and accurately determining concentration levels of certain elements and substances in products.
Ken Forbes	Maybe - Random sampling and testing of products goes far to assist enforcement. Audit of suppliers of high risk products will also help.
Jerry Munoz	Yes. Especially when exposure to infants, children and other sensitive group are the recipients.
sleethn@alltech1.biz	Yes, but not enough enforcement staff and system is rigged against successfully regulating.
All American Facility Services	Yes.
IPC - Association Connecting Electronics Industries and the California Circuits Association (CCA)	The European Union RoHS banned the use of lead, cadmium, mercury, hexavalent chromium and both polybrominated biphenyl (PBB) and polybrominated diphenyl ether (PBDE) flame retardants in electrical and electronic equipment as of July 1, 2006. Shortly afterwards, California followed suit with its own law (California RoHS) modeled after the EU. The EU's decision to restrict these chemicals was not based on a complete examination of risk, but instead was based solely on the potential hazards of lead. The exposure element of a risk analysis was never studied. In order to determine risk, both the hazard and exposure of a chemical must be taken into account. In addition to failing to conduct a risk analysis, the EU also failed to conduct a life-cycle assessment of the health and environmental effects of the potential substitutes. As a result, while enormous costs were incurred, the public did not realize any net environmental or human health benefit from the regulation. Review of the U.S. Environmental Protection Agency (EPA) Lead-Free Solder project illuminates the environmental trade-offs inherent in material substitutions and the benefits of conducting life-cycle analysis. The study evaluated the environmental impacts of tin-lead solder versus lead-free

	alternative solders. Because tin-silver-copper solder in electronics requires higher processing temperatures than tin-lead solder tens of thousands of solder machines worldwide now operate at higher temperature. The higher operating temperatures required for the manufacture of lead-free electronics has resulted in significantly higher energy usage during manufacturing. The increased energy use associated with manufacturing lead-free electronics was projected by the study to cause higher air pollution, acid rain, stream eutrophication, and global warming impacts than the tin-lead soldered electronics. EPA's study serves as an important reminder that there are environmental trade-offs when substituting one substance for another.
Smart Sonic - Bill Schreiber	If not enforceable, the chemical levels should be, at least, documented and published in a form that the everyday user can understand. For example, it is not currently required to disclose VOC content on a Material Safety Data Sheet (MSDS). Only "Vapor Pressure" is required. Yet, the media and regulating agencies continue to refer to the hazards of "VOCs". Most chemical users are not familiar with the association or conversion of "Vapor Pressure" to "VOCs" and therefore often think that if VOCs are not disclosed in the MSDS, the chemical must be VOC-free. Many chemical manufacturers rely on this ignorance and market their VOC-containing chemicals as "environmentally friendly". VOCs and other substances of concern should be disclosed on the MSDS and product containers.
Consumer Specialty Products Association	Yes, by definition regulatory standards and permissible exposure limits have the force of law and can be enforced by the relevant agency or legal proceedings. We are unaware of a mandatory standard that that is not enforceable.
The Soap and Detergent Association	Mandatory standards are absolutely enforceable.
Deborah Waite	Yes. Very much so.
QUESTION 5: In your opinion, do you think that the established standards/permissible levels for chemicals of concern in consumer products are based on sound science and are tailored to the consumer exposure risk(s) that they may impose?	
Michael Kirschner	No, they have no basis in science, detection limits, production limits, existing ASTM or other material standards, or anything else as far as I can tell.
Ken Forbes	No. VOC regulation of automotive aerosol cleaners and similar non-aerosol cleaners are mandated ridiculously low limits for the extremely small contribution of all greenhouse gas emissions in California and VOC regulation of consumer products in general is more politically motivated than science based. The proposed alternative water-based, "green" cleaners are NOT as effective in removing oils and greases despite some studies, such as the uncontrolled Wolf report that states to the contrary.
Jerry Munoz	No comment.
sleethn@alltech1.biz	Sound science, though outdated and permissible risk is often left to the eye of the interested party.
All American Facility Services	I do but science has come a long way since these products were introduced in the market place. The consumer exposure to risk no longer has to exist in most areas of concern.

IPC - Association Connecting Electronics Industries and the California Circuits Association (CCA)	It is very difficult, costly and resource-intensive to develop the test data necessary for enforcement of chemicals of concern in products. We are concerned that the DTSC may use X-ray fluorescence spectroscopy (XRF) as an inexpensive alternative to appropriate testing. It is important to note that the XRF is merely a screening tool and does not produce reliable test results suitable for enforcement action. These devices can produce false positives when testing materials for banned substances and cannot discern critical differences between similar substances. Due to the high cost and resources necessary to conduct testing for chemicals of concern in products, we believe that enforcement may be very challenging.
Smart Sonic - Bill Schreiber	My company only deals with industrial products.
Consumer Specialty Products Association	Yes, to the extent practicable current standards and regulatory programs take into consideration consumer exposure risks In some instances standards need to provide flexible controls based on new data and scientific method advancements to assess risk and hazard; but the limiting factor is often resourcing constraints within the regulatory agencies themselves to maintain currency. Therefore, any new program being considered by California, including and especially the Green Chemistry Initiative, must recognize that state-of-the-science is not static and must be robust enough to allow for the timely evaluation, and re-evaluation, of chemicals.
The Soap and Detergent Association	In many cases, an established standard includes arbitrary safety factors, unrealistic worst-case assumptions or over simplified exposure scenarios. The Soap and Detergent Association has developed a publication entitled Exposure and Risk Screening Methods for Consumer Product Ingredients which presents methodologies and specific consumer exposure information that can be used for screening-level risk assessments of environmental and repeated human exposures to High Production Volume (HPV) chemicals. Many of these chemicals are utilized through the manufacturing and use of consumer products, mainly laundry, cleaning, and personal care products. The intended audience of this document is chemical risk assessors within governmental agencies, businesses and stakeholder groups who have some experience in the area of consumer products exposure and risk assessment and have responsibility for prioritizing chemical safety reviews of substances. This document will also be useful for assessors involved in chemical risk management work as a tool to improve the efficiency of resource utilization. This document (available in Adobe Acrobat format) can be downloaded at: http://www.cleaning101.com
Deborah Waite	Yes.
QUESTION 6: From your perspective, is there an adequate enforcement and compliance infrastructure in place (e.g. staff, equipment, lab resources, funds, etc.) for the Chemicals of Concern in consumer products?	
Michael Kirschner	No.
Ken Forbes	No. Set up the labs but keep the mid and high level administration low. How many levels of bureaucracy do we need? Very little. A product either exceeds a set limit or it doesn't. Period. We don't need SCAQMD size and scope for this program.
Jerry Munoz	The infrastructure is there for industrial and commercial facilities but not for the retail end.
sleethn@alltech1.biz	No.

All American Facility Services	Yes, I think the EPA and OSHA are doing a wonderful job educating and getting the word out to consumers and purchasers on the hazards of using and storing these chemicals.
IPC - Association Connecting Electronics Industries and the California Circuits Association (CCA)	To put it simply, hazard does not equal risk. We emphasize the importance of risk-based decision-making when evaluating chemicals of concern in consumer products. Too often government has succumbed to unfounded public fears about chemicals and produced regulations like California RoHS, which have questionable benefits. We urge establishment of risk-based standards that are protective of the human health and the environment. In a chemical risk analysis, risk is seen as a function of the intrinsic hazards possessed by the chemical and the likelihood to which someone or something could be exposed to those hazards. This is one of the most important concepts to remember when discussing chemical safety. Even if a chemical has hazardous properties, that does not mean it is likely to cause harm when used in a product because exposure is unlikely. We urge DTSC to follow a scientific risk-based approach for any chemical regulation.
Smart Sonic - Bill Schreiber	My company only deals with industrial products. However, I do NOT believe that there is adequate enforcement and compliance infrastructure in place for industrial products and therefore it is also probably true for consumer products.
Consumer Specialty Products Association	Yes. Before additional enforcement mechanisms are developed for "chemicals of concern" the agencies should first fully understand their own regulatory authority and that of other jurisdictions, and work with those jurisdictions and the industry on clear guidance and communication of its regulatory objectives.
The Soap and Detergent Association	Yes.
Deborah Waite	No. But California's budget won't allow more.
QUESTION 7: Does an education and outreach program exist (e.g. webpage(s), fact sheets, conferences, etc.) for the regulated industry? If so, do you believe the existing program is effective?	
Michael Kirschner	The EWRA has a web page, listserv, meetings, etc. which seem to be adequate.
Ken Forbes	Yes there is an education and outreach program for those regulated. No I don't think it is effective. Very little information is ever obtained by me or my company in California from agency websites and fact sheets put out for industry. This is wasted dollars in my opinion.
Jerry Munoz	Not aware.
sleethn@alltech1.biz	No, and no.
All American Facility Services	I do believe that our regulated industry does try to educate the end user on health and safety. Education is an effective tool in exposing the risks associated with these products.
IPC - Association Connecting Electronics Industries and the California Circuits Association (CCA)	Due to the prohibitively expensive testing costs and manpower necessary for enforcement of chemicals of concern, we are concerned that there is inadequate enforcement and compliance infrastructure in place in California.

Smart Sonic - Bill Schreiber	The education and outreach is available, but under utilized. It would be very easy for every manufacture to post answers to a standard list of questions provided by the DTSC. Such as: Does this product contain VOCs? Does this product contain mercury? Etc
Consumer Specialty Products Association	For many chemicals and products, there are adequate resources for industry to determine how to comply and exceed standard; but particularly for small businesses additional resources may be needed to provide uniformity in communicating how to comply with standards across different levels of government (i.e. international, national, state, and local) . Communication of consumer safety information is also increasingly an objective of most companies so providing consistent information relative to identified chemicals and products is probably a mutually agreeable objective of both government and industry.
The Soap and Detergent Association	Most Federal regulatory programs have a substantial amount of guidance associated with achieving compliance by industry. These programs and activities are most effective for larger companies; however, compliance is often difficult for small businesses that do not have a large staff let alone specialists in regulatory affairs. Similarly, small companies may have the most difficulty in achieving regulatory compliance. Existing government outreach programs are for the most part effective, but additional assistance for small businesses to achieve compliance would improve products and reduce risks.
Deborah Waite	Yes - the education and outreach programs are extensive and, I believe, effective for those who choose to utilize them.
QUESTION 8: Does an education and outreach program exist (e.g. webpage(s), fact sheets, sample school curriculum, media events, press releases, etc.) for the public consumer? If so, do you believe the existing program is effective?	
Michael Kirschner	No. Most consumers are clueless.
Ken Forbes	Yes - also wasted dollars in my opinion. Stay out of the media and schools with green propaganda that often times is slanted against responsible industry, overly conservative in nature and unscientific in content. The role of government in education at this level should be extremely limited.
Jerry Munoz	Only when there is a problem.
sleethn@alltech1.biz	No, and no.
All American Facility Services	It helps the consumer take precaution when using the products and that is effective in preventing injury. But why use a product like that at all?
IPC - Association Connecting Electronics Industries and the California Circuits Association (CCA)	The California Legislature has increasingly sought to address public concerns and fears about the environmental and human health impact of consumer products through legislation and regulation. Often the driver behind these legislative and regulatory initiatives is not science or rational analysis. A public outreach campaign is critical to inform the general public about the difference between hazard and risk. The outreach campaign should emphasize the fact that hazard does not equal risk. The likelihood of exposure to those hazards is an important component of risk that must be conveyed to the public. By educating the public, the government can allay fears on chemicals in products without passing unnecessary regulations. An educated public can then support legislation focused on the chemicals that pose a genuine risk to the environment or human health.
Smart Sonic - Bill Schreiber	See number 7

Consumer Specialty Products Association	Yes, nearly all industries have information related to education and outreach for their products. CSPA has developed consumer education websites and campaigns discussing the appropriate use, storage and disposal of our members' products. Please see: o Pest Management Products: http://www.aboutbugs.com o Air Care Products: http://www.aboutaircare.com o Aerosols Packaged Products: http://www.aboutaerosols.com o Antimicrobial Products: http://www.aboutgerms.com o Cleaning Products: http://www.aboutcleaningproducts.com o Discussion of the need for valid science in policy discussions: http://www.validscience.com
The Soap and Detergent Association	There are a lot of materials available from regulatory agencies, but it requires consumers to be engaged and to seek out particular programs. Government agencies typically do not have large budgets to publicize their programs. Similarly, there are sector-specific and product-specific education and outreach programs sponsored by industry and individual companies. For example, The Soap and Detergent Association has education and outreach programs dealing with hand hygiene, the proper use of cleaning products, the environmental safety of cleaning product chemicals, product stewardship and the like which are available on our website (http://www.cleaning101.com).
Deborah Waite	Yes - education and outreach programs do exist. I believe they are becoming more and more effective as consumers become more internet savvy.
QUESTION 9: Do you think that a level playing field exists for Chemicals of Concern in consumer products? If yes, do you believe the standards/permissible levels for the Chemical of Concern are consistently applied to all uses/products?	
Michael Kirschner	No. Chemicals of concern are picked based on whichever legislation gets passed, not on an analysis of merit, impact, or degree of problem.
Ken Forbes	No. The government and NGO so-called environmental interest group have far to much input and authority. No standards and levels are not consistently applied.
Jerry Munoz	No, I believe that is area that will come with much effort and maybe enforcement.
sleethn@alltech1.biz	No, and no.
All American Facility Services	Yes, I believe the manufactures of these products test and apply the industry standards.
IPC - Association Connecting Electronics Industries and the California Circuits Association (CCA)	Industry is regulated in an inconsistent and piecemeal approach regarding chemicals of concern in products. Regulation is rarely based on science or a risk evaluation. Legislators usually succumb to unfounded public fears instead of scientific data when passing laws to ban chemicals. Sound science and an approach that evaluates risks versus benefits should form the foundation for any regulatory structure adopted by California. The process must also give due consideration to the economic and societal needs of all Californians while also leaving California businesses the flexibility to implement innovative, cost-effective solutions that promote business objectives.
Smart Sonic - Bill Schreiber	No, for industrial products and therefore probably no for consumer products.

Consumer Specialty Products Association	Clarification is needed on this question. All chemicals of concern and consumer products have regulatory oversight to ensure their safety. However, the intention for oversight has not always been exercised by regulatory agencies and, at times has been inconsistent. However it is important to note that our industry does not ignore laws because they believe them to be insufficient or not enforceable and we follow and exceed all laws and regulations. Additionally our industry bases its use of ingredients on the preponderance of scientific safety data.
The Soap and Detergent Association	SDA believes there is a “level playing” field when it comes to the regulation of Chemicals of Concern in consumer product however we also see criticism against certain chemicals by activists without any scientific basis for that criticism. We are concerned that the bias of activists may influence regulators to make poor decisions regarding chemicals management.
Deborah Waite	This appears to be another leading question seeking a pre-determined answer. I do not understand what you mean by "level playing field", but it seems to infer that it isn't. I believe the standards/permissible levels are consistently applied under the Prop 65 infrastructure.
QUESTION 10: Do you believe that the industry is regulated consistently regarding Chemicals of Concern in consumer products?	
Michael Kirschner	No; there is no evidence that any sort of pareto analysis has been done to identify the most egregious problems, nor those that would have the biggest positive impact if addressed. What is addressed is based on the hot topic of the day and what legislation passes. There is no consistency, and no sense, and no way for industry or anyone else to plan. This is a general problem with US chemical policy, not just California chemical policy.
Ken Forbes	No. I believe "the industry" is over-regulated with regard to VOC, aromatic and some chlorinated content in these products and under regulated with regard to lead and other toxic heavy metals of concern.
Jerry Munoz	No, I believe that is area that will come with much effort and maybe enforcement.
sleethn@alltech1.biz	No.
All American Facility Services	Yes.
IPC - Association Connecting Electronics Industries and the California Circuits Association (CCA)	
Smart Sonic - Bill Schreiber	No.
Consumer Specialty Products Association	Federal, state, and local agencies have clear oversight authority for chemicals of concern in various phases of their life-cycle; however, this authority may not always be consistently applied. Before additional regulatory mechanisms are developed for “chemicals of concern” agencies should first fully understand how to leverage their own regulatory authority and that of other jurisdictions, and work with those jurisdictions and the industry on advancing consistent regulatory objectives.

The Soap and Detergent Association	SDA's concern is not that the Chemicals of Concern are regulated consistently, but that they are regulated appropriately based on the risks they pose to consumers as a function of their hazard profile, use and level of exposure. Risks should be minimized, but risk reduction should not occur without consideration of beneficial uses and costs associated with minimization. Risk reduction should not occur to the point of diminishing return.
Deborah Waite	Yes I do.

Attachment F
Key Element: Strengthening Consumer Protection Laws

Foundational Questionnaire Response Summary

Question 1: How big should the regulated universe be? All consumer products or only those that contain chemicals of concern?

F.S.1: The majority of responders indicated that the regulated universe should be confined to only those products that contain chemicals of concern. One responder wrote, “The regulated universe for consumer product regulation in this Green Chemistry initiative with the California DTSC should be only for those products that contain chemicals of concern. Other products can be regulated if additional chemicals of concern are added to the existing list or if other products are suspected of containing existing chemicals of concern. It is only reasonable to start this project with a limited scope because all consumer products do not need regulating of chemical content.” Another responder wrote, “Anything that will limit the potentially negative economic impact would be welcome. Therefore, I think that limiting the scope is good, but the problem then remains of identifying what will be examined - or from the perspective of the manufacturer/user, whose ox is gored.”

Question 2: What attributes would make the current system more effective? Please provide your perspective on:

- Increased consumer awareness of existing laws?
- Enhanced enforcement authority?
- Improved coordination among existing consumer protection agencies?

F.S.2: A slight majority of responders indicated that increased consumer awareness of existing laws would make the current system more effective. One responder indicated, “This should help. After all, people are not dropping down dead left and right currently, but education should be education and not propaganda or alarming data that people might take out of context and be overly concerned about.” Another responder wrote, “Increased consumer awareness of existing laws? It is not consumer awareness regarding the laws - it is consumer awareness around what is in products. Focus on the market drivers.”

There was no clear consensus response to whether enhanced enforcement authority would make the current system more effective. The responders who answered this question were generally split on this issue. One responder wrote, “Begs the questions; why is it not enforced now?” Another responder wrote, “For more problematic chemicals and products enforcement is necessary to give any law 'teeth'. If there is a law, there

should be adequate resources to ensure it is followed. Market incentives are preferable."

Question 3: If we were to develop a new regulatory model, what would it consist of? How to target Education and Outreach for:

- Consumer?
- Industry?

What kind of Enforcement Tools?

. Should the Framework be flexible to add additional:

- Products?
- Standards for hazardous products in commerce?
- Specific regulatory thresholds for each product?
- Have a single consumer product compliance and enforcement agency?

F.S.3: The responders were in general agreement for the need to target the consumer and industry for better education and outreach. One wrote, "A great need for usable information about toxics. Restricting chemicals is very difficult and subject numerous scientific ad legal challenges. If the information on chemicals of concern and alternatives can be presented to consumer in the products for which the consumer recognizes, I expect they will drive the market."

Only a few responders addressed the question concerning enforcement tools. One responder wrote, "Incentives for early responders/leaders in the market. Marketing recognition might be a significant 'carrot'. Let consumers 'vote' with their wallets/purses." Another responder indicated, "…product bans and, if necessary, chemical bans with penalties…" A third responder wrote, "And if it is not enforced now, how will additional regulations serve to diminish that situation." Lastly, another responder indicated, "Make sure that what is on the books now is working adequately, before multiplication of more laws/regulations/bureaucracy."

The questions regarding the flexibility of a new regulatory framework were only directly addressed by a few responders. However, those that did answer all the questions generally responded in the affirmative. One responder wrote:

- Products? Yes absolutely.
- Standards for hazardous products in commerce? Yes, absolutely.
- Specific regulatory thresholds for each product? Everything should be relative and with incentive and drivers to continually improve. Thresholds set today can be outdated tomorrow, and changing the laws are onerous and resource depleting. A more 'active' or 'alive' system should be used in today's dynamic world.

Another responder indicated:

- Products? Important that we do not stifle innovation through increases in product development costs, thereby depriving consumers more efficacious, lower-cost alternatives.
- Standards for hazardous products in commerce? We have watchdogs in place for shipment, labeling, etc. Ensure that they have the resources to do their job adequately.
- Specific regulatory thresholds for each product? A multiplicity of laws/regulations will be burdensome to manufacturers/distributors; will likely contribute to sensory overload to the consumers (thereby lowering his/her attention to specific products with higher risk). Many consumers do not read the product labels now provided."

The majority of responders either agreed, or were not opposed, to the concept of a single consumer product compliance and enforcement agency. One responder wrote "Any new regulatory model would need to replace existing agencies, rather than be in addition to. Another responder indicated "If that makes sense and is necessary."

Attachment G
Key Element: Strengthening Consumer Protection Laws

Responses to Consumer Protection Foundational Questions

QUESTION 1: How big should the regulated universe be? All consumer products or only those that contain chemicals of concern?	
Todd Wirdzek	Nationwide rather than state by state. Only chemicals of concern.
buczekm@aol.com	Chemicals of Concern - but how to define
Ken Forbes	The regulated universe for consumer product regulation in this Green Chemistry initiative with the California DTSC should be only for those products that contain chemicals of concern. Other products can be regulated if additional chemicals of concern are added to the existing list or if other products are suspected of containing existing chemicals of concern. It is only reasonable to start this project with a limited scope because all consumer products do not need regulating of chemical content. Therefore in this instance, as with most regulation in general, a limited approach by government from the beginning makes the most sense. It is extremely difficult to reduce government reach once sweeping authority is granted. Such authority is not necessary here and would add excessive cost and unwarranted size to the proposed program.
Bob Davenport	Anything that will limit the potentially negative economic impact would be welcome. Therefore, I think that limiting the scope is good, but the problem then remains of identifying what will be examined - or from the perspective of the manufacturer/user, whose ox is gored.
Maria Peeler	All consumer products should be regulated, and the criteria should include characteristics of the materials, so nanomaterials are included under the context of reactivity and other characteristics which you do not match that of the same chemicals(s) in the bulk.
Cayce Warf	Prioritize chemicals of concern by (risk x exposure) criterion
Marilyn Johnson	Due to the changing nature of information and products, there should be a base level of requirement for all products, and a tiered approach as the level of concern increases. Innovation towards more benign design should be rewarded, and provided incentives. Less regulation for more benign products and increased regulation for more problematic chemicals. This will drive innovation and the market will begin to prefer benign.
Carol Massey	Only those that contain chemicals of concern.
Deborah Waite	The regulated universe should be determined by Prop 65 and/or CARB.
Question 2: What attributes would make the current system more effective? Please provide your perspective on: - Increased consumer awareness of existing laws? - Enhanced enforcement authority? - Improved coordination among existing consumer protection agencies?	
Todd Wirdzek	Yes. Yes. Yes.
buczekm@aol.com	Accountability by the importer of record AND the retailer, either or both can be fined as appropriate

Ken Forbes	
Bob Davenport	This should help. After all, people are not dropping down dead left and right currently, but education should be education and not propaganda or alarming data that people might take out of context and be overly concerned about. Begs the questions; why is it not enforced now? And if it is not enforced now, how will additional regulations serve to diminish that situation. If the coordination does not call for a third agency to oversee the two, yes. But this should lead to streamlining rather than bureaucracy bloating.
Maria Peeler	Increased consumer awareness of existing laws? Marginally effective or none. Enhanced enforcement authority? Potentially larger effectiveness. Improved coordination among existing consumer protection agencies? Potentially larger effectiveness, but in reality all three are needed. All require, first and foremost complete product LCA data
Cayce Warf	Make sure that what is on the books now is working adequately, before multiplication of more laws/regulations/bureaucracy
Marilyn Johnson	Increased consumer awareness of existing laws? It is not consumer awareness regarding the laws - it is consumer awareness around what is in products. Focus on the market drivers. Enhanced enforcement authority? For more problematic chemicals and products enforcement is necessary to give any law 'teeth'. If there is a law, there should be adequate resources to ensure it is followed. Market incentives are preferable. Improved coordination among existing consumer protection agencies? Yes. Again, it is education and options for consumers to allow them to market select preferable products.
Carol Massey	. Increased consumer awareness of existing laws? Yes, definitely . Enhanced enforcement authority? Not sure. . Improved coordination among existing consumer protection agencies? Yes!
Deborah Waite	Get rid of bounty hunter provision; utilize current CARB staff to monitor products and issue violations. increased consumer awareness of existing laws? Not necessary. Enhanced enforcement authority? Not necessary. Improved coordination among existing consumer protection agencies? That's always a good idea - but I don't want to see more state resources drained. Need to make program self-sustaining - have violations pay for enforcement.

QUESTION 3: If we were to develop a new regulatory model, what would it consist of? How to target Education and Outreach for: - Consumer? - Industry? What kind of Enforcement Tools? Should the Framework be flexible to add additional: - Products? - Standards for hazardous products in commerce? - Specific regulatory thresholds for each product? - Have a single consumer product compliance and enforcement agency?	
Todd Wirdzek	Any new regulatory model would need to replace existing agencies, rather than be in addition to. Handouts/literature at point-of-sale. Through industry-specific associations, affiliations, and groups. No answer regarding enforcement Yes. Yes. Yes. Yes.
buczekm@aol.com	A great need for usable information about toxics. Restricting chemicals is very difficult and subject numerous scientific ad legal challenges. If the information on chemicals of concern and alternatives can be presented to consumer in the products for which the consumer recognizes, I expect they will drive the market.
Ken Forbes	
Bob Davenport	Only limited due to the ability of the consumer to process suchinformation; Yes, let industry have reasonable guidelines and let them come up withthe solution; Appropriately set ones. Ones that allow for remediation withouteconomic dislocation; This is vague. You mean new chemicals that come into use into consumerproducts? If so, then yes. But some arenas of use should probably notbe as subject to regulation as others - this being a factor of publicexposure; Set a reasonable one and stick with it unless it's totally erroneous tostart (and that should be very exceptional if this process is done in areasonable way to start with); Maybe; See above on creating bureaucracies.
Maria Peeler	How to target Education and Outreach for: - Consumer? yes - Industry? yes What kind of Enforcement Tools? product bans and, if necessary, chemical bans with penalties of registration as business, etc. for repeated offenses. This would include sale and purchase. Should the Framework be flexible to add additional: - Products? yes - Standards for hazardous products in commerce? yes - Specific regulatory thresholds for each product? yes - Have a single consumer product compliance and enforcement agency? yes

Cayce Warf	What kind of Enforcement Tools? Incentives for early responders/leaders in the market. Marketing recognition might be a significant 'carrot'. Let consumers 'vote' with their wallets/purses. Should the Framework be flexible to add additional: - Products? Important that we do not stifle innovation through increases in product development costs, thereby depriving consumers more efficacious, lower-cost alternatives. - Standards for hazardous products in commerce? We have watchdogs in place for shipment, labeling, etc. Ensure that they have the resources to do their job adequately. - Specific regulatory thresholds for each product? A multiplicity of laws/regulations will be burdensome to manufacturers/distributors; will likely contribute to sensory overload to the consumers (thereby lowering his/her attention to specific products with higher risk). Many consumers do not read the product labels now provided. - Have a single consumer product compliance and enforcement agency? At first blush, sounds good. However, human safety is of a different ilk than carbon footprint or global warming or even environmental fate.
Marilyn Johnson	How to target Education and Outreach for: - Consumer? Where consumers shop - in stores and online. - Industry? About the laws, and incentives towards innovation. What kind of Enforcement Tools? Restrict market access, and include education to the public about companies and product facts. Should the Framework be flexible to add additional: - Products? Yes absolutely. - Standards for hazardous products in commerce? Yes, absolutely. - Specific regulatory thresholds for each product? Everything should be relative and with incentive and drivers to continually improve. Thresholds set today can be outdated tomorrow, and changing the laws are onerous and resource depleting. A more 'active' or 'alive' system should be used in today's dynamic world. - Have a single consumer product compliance and enforcement agency? If that makes sense and is necessary.
Carol Massey	How to target Education and Outreach for: - Consumer? Yes - Industry? Yes What kind of Enforcement Tools? Fines. Should the Framework be flexible to add additional. - Products? Yes - Standards for hazardous products in commerce? Yes. - Specific regulatory thresholds for each product? Yes. - Have a single consumer product compliance and enforcement agency? Yes.

Deborah Waite	How to target Education and Outreach for: - Consumer? Why? The consumer is very, very protected under California's current regulatory scheme. - Industry? Email blasts would be acceptable. What kind of Enforcement Tools? Not sure what you mean by this. Fines for violations that make the enforcement program self-sufficient is likely the best alternative. Should the Framework be flexible to add additional: - Products? - Standards for hazardous products in commerce? - Specific regulatory thresholds for each product? - Have a single consumer product compliance and enforcement agency? Since a new regulatory model is not needed, these questions are moot.

Attachment H
Key Element: Strengthening Consumer Protection Laws

Miscellaneous Responses	
buczekm@aol.com	I think there are 2 components to consider, regulation and enforcement. Even the limited cases where some regulations exist, enforcement is always a challenge and cannot be done efficiently by adding more state employees to patrol the borders and ports. So the burden for enforcement must be placed equally on the importer of record and the retail outlet selling the product to the consumer, unless both are responsible there will be gaps. I think that California is more than willing to provide protection to its consumers but like everyone else, it does not have the proper data on long term, low level exposure to certain chemicals and on available alternatives. I think that the government is responsible to set up the protocol for gathering the information and for making that information available to the consumer in an easy to use manner. I think the importer and retailer should be responsible for the products they sell.
Bob Rawson Industrial Waste Inspector President IWS Corporation College wastewater instructor Environmentalist Inventor Veteran Farmer parent	I would not ask for nor willingly accept any restrictions on my access to any non-nuclear chemical or product of commerce, but rather I would request that all such chemicals be adequately and completely described in their label so that the important characteristics and formula of any chemical or product content is fully disclosed. Consumers need and deserve to be told the contents, of what they are buying so that they know the short term and chronic toxicity and physical dangers to themselves and those around them when they use a product. They need to know the proper disposal methods, fire explosion and toxicity of a product and what its incompatibilities are They need to know proper shelf life and application rate and recommended application use. People need and deserve to know what the antidote is and who they should call for medical information or intervention. Give the people a complete and FULL DISCLOSURE, not restrictions on our personal economic and intellectual freedoms. I want to know the chemical formula pertaining to all components in all products that I purchase. From this I can research whether it is good for me and what its short and long term implications are. I refuse to purchase any product that does not disclose its formula so that I, as an educated person, can determine or find out what this compound is and the degree of toxicity it represents to me and the environment. I like the idea of an MSDS plus being a required complement the sale of every product on the market. Please don't play big brother and try to restrict my access to anything. If I contaminate the environment bring civil and criminal charges on me but don't treat me as a dumb shit who is not capable of being a wise consumer when given proper information. Just tell me and everyone around by proper labeling, what we need to know so we can be responsible adults and act like responsible adults. I do not want any entity telling me that I cannot purchase a chemical that would be useful to me when used in a prescribed manner. Example I use colchicine for scientific plant research to change the chromosome number of plants in order to hybridize them. It is a poison. I do not want to have to obtain a license or be part of a university staff knighted with a PhD or owned by a mega corporation in order to conduct my

Miscellaneous Responses	
	research. I just want to have the MSDS information made fully available to me and I want people like me held accountable for the proper use and safe disposal of the products we purchase. If I do not properly use and dispose of the product then and only then do I want government to impose its heavy hand. Thomas Edison would not have invented the light bulb if he could not have accessed the raw materials for his research. Real intellectual advancements will come from individuals, not bureaucratic universities and corporations. It always has been so and it always will be so. At this point we as individuals in society are almost unable to solve our own problems or those of society because we are so personally restricting the minds and actions of the individuals who could best provide us with the answers we desperately need. Instead of this folly of regulatory tyranny and Ludite intellectual and social stagnation lets look at a model that can provide us with answers to our pressing problems. One such answer is simply requiring adequate truth and full disclosure in labeling. If a few hundred million pounds of pesticides are used on our crops, how about identifying those pesticides for us and telling us the levels of these on the food we eat and products we consume so we can determine the consequences of these levels on our food. How about making accountability on the store shelf where it really counts. I would rather buy a poison for a specific purpose that I am intending than buy a poison that I am unaware of and defenseless against.
Ann Mason	In your e-mail a note identified the possible "chemicals of concern." ACC's Chlorine Chemistry Division responds that the use of the term "halogens and other aromatic hydrocarbons" includes an extremely broad group of chemicals. As a result, it is not clear what substances CA is considering and it is difficult, if not impossible to respond to the request. As it relates to halogenated compounds, it is important to note that: * Halogens in and of themselves are not aromatic. * Halogenated compounds consist of a very broad set of distinct compounds-some of which are inorganic and others organic. Each compound has varying chemical characteristics. * Halogenated compounds include a huge group of compounds that provide the essential building block chemistry for the tool box of innovation. ACC and its members value innovation and strive to provide the raw materials that make energy conserving, environmentally friendly, and value enhancing products possible. As such, our companies use a variety of chemical and engineering tools. Among these tools, halogen chemistry is an essential part of innovating and manufacturing beneficial products. * Aromatic hydrocarbons suggest another broad set of compounds--some of which might have a halogen.
Sarah Brozena, American Chemistry Council	In response to the DTSC's questions below, the American Chemistry Council would like to provide DTSC some information about the laws, regulations and programs to which we and the entire chemical value chain are subject. These layers of protection are applied to products throughout the business of chemistry's value chain - thus providing protection to consumers every day. This information should provide you a broader perspective on some of the questions you posed below. Also, please see the two attachments, 1) explaining the US business of chemistry chain of commerce and 2) more

Miscellaneous Responses	
	detail on how the Toxic Substances Control Act functions. a) EVALUATION OF PRODUCTS: The business of chemistry evaluates products before they reach the marketplace for health, safety and environmental compliance. A portion of our research investment helps evaluate products before they reach the marketplace. These laws regulate the development of new chemical products: -- Federal Insecticide, Fungicide and Rodenticide Act (FIFRA) sets requirements for pesticide product testing and approval by EPA; -- Federal Food, Drug and Cosmetics Act (FFDCA) requires pre-market approval by the Food and Drug Administration (FDA) of all new drugs, food additives, medical devices and materials that come into contact with food and drugs, and medical devices; -- Toxic Substances control Act (TSCA) requires EPA evaluation of all new chemicals and if EPA has a concern about potential risk, it can prohibit or limit the manufacture, use or distribution of that product. b) POLLUTION PREVENTION: We have reduced our emissions by more than 75% over the past twenty years through the: -- Clean Air Act, which includes a permit program requiring facilities to report on chemicals released and steps taken to reduce that release; -- Clean Water Act, which regulates the discharges of pollutants into the waters of the US through specific wastewater standards set by EPA and states; -- Resource Conservation and Recovery Act, which gives EPA the authority to control the generation, transportation, treatment, storage and disposal of hazardous waste; -- Emergency Planning and Community Right to Know Act, which establishes the Toxic Release Inventory (TRI) and is set up to inform communities and its citizens of chemical hazards in their areas. EPCRA requires businesses to report locations and quantities of chemicals released; and the -- Pollution Prevention Act, which establishes the national policy that pollution should be prevented or reduced at the source whenever feasible and requires reporting on waste management activities. c) COMPLIANCE WITH E H & S REGULATIONS: We invest billions of dollars each year complying with environmental, health and safety regulations. The safe production and use of our products is too important to leave to chance. These laws and programs provide for thorough testing and evaluation of chemicals in commerce: -- TSCA gives EPA authority to require submission of details about the manufacture, processing and use of specific chemicals, the potential for human exposure and health and safety information; -- FIFRA provides for periodic review of registered pesticides to evaluate changes in use patterns; -- FFDCA establishes safe standards of chemical content for various products; -- The High Production Volume (HPV) Challenge Program and the Voluntary Children's Chemical Evaluation Program (VCCEP) are voluntary initiatives under which the chemistry industry supplies EPA with evaluation data on chemicals. This information is publicly available. -- Chemical Assessment and Management Program (ChAMP): EPA is now engaged in a new program, ChAMP, to prioritize by 2012 the HPV chemicals

Miscellaneous Responses	
	as well as moderate volume chemicals for further evaluation and decisions. d) WORKER SAFETY: Our industry's worker safety record is four times better than the US manufacturing average. -- The Occupational Safety and Health Act (OSHA) requires evaluation of chemical hazards and preparation of labels and material safety data sheets to convey hazard information to workers. -- The Hazardous Materials Transportation Act (HMTA) was established to protect against risks from transportation of hazardous materials in commerce. e) CONSUMER PROTECTION: Chemistry is a critical building block of almost all of the products we use every day. These laws govern consumer protection and risks to public health: -- Consumer Product Safety Act (CPSA) sets a standard to reduce or eliminate any unreasonable risk of injury they find associated with a consumer product. It provides the Consumer Product Safety commission (CPSC) with authority to pursue product recalls or bans. -- Federal Hazardous Substances Act (FHSA) requires that certain hazardous household products bear cautionary labeling to alert consumers to potential hazards and to inform them of measures to protect themselves from those hazards. -- Food Quality Protection Act (FQPA): establishes a health based safety standard for pesticide residue in all foods -- Poison Packaging Prevention Act (PPPS) authorizes the CPSC to impose standards for packaging to prevent injury to children -- Safe Drinking Water Act (SCWA) protects public health by regulating the national's public drinking water supply. f) RESPONSIBLE CARE: Through initiatives called Responsible Care, the American Chemistry Council (ACC) member companies go above and beyond government rules and regulations. We employ a rigorous management system that is verified by third party auditors and we share our results with the public. Our progress is measured, tracked and available for review at: www.responsiblecare-US.org ACC also operates the Chemical Transportation Emergency Center, or CHEMTREC, which is a 24/7 resource fore emergency responders. Another program, the Transportation Community Awareness and Emergency Response, or TRANSCAER, helps communities prepare for and respond to potential hazardous material transportation incidents. g) BENEFITS OF CHEMISTRY: Chemistry is the essential formula behind the products and services that make our lives safer, healthier and better. As a science based enterprise, we make decisions based on science and believe it is the best foundation for all sound policy and the management of chemicals. Science also informs the pervasive culture of safety that helps our industry operate safely, profitably, and with care for future generations.
Carrie Nagy, MPH Epidemiologist Toxics Epidemiology Program	I applaud your efforts to tackle this enormous task of looking at consumer protection when it comes to chemicals found in consumer products. As someone who works for the LA County Dept of Public Health, Toxics Epidemiology Program, I would love to see more consumer protection and better definitions and regulations for dealing with potentially hazardous

Miscellaneous Responses	
	products. The format of the following questionnaire, however makes it very difficult for me to respond to, let alone in a timely manner. The questions presented here are very open ended and cumbersome, warranting many re-reads to even understand where you are coming from. I wonder who the audience is that you expect to answer this and feel that the wording might be okay if I were sitting at a table with all of you and this were a topic of discussion. In fact, the whole format reminds me of someone's notes from the planning committee's brainstorming session. I do understand the complexity of what you are tackling, but in the future, would you please make use of current technology available to you for administering surveys of this kind? Email format is not appropriate for asking questions of this nature and depth. It is too difficult to understand what you are really looking for in an answer-- I felt like I needed someone to hold my hand through the process. If you want meaningful responses, then I suggest you ask your staff to complete the questionnaire themselves and make sure that the questions can be answered in brief one-word or one-sentence answers. Having 14 questions disguised as 3 is very confusing and misleading. Please try to use multiple choice rather than open-ended questions. This will help your responders understand the range and scope of what is possible as an answer. Perhaps it would be helpful in the future to consult with someone like myself, an epidemiologist, who is very familiar with survey design and analysis. An online survey can be very quick and even free if you use such sites as surveymonkey.com and then email your listserve a link to the survey. This is surely an option to you as government agency since I recently completed one for the CA Biomonitoring Program, which would've faced similar confidentiality concerns. Please feel free to contact me if you have any questions. I really do appreciate the creation of the Green Chemistry Initiative and all of your hard work on this and sincerely hope that my critical comments might be used to better your efforts.

APPENDIX D-3

KEY ELEMENT

EXPAND CALIFORNIA'S POLLUTION PREVENTION PROGRAM

Team Leader: Claudia Polsky, DTSC

California can prime the pump for Green Chemistry by growing existing pollution prevention programs. This program, called P2, helps businesses reduce toxic chemicals while increasing profits. But the investment has been modest and limited. Green Chemistry is a long-term solution, but expanding pollution prevention to include more companies and spread technology across industrial sectors would achieve short-term gains.

Executive Summary

The Department of Toxic Substances Control's (DTSC) Office of Pollution Prevention and Green Technology administers a well-regarded collection of programs focused primarily on source reduction for hazardous waste generation, development of alternatives to toxic chemicals and specific toxics in specific consumer products, with some limited participation in support of green technology projects and green business certification. Although these efforts successfully reduce hazardous wastes and set the stage for the shift toward a cradle to cradle approach, they are limited by their emphasis on wastes and narrow scope of programs that support green technologies and businesses.

A number of opportunities exist to improve and expand every element of these programs to detoxify industrial production and consumer products in California. All options identified require a new concept to redefine the role of the P2 Office, from a program defined by its tools – specifically, voluntary programs – to a program defined by the place and time of intervention: at the front of the pipe, *before* toxics are introduced into products and processes. A focus on the point of generation (rather than disposal) in turn necessitates a willingness to consider a greater role for an array of regulatory tools in instances where, despite evidence that green alternatives exist, perform, and are economically feasible, industry fails to embrace them on a broad scale voluntarily.

The recommended options for expanding pollution prevention programs include refocusing the Source Reduction Act on chemical use rather than waste, increasing state funding for development of safer alternatives, expanding voluntary programs and the role of regulation to achieve large-scale safer substitutes, promoting extended producer responsibility for consumer products, making state government a pollution prevention and green technology leader, and increasing state support for local green business programs.

Introduction

DTSC's Office of Pollution Prevention and Green Technology ("P2 Office") has historically worked to reduce the use of toxics chemicals in, and the hazardous waste generated by, California industry. Core programs have: (1) assessed hazardous wastes generated by particular industries, and promoted methods to reduce the quantity and/or toxicity of such wastes; (2) evaluated, or funded development of, promising green technologies or safer substitutes for existing chemicals; and (3) conducted pollution prevention training and outreach to assist small businesses, local hazardous waste enforcement agencies, and local green business programs.

In 2008, the P2 Office doubled in size, and now includes numerous functions related to toxic chemicals in consumer products. A new "Toxics in Consumer Products" branch educates industry and the public about legislative prohibitions on the use of toxic materials in specific applications, such as restrictions on the use of lead in jewelry, and on use of certain heavy metals in electronic devices and in product packaging. Many of these restrictions apply to products manufactured out of state or abroad, requiring DTSC to navigate difficult practical and jurisdictional issues to insure that green-chemistry signals are sent up the supply chain to those who most directly control product composition.

The Toxics in Consumer Products branch also works to ensure safe end-of-life management of products with toxic constituents, such as perchlorate-containing fireworks, and chemically treated wood used in utility poles, railroad ties, and other high-volume applications. The branch additionally works to create adequate recycling infrastructure for, and educate the public about, the everyday wastes generated by California consumers that contain hazardous materials, including batteries, fluorescent bulbs, and personal computers.

As a final program element in the P2 Office that combines aspects of pollution prevention, green technology, and a consumer product focus, a new "Plastics Hazard Reduction Unit" is devoted to promoting research on, and creating markets for, less-toxic plastics and bio-based plastics for uses that include disposable beverage containers.

This Green Chemistry Initiative KEY ELEMENT encompasses recommendations made by many familiar with DTSC's existing P2 Office program, including but not limited to P2 Office staff, DTSC's external Source Reduction Advisory Committee, local green business program representatives, pollution prevention staff of U.S. EPA Region IX, and DTSC contractors working to identify safer substitutes for toxic chemicals in specific applications. These parties were asked (a) how DTSC could improve or expand upon existing program elements in the P2 Office, and (b) how CalEPA could enhance environmental protection in California by applying lessons learned to date in DTSC's P2 Office programs.

The Challenge

The strength of DTSC's Office of Pollution Prevention is its technically competent, environmentally motivated group of professionals, with expertise ranging from engineering to toxicology to green marketing and technical writing. A number of staff

members hold doctoral degrees, and many have extensive private sector experience in regulated industrial sectors. As such, staff are generally well equipped to evaluate existing practices in technically complex industries, and to identify pollution prevention and green technology opportunities. Staff also have considerable experience in drafting technical reports, peer-reviewed scientific papers, and nontechnical educational outreach materials for a variety of audiences. Nonetheless, in attempting to fulfill DTSC's toxics-reduction mission, there are currently structural limitations or challenges associated with almost every facet of the P2 Office's work. Individually and collectively, these constraints prevent the program from having a transformative (rather than marginal) effect on California businesses.

The P2 Office's bedrock **source-reduction** statute ("SB 14"), innovative when introduced in 1989, is now in part outmoded in its near-exclusive focus on hazardous *waste* generation as a means of toxics reduction. Specifically, the statute fails to address adequately the large number of toxic chemicals now appearing in the first instance embedded in consumer products, rather than in waste streams, and to prioritize input substitution over other means of reducing hazardous waste generation. In a related vein, a decade's worth of experience with the 1998 amendment to the source-reduction statute ("SB 1916") has revealed that while educational outreach and technical assistance to targeted industrial sectors can induce many businesses to green their practices, voluntary adoption of green chemistry/green technology innovation is slow, and consistently fails to achieve an industry-transformative scale.

In an effort to promote **development of alternatives to toxic chemicals** in specific applications, the P2 Office directs limited contract funding to nongovernmental green-chemistry researchers, or provides staff time as an in-kind match for (also quite limited) U.S. EPA Pollution Prevention grants for alternatives development. The paucity of State and federal government funds directed to targeted applied research on alternatives development is a significant impediment to development of viable substitutes for toxic chemicals in widespread applications.

In addressing **toxics in consumer products** – a welcome new role for the P2 Office – staff are primarily tasked with implementing product- or product-category-specific legislation pertaining to end-of-life product management. Although such legislation addresses legitimate environmental concerns, DTSC's consumer product authorities have been created piecemeal, and lack a coherent overall framework for allocation of responsibility in the product supply chain for end-of-life management of products with toxic constituents.

With respect to **green technology** projects, P2 Office research and analysis frequently demonstrate the feasibility-in-concept of changes in industrial processes or business operations, such as a change from chemical to nonchemical means of controlling scale and corrosion in water cooling towers atop buildings, or the ability to extend motor oil life in fleet vehicles through a program of oil analysis that prevents unnecessary oil changes. In many of these instances, however, staff experience has been that it is harder to induce government agencies to adopt green technologies and practices than it is to persuade the private sector to adopt such innovations, a fact inconsistent with the State's green leadership aspirations.

In collaborative efforts to support the pollution prevention work of local entities, P2 Office staff have observed the **insufficiency of existing green business program infrastructure** to meet the high demand for green business certifications in California. In most counties with green business programs, there are long waiting lists for would-be green businesses to obtain recognition and publicity as such. In many other counties, there is no green business recognition program whatsoever, greatly reducing any potential marketing advantage to those businesses contemplating adoption of greener business practices.

Each of the above-listed challenges presents an opportunity to revisit specific statutory authorities reposed in the Department of Toxic Substances Control, and a broader opportunity for California to reevaluate its voluntary pollution prevention programs, regulatory approaches, funding priorities, and role as green chemistry and technology leader.

Background

1. Source reduction and P2 information dissemination under the Hazardous Source Reduction and Management Act

The P2 Office implements California's Hazardous Waste Source Reduction and Management Review Act of 1989, often referred to by its bill number, "SB 14" (hereafter, "Source Reduction Act"). The Source Reduction Act mandates that large industries systematically examine their opportunities for source reduction of hazardous materials, before they can become hazardous waste. The Act defines "source reduction" as action that causes "a net reduction in the generation of hazardous waste," or "a lessening of the properties which cause it to be classified as a hazardous waste."[1] The statute also requires DTSC to disseminate information regarding pollution-prevention opportunities in specific large industries selected by the Department.

"Source reduction" is defined by the Source Reduction Act as: (1) input changes in materials or feedstocks; (2) production process changes, such as reusing materials within a given process; (3) product reformulation/substitution, including changes in specifications of end products; and (4) operational improvements to improve site management, such as inventory control and better employee training. Source reduction is defined to exclude actions taken after a hazardous waste is generated, such as concentration to reduce hazardous waste volume, dilution to reduce hazardous characteristics, or displacement of hazardous waste from one environmental medium to another..

The Source Reduction Act requires hazardous waste generators who meet a quantitative threshold of annual waste generation to review any alternative processes, operations, or procedures that would reduce the generation of hazardous waste, and to devise a plan and timetable for implementing and documenting all "technically feasible and economically practicable" source reduction measures. As required by the statute, DTSC has developed a format for generators to review their operations, to plan for

[1] Health & Saf. Code, Div. 20, Ch. 6.5, Art.11.9, Section 25244.14(e)(1).

source reduction, and every four years, to submit a “hazardous waste management performance report” that documents source reduction measures implemented in the preceding four years.

The statute also requires DTSC to select “at least two categories of generators by SIC [Standard Industrial Classification] Code with potential for source reduction” every two years, to review their reports in detail, to identify successful source reduction approaches, and to disseminate information regarding those approaches to other generators in the same industrial category. To date, the P2 Office has examined waste-generation data from, and pollution prevention practices and opportunities in, industry sectors ranging from petroleum refineries to pharmaceuticals manufacture to metal fabrication.

2. Targeted voluntary P2 under Senate Bill 1916

In 1998, DTSC’s source reduction program was enlarged through passage of Senate Bill 1916, in which the legislature expressed its intention to “expand the State's hazardous waste activities . . . to promote implementation of source reductions measures using education, outreach, and other effective voluntary techniques.”[2] Key features of this expansion included:

- the requirement that DTSC establish a “technical assistance and outreach program to promote implementation of model source reduction measures in priority industry categories,” focusing on at least two priority categories of industries with source-reduction potential every two years, including one category consisting primarily of small businesses;

- the requirement that DTSC provide source reduction training and resources to CUPAs [Certified Unified Program Agencies], regional and local governments, and business assistance corporations and centers;

- the formation of an external Pollution Prevention Advisory Committee to provide advice on and critical review of the Department’s proposed two-year work plans, review the Department’s source-reduction progress, and make recommendations regarding program activities, funding priorities, and legislative changes;

- establishment of two quantitative benchmarks for the Source Reduction program: (a) the instruction that for source reduction projects involving “primarily large or technologically complex businesses,” DTSC communicate with representatives of 80% of the state’s companies in the category (a measure of DTSC effort or “output”); and (b) a requirement that DTSC determine “the extent to which the statewide goal of 5 percent per year reduction of the generation of hazardous wastes . . . has been attained” (a measure of environmental outcome); and

- the instruction that DTSC evaluate why the 5% reduction-per-year source reduction had or had not been attained, make “recommendations designed to assure . . . attainment,” and include “recommendations for legislation” in future two-year work plans.

Sectors previously targeted for focused pollution-prevention outreach to encourage voluntary adoption of green practices include, but are not limited to, the vehicle service and repair industry, the chemical industry, and the auto body and paint industry.

3. Green Technology

The P2 Office's Green Technology staff respond to a variety of requests for evaluation of promising environmental technologies, investigate emerging technologies of potential environmental concern, and conduct life cycle analyses of products and processes to inform decisions about toxic chemical use and alternative technologies. Green tech projects stem from the Hazardous Waste Treatment Reform Act of 1995[3] and related authorities that authorize DTSC to "coordinate research and study" and "conduct pilot projects" related to technologies that can "ameliorat[e] California's hazardous waste disposal problems."[4] Green tech projects have ranged from evaluation of technologies for remediating groundwater contaminated with chlorinated solvents, to determining whether drum-top lamp crushers are a viable alternative for disposing of spent mercury-containing fluorescent lamps, to exploring the potential environmental risks associated with emerging nanotechnology applications.

4. Toxics in Consumer Products

In recent years, DTSC's authority to prevent pollution through hazardous waste source reduction has been supplemented by new legislative authority and responsibility for toxic chemicals in consumer products. Some statutes require DTSC to enforce requirements that toxic materials in specified products do not exceed regulatory limits, as in the Toxics in Packaging Prevention Act, the lead-containing jewelry law, and provisions of California's Electronic Waste Recycling Act of 2003 that restrict hazardous substances in electronics ("California RoHS").

Other laws require DTSC to ensure that products containing toxics are properly managed at the end of their useful life. Examples include California's Treated Wood Waste law, the Perchlorate Contamination Act, and the Lighting Efficiency and Toxics Reduction Act (governing end-of-life recycling of mercury-containing lamps). DTSC has also voluntarily participated in multi-party negotiations that led to creation of a National Mercury Vehicle Switch Recovery Program to ensure removal of mercury switches prior to auto shredding. In another voluntary program – the "Take-it-Back Partnership" – DTSC has promoted retail take-back of electronic waste by retailers, particularly waste not eligible for payment to recyclers under the Electronic Waste Recycling Act.

5. Alternatives Development

DTSC is among many government units in California – including U.S. EPA Region IX, the South Coast Air Quality Management District (SCAQMD), and the Port of San Diego – that fund or provide in-kind staff support for contractors conducting targeted research on alternatives to toxic chemicals in widespread applications. DTSC-supported contract research has included research on low-VOC, low toxicity alternatives for: spotting

[3] Health & Saf. Code, Div. 20, Ch. 6.5, Art.11.9, section 25179.1 *et seq.*
[4] Health & Saf. Code, Div. 20, Ch. 6.5, Art.11.9, section 25170 *et seq.*

chemicals used in the garment cleaning industry; automotive aerosol cleaning products; methylene chloride used in consumer product paint strippers; and materials used for cleaning lithographic printing ink from application equipment. Results of such research inform DTSC's implementation of voluntary pollution prevention programs in relevant industry sectors, and in some instances induce other government bodies (such as the SCAQMD) to revise regulations to reflect the availability of viable substitutes.

6. Green Business Support

DTSC's P2 Office conducts numerous activities in furtherance of the Source Reduction Act amendments' instruction that DTSC provide "source-reduction training and resources" to support local pollution prevention activities throughout California.[5] The P2 Office shares industry-specific fact sheets, provides training programs and technical assistance, and provides various forms of staff support to local government environmental programs, CUPAs, small business development corporations, and local Green Business Programs conducting pollution-prevention activities.

7. Biomonitoring

DTSC's Environmental Chemistry Lab (ECL) provides laboratory support for the P2 Office and other DTSC programs. ECL has for years conducted pioneering biomonitoring studies of tissues and body fluid, such as blood and breast milk, to determine the levels of certain toxic chemicals in humans and wildlife. Chemicals of existing or emerging concern include a variety of persistent organic pollutants that bioaccumulate in the food chain, such as PCB's and brominated flame retardants. ECL will continue and expand its biomonitoring under California's first-in-the nation Environmental Contaminant Biomonitoring Program (established in 2006 by Senate Bill 1379), which will help identify needs for targeted pollution prevention.

The Opportunity

Opportunities exist to improve and expand every element of the P2 Office program so as to detoxify industrial production and consumer products in California. Implicit in all options identified is a reconceptualization of the role of the P2 Office, from a program defined by its tools – specifically, voluntary programs – to a program defined by the place and time of intervention: at the front of the pipe, *before* toxics are introduced into products and processes. A focus on the point of generation (rather than disposal) in turn necessitates a willingness to consider a greater role for regulation in instances where, despite evidence that green alternatives exist, perform, and are economically feasible, industry fails to embrace them on a broad scale voluntarily.

[5] Health & Saf. Code, Div. 20, Ch. 6.5, Art.11.9, Section 25244.17.2.

RECOMMENDATION #1:
REFOCUS THE SOURCE REDUCTION ACT ON CHEMICAL USE RATHER THAN WASTE

Pollution prevention planning through the process mandated by the Hazardous Waste Source Reduction and Management Review Act of 1989 ("Source Reduction Act") has proven a useful tool for individual businesses motivated to improve efficiency and environmental performance. Nevertheless, the statute's waste-oriented approach has not been demonstrated to substantially reduce the use of toxic chemicals in California industry overall. P2 Office staff experienced with the program's operation therefore propose revising and enhancing the statute to focus it exclusively on reducing toxic chemical *use*, rather than its existing goal of reducing the generation of hazardous *waste.*

There are two fundamental means of amending the statute to focus on chemical use: changing applicability standards, and/or revising the statutory definition of P2 approaches qualifying as "source reduction." The current Source Reduction Act reporting and planning universe consists of approximately 1,800 facilities, based on quantity of routinely generated hazardous waste. One option for refocusing applicability is to exchange the existing universe of source reduction planners for a new universe of entities determined by toxic chemical use. The new universe could consist of Toxics Release Inventory (TRI) reporters;[6] business plan filers (or a subset of those); or chemical users as determined by some other database or reporting requirement (such as chemical purchases, or any new chemical use reporting requirement resulting from the Green Chemistry Initiative). Alternatively, the Source Reduction Act could be amended to add a new universe of facilities to the existing universe via a new chemical use threshold.

An alternative or additional means of reforming the Source Reduction Act and regulations is to focus exclusively on strategies that result in reductions in toxic chemical use. Currently, measures qualifying as "source reduction" for regulatory purposes include input changes, operational improvements, production process changes, product reformulation, and administrative steps taken to reduce hazardous waste generation. "Administrative steps" in turn include, but are not limited to: inventory control, employee award programs, employee training, in-house policies, and corporate or management commitment. P2 Office staff recommend that the statute and regulations: (1) better define "operational improvement" to reflect the goal of toxic <u>use</u> reduction; (2) better define "production process changes" so as to deny pollution-prevention credit for efficiency measures facilities should already be implementing, and to insure that toxic chemicals are not taken out of a waste stream and including instead in consumer products; (3) eliminate pollution-prevention credit for most "administrative

[6] Approximately 1,500 facilities in California annually report to the TRI. *See* State Fact Sheet for California at: *www.epa.gov/region09/toxic/tri*. Considerable underreporting is assumed (based on extrapolation from the number of TRI filers in much smaller states), and the intersection of California's 1,800 Source Reduction Act filers and the 1,500 TRI reporters is unknown.

steps" (excepting "inventory control"); and (4) add a requirement for materials accounting, modeled after the programs in Massachusetts and New Jersey.[7] These proposals are applicable to any reporting universe (*e.g.,* hazardous waste generators and/or toxic chemical users).

Other staff-generated proposals for improving the Source Reduction Act program include: (1) developing an online reporting function that links chemical use planners to online technical information (such as Design for the Environment program information) and allows online certification of completion;[8] (2) allowing facilities to use their own Environmental Management System (EMS) as a surrogate for mandatory planning,[9] provided that they include specified elements, such as public reporting and the establishment of source reduction and/or chemical use reduction as the highest priority; and, most ambitiously, (3) remaking the Source Reduction Act as a comprehensive, multimedia planning program that integrates the various state, and to the extent possible, federal, planning requirements to reduce the regulatory burden on facilities, administrative costs for public agencies, and render the planning exercise both more effective and more consistent with other business planning efforts. This last concept could require significant agency resources to determine which planning programs would be suitable for integration into a single requirement, and is thus an ultimate goal rather than a recommendation for early action.

These proposals, and related means of strengthening and updating the Source Reduction Act, will be further vetted by a recently established subcommittee of the Source Reduction Advisory Committee ("SB 1916 Advisory Committee"). This Committee is tasked by statute with reviewing the effectiveness of DTSC's source-reduction projects, and making "[r]ecommendations for legislation" to improve California's source reduction program.[10] After full-Committee input, these recommendations would ultimately yield a legislative proposal to update and strengthen the Source Reduction Act.

RECOMMENDATION #2:
INCREASE STATE FUNDING FOR DEVELOPMENT OF SAFER ALTERNATIVES

DTSC has historically funded or co-funded projects to develop alternatives to toxic chemicals in specific applications. These include both "drop-in" less-toxic chemical replacements for existing chemicals, and alternative technologies or methods that

[7] To be most successful, the materials accounting program element should be supported by adequate training and certification of plan preparers. In Massachusetts, for example, individuals must pass a course and then be certified as qualified to prepare the Toxic Use Reduction Plans required by that state's Toxic Use Reduction Act.

[8] The state of Texas has such an on-line planning program; see *www.tceq.state.tx.us/assistance/P2Recycle/wrpa/instructions.html*

[9] This approach has been demonstrated by the state of Washington, which found that allowing for the "EMS alternative" to mandatory planning resulted in more vigorous and comprehensive planning and results.

[10] Health & Saf. Code, Div. 20, Ch. 6.5, Art.11.9, section 25244.22 (c)

reduce or eliminate the need for toxic chemicals. Chemistry Nobel Laureate Jerome Karle has observed that "[s]ocieties whose governments recognize the dependence of the development of successful novel technologies on broadly supported basic research are more likely to be healthier and economically prosperous in the future than those that do not."[11] A core function of government science is to support basic research in areas of high societal need or interest that, for a variety of reasons, have not attracted sufficient private capital, as in the case of green-chemistry investment.

At present, worthy applied green-chemistry research projects far outstrip DTSC's capacity to fund basic research on alternatives to toxic chemicals. U.S. EPA has similarly limited funding for basic pollution prevention research on chemical alternatives. The paucity of State and federal government funds directed to targeted applied research on alternatives development is a significant impediment to development of viable substitutes for toxic chemicals in widespread applications.

DTSC's contractors have identified numerous specific green chemistry projects with immediate real-world application that are in currently in need of funding. These include development, testing, and in-use demonstration of products as diverse as low-VOC floor wax strippers and graffiti removal chemicals, and nontoxic marine coatings for pleasure boats.

When a guaranteed market for green chemicals is created through some combination of demand by informed consumers (see Key Element C-1), government regulation (see Recommendation #3, below), and government leadership as market-participant (see Recommendation #4, below), private capital can be expected to invest in green chemistry to meet market demand. Until such time, there will be a need for significant public investment in development and promotion of least-toxic chemical alternatives.

The magnitude of funding need, and source(s) of additional funding to support alternatives research, have not been determined. However, any tax or fee on chemical production and/or use could be directed to such work.

RECOMMENDATION #3:
EXPAND VOLUNTARY PROGRAMS, AND THE ROLE OF REGULATION, TO ACHIEVE LARGE-SCALE SAFER SUBSTITUTIONS

The P2 Office's programs and projects have demonstrated the technical feasibility – and in many instances, cost savings achievable through – input substitutions, process changes, and other methods of reducing the toxicity of products and industrial processes. The program's challenge, however, has been to create *broad-scale* adoption of these methods through voluntary action alone, rather than merely niche application by a small segment of environmentally conscientious businesses. There are multiple sources of this problem, including the small number of sectors that can be targeted with existing staffing, the short statutory time frame for disseminating green innovation, the slow pace of adoption of best practices by small businesses, DTSC's limited ability to affect large industries' behavior, and the "uneven playing field" that can

[11] Jerome Karle, *The Role of Science and Technology in Future Design*, June 29, 2000, *available at*: http://nobelprize.org/nobel_prizes/chemistry/articles/karle/index.html

place environmentally superior performers at a competitive disadvantage in the marketplace. Each of these limitations is surmountable, and must be surmounted, if California is to achieve pollution prevention on a meaningful scale.

The small number of sectors that can be addressed concurrently, and the short statutory timeframe for disseminating pollution prevention materials and encouraging adoption of green practices, are both factors limiting the success of the P2 program in effecting industry changes. As amended in 1998, the Source Reduction Act requires that every two years, DTSC select one new large and one new small business sector to target for hazardous waste source reduction education. DTSC's experience demonstrates that two years is in many instances too short a project cycle, however, particularly given the need to spend the first year gathering sector-specific information and developing outreach materials, and the vast number of businesses that must be reached in a state as large as California. Thus, for example, DTSC has extended its Vehicle Service and Repair project for three project cycles (totaling six years) to meet business demand, and continues to receive requests for program materials. By increasing the number of sectors that could be targeted for P2 efforts concurrently (through increased staffing), and by amending the Source Reduction Act to give DTSC more flexibility as to project duration, DTSC could achieve greater industry penetration in its chosen industrial sectors.

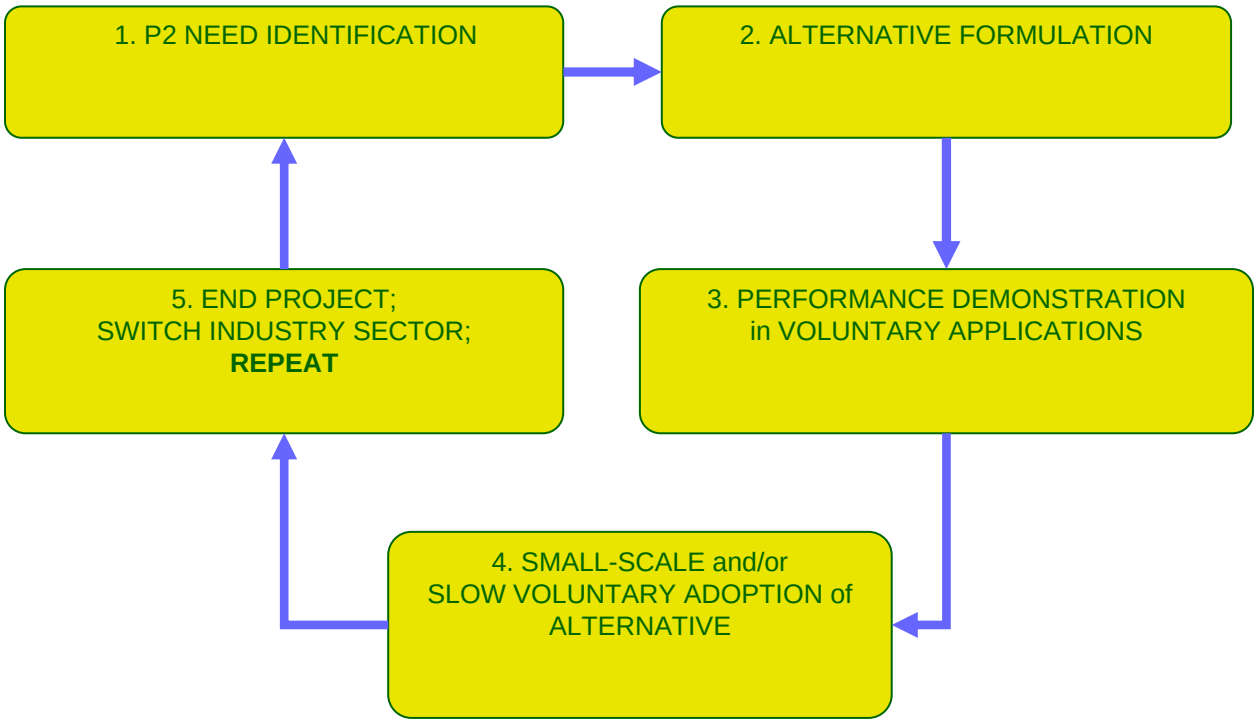
Certain other problems with the wholly voluntary nature of existing P2 source-reduction programs are not so easily overcome. The slow pace of adoption of best practices by small businesses has meant that even in DTSC's highly praised Vehicle Service and Repair (VSR) program, it has taken six years' worth of voluntary program activity to impact the environmental practices of approximately 300 out of California's estimated 30,000 VSR shops, or 1% of the total. Thus, even as the VSR program enters a low-level "maintenance" phase (in preparation for mandatory exploration of a new sector), and despite enthusiasm for the program from participating businesses, the program has failed to have a transformative effect on industry because of the resource-intensiveness of DTSC-to-business and business-by-business education and persuasion.

Similarly, DTSC's voluntary pollution prevention programs have had limited ability to affect large-industry behavior. Under the Source Reduction Act, DTSC analyzes hazardous wastes generated by specific large industry sectors, and compiles and disseminates "assessment" reports regarding best practices in these sectors to inspire emulation. DTSC has also initiated a "Chemical Industry Challenge" recognition program to acknowledge businesses in that sector that adopt particularly innovative or significant pollution-reducing technologies or practices. Nonetheless, both DTSC and industry are aware that best-practices reports and recognition events provide insufficient incentive to *drive* large-business decision making, and at best – if well publicized – can alert other businesses to potential opportunities for green innovation.

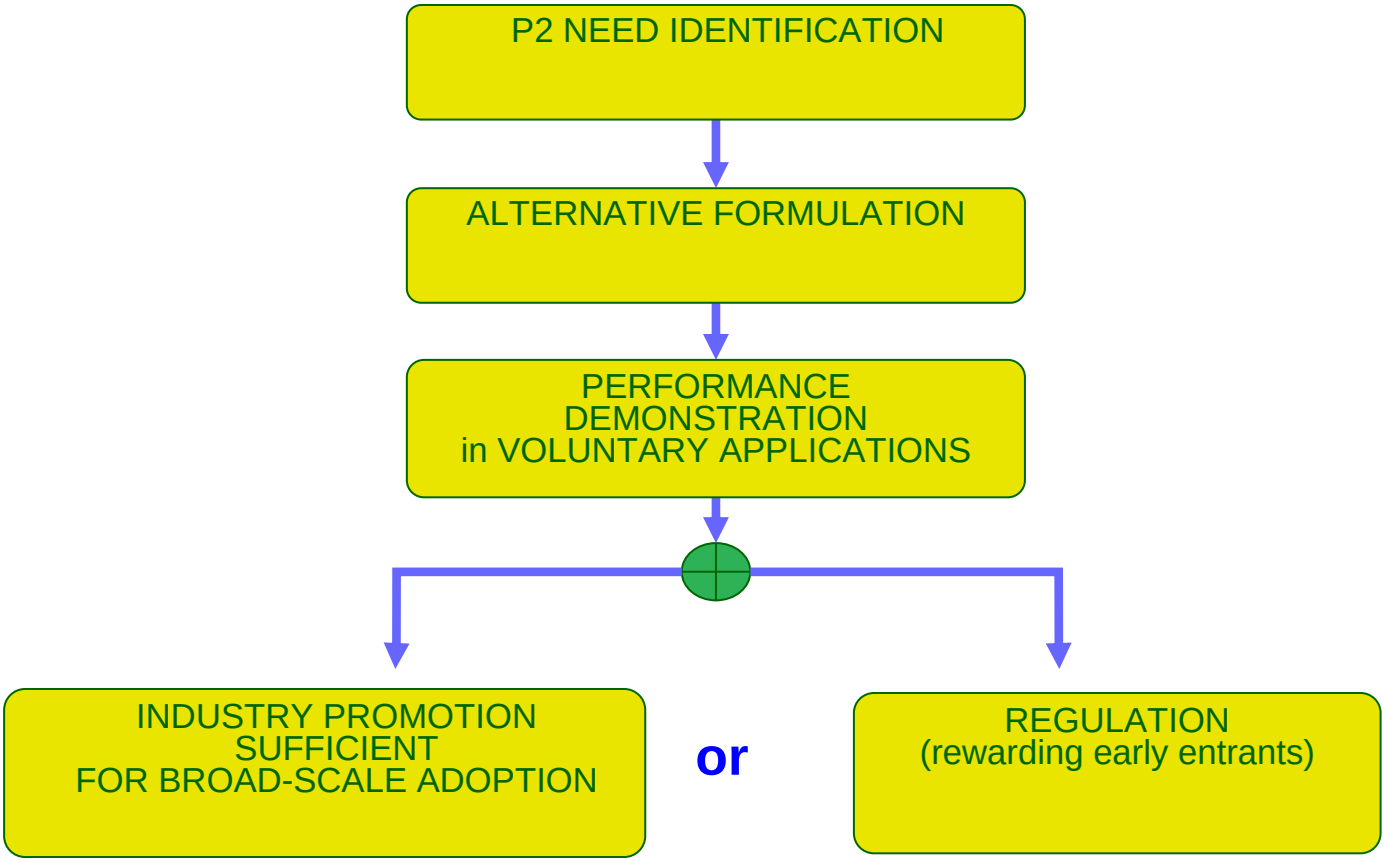
In the case of both large and small businesses, the competitive disadvantage experienced by businesses opting for environmentally superior, but more costly, inputs and processes is a significant factor limiting voluntary adoption of green practices. Some green methods are costlier than conventional methods. Many others "pay for themselves" over time, but often over long payback periods. Even where green actions pay for themselves in a reasonable time period, however, this fact may be insufficient to

motivate adoption by a business intent on maximizing profit. Such a business will not ask only whether an innovation "pays for itself" over time, but also, *e.g.*, whether capital is available to pay for the transition to a new process, and if so, how the return on investment compares to alternative uses of that capital for the same period.

The result of the foregoing factors is a project cycle that generally begins with identification of the pollution-prevention needs in a given industry sector, proceeds to identification of safer alternatives, demonstrates the performance and economic feasibility of using alternatives, avoids some quantum of pollution, but ultimately fails to achieve anything approaching industry transformation, as follows:



The new model endorsed here is that P2 Office voluntary programs be viewed as leading to *either* of two desired outcomes: large-scale voluntary adoption of safer alternatives by industry, or, failing that, well-informed regulation that relies on the performance testing conducted through voluntary adoption to raise the regulatory floor to an appropriate level. In this view, regulation is neither the intended nor inevitable outcome of the identification of green alternatives to toxic chemicals. Rather, government regulation is a means of *insuring* realization of achievable environmental improvement if and when industry fails to self-regulate on a substantial scale. In such a model, the existence of a viable, field-tested substitute for a toxic chemical would induce a threat of government regulation absent evidence of swift and pervasive industry adoption of that alternative, as follows:



The certainty and predictability of government regulation following any non-diffusion of viable alternatives would serve two critical purposes. First, it would motivate early and broad voluntary adoption of alternatives by industry, in the first instance in an effort to fend off regulation, and as a fallback, to avoid operational interruptions as a result of a mandate to introduce new chemicals or processes. This incentive could be magnified through regulations designed to reward early adopters of safer alternatives, such as by grandfathering operations that represent marked improvements over prior practices, but may not precisely conform to new regulatory standards. Second, and as important, a guarantee of broad voluntary diffusion of alternatives *or* mandatory diffusion through regulation would create precisely the market conditions necessary to motivate significant private investment in green chemistry: a guarantee of a substantial product market, with corresponding return on investment, that would produce the desired "race to the top."

DTSC is currently working to quantify the scale of adoption or nonadoption of P2 measures, and the resulting environmental benefits, following the promotion of specific P2 actions through voluntary programs. DTSC is also financially supporting similar outcome-measurement efforts by local green business programs (see Recommendation #6, below). These combined data will be extremely useful in determining where further

regulation of chemicals in particular industrial applications is warranted, and conversely, where the success of a particular voluntary program may obviate the need for additional regulation. Any additional regulation could be achieved through a combination of DTSC-sponsored legislation, and issue-specific collaboration with other CalEPA BDO's and local air districts to promote adoption of appropriate policies, rules, and regulations.

RECOMMENDATION #4:
PROMOTE EXTENDED PRODUCER RESPONSIBILITY FOR CONSUMER PRODUCTS

Pursuant to a variety of narrowly drawn statutory directives, DTSC's Toxics in Consumer Products staff are responsible for devising or implementing end-of-life management regimes for certain consumer products containing toxic constituents. DTSC lacks any more general statutory authority (or funding) to analyze and prioritize end-of-life issues across product types, however, or to devise systemic solutions. As the California Integrated Waste Management Board (CIWMB) has recognized, "[addressing] products with problematic end-of-life management issues through a patchwork of product-specific or substance-specific legislation" (CIWMB Resolution 2008-15) delivers insufficient environmental protection, while imposing significant economic and administrative costs on the State and local governments.

Accordingly, CIWMB in 2007 adopted a "Strategic Directive" designed to insure that producers assume logistical and financial responsibility for the safe stewardship of products and their packaging from "cradle to cradle." The Waste Board has since resolved to make the concept of Extended Producer Responsibility (EPR) "an overall policy priority to guide proposals to seek statutory authority" over products and packaging. (CIWMB Resolution 2008-15.) In the near future, CIWMB and the P2 Office will meet to discuss their mutual interest in advancing EPR for consumer products sold in California, and the desirability of a consistent and coherent approach to end-of-life product issues across CalEPA BDO's.

DTSC's P2 Office concurs with the many Green Chemistry Initiative commenters who urged that the time is ripe for adoption of an Agency-wide EPR policy with respect to end-of-life management of products and packages with toxic constituents.

RECOMMENDATION #5:
MAKE STATE GOVERNMENT A P2 AND GREEN TECHNOLOGY LEADER

In its role as market participant rather than regulator, the State of California has a major opportunity to demonstrate green leadership as an early adopter of pollution prevention methods and green technology. The recommendation for the State to adopt green technology processes goes beyond mere purchasing of environmentally preferable *products* (described in Key Element C-6).

In the green technology area, the P2 Office frequently demonstrates the feasibility of certain toxics reduction measures, such as the use of high efficiency oil filters, long-life oils, and oil analysis programs to extend motor oil life in fleet vehicles, or alternatives to the use of chemical biocides to control fouling and corrosion in cooling tower water.

Unfortunately, state agencies have often proven the most difficult to persuade to adopt such cutting-edge green methods. If the State of California mandated (or more strongly supported) the demonstration and use of such technologies in State operations, it would both attract attention to green-tech innovation, and reassure the private sector regarding the performance of new technologies.

This recommendation could be readily implemented through an "Executive Order on Green Leadership" that directs State agencies to adopt all feasible and cost-effective pollution-prevention and green technology measures. This Order could be publicized through a session at California's annual Green Government Summit showcasing sector-specific opportunities for California agencies to adopt greener practices and technology.

RECOMMENDATION #6:
INCREASE STATE SUPPORT FOR LOCAL GREEN BUSINESS PROGRAMS

The State should expand not only its role as green leader, but its role as green helper, by greatly increasing its support for local green business programs. Indeed, given the abundant opportunity demonstrated in Figures A through C below, enhancing State support for green business programs may be *the single most effective means of increasing the voluntary adoption of pollution-prevention practices by small and medium-size businesses in California.*

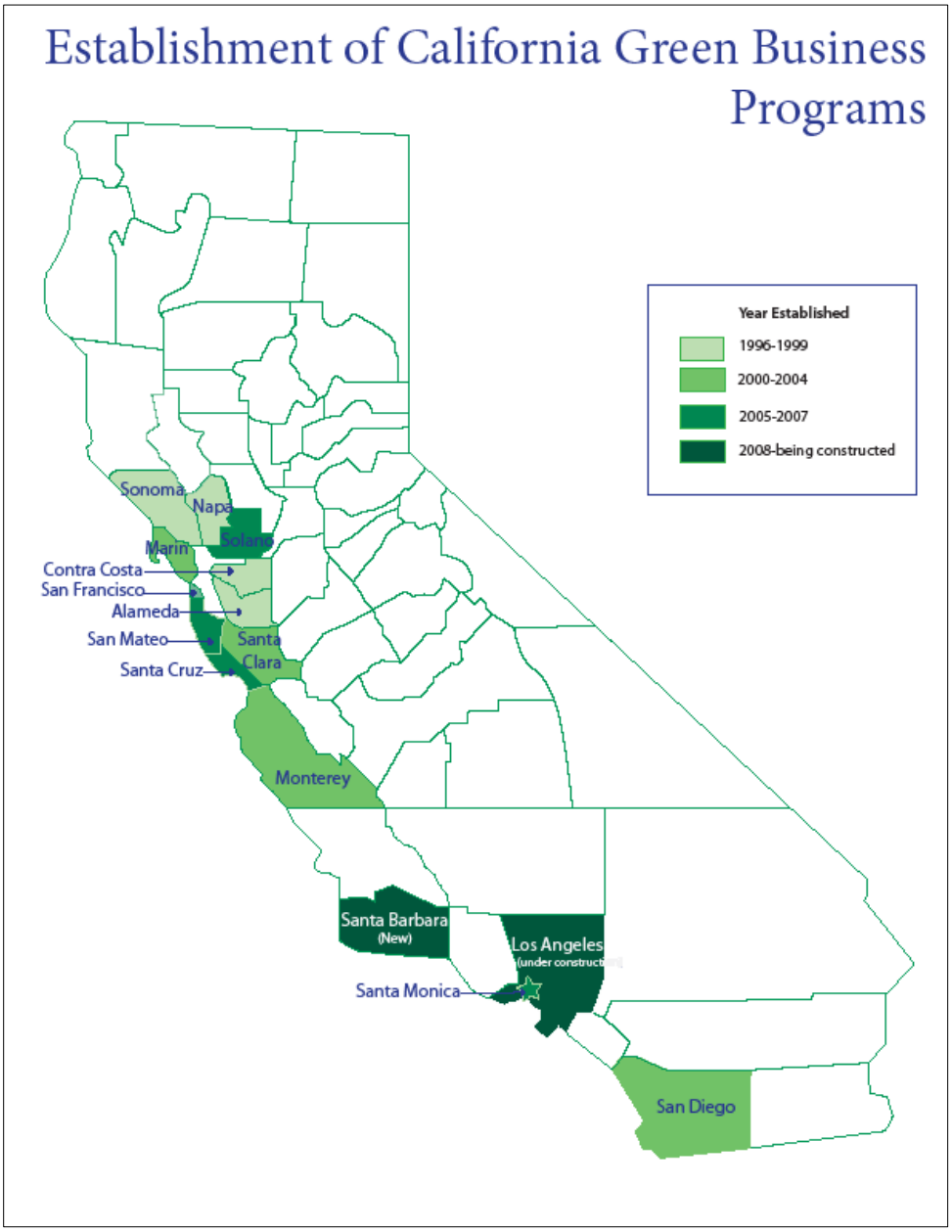
Green business programs have been enormously successful and high-leverage mechanisms for inducing local businesses to go beyond regulatory compliance in the area of environmental performance. Historically, the P2 Office has assisted such programs by creating and sharing fact sheets and other resource materials describing pollution prevention methods applicable to a particular industry sector, analyzing their performance and environmental benefits, and determining investment payback periods. These materials have been abundantly praised by local programs, used in their green-business outreach, and incorporated into industry-specific "checklists" indicating green measures required for certification as a green business. The P2 Office has also provided technical assistance to green business programs in California, and participated in program planning meetings of the California Green Business Network and other coordinating bodies with green-business-related committees, such as the Association of Bay Area Governments. Most recently, DTSC has provided funding for a green business environmental-outcome measurement tool (currently in development) that will quantify the considerable toxics-reduction, greenhouse gas reduction, and other multi-media environmental benefits of existing green business certification programs.

Nonetheless, despite a strong working relationship between DTSC and green business programs, DTSC's involvement with green businesses has not led to a quantum increase in green business program growth and penetration in California, or a change in the model for delivery of green business certification to California businesses. This is primarily because to date DTSC has had limited staff (less than 2 PY) allocated to local green business support activities, and has not actively worked to identify systemic green business program needs, or strategize regarding statewide expansion possibilities.

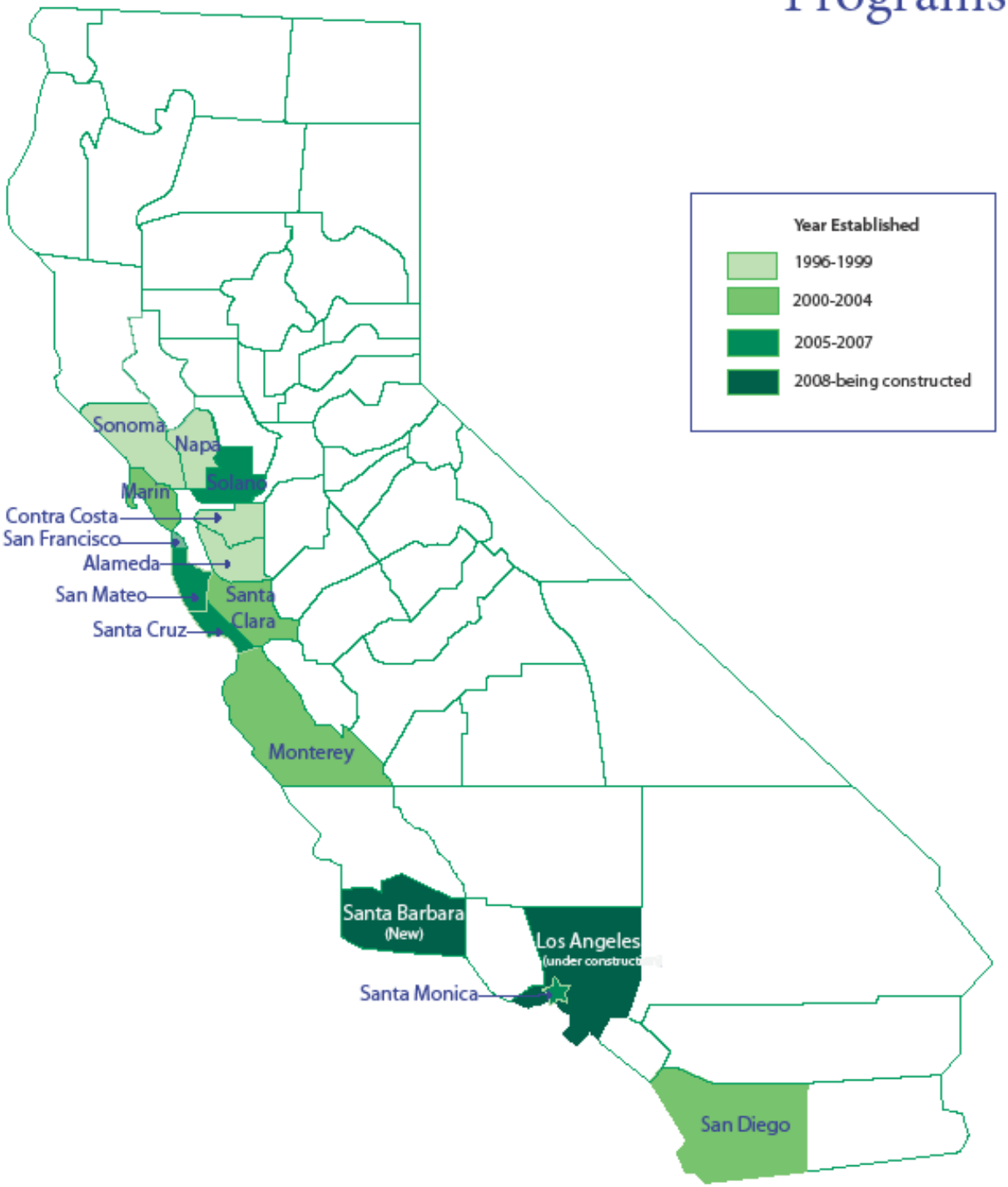
Planning for pollution prevention program expansion through the Green Chemistry Initiative has revealed the significant opportunity represented by California's major

geographic gaps in green business program coverage (Figure A); the high return on program investment, as demonstrated by staff-to-outcome ratios (Figure B); and existing programs' inability to service those *eager* to engage in voluntary pollution prevention activities, as demonstrated by the significant backlog of businesses awaiting certification (Figure C).

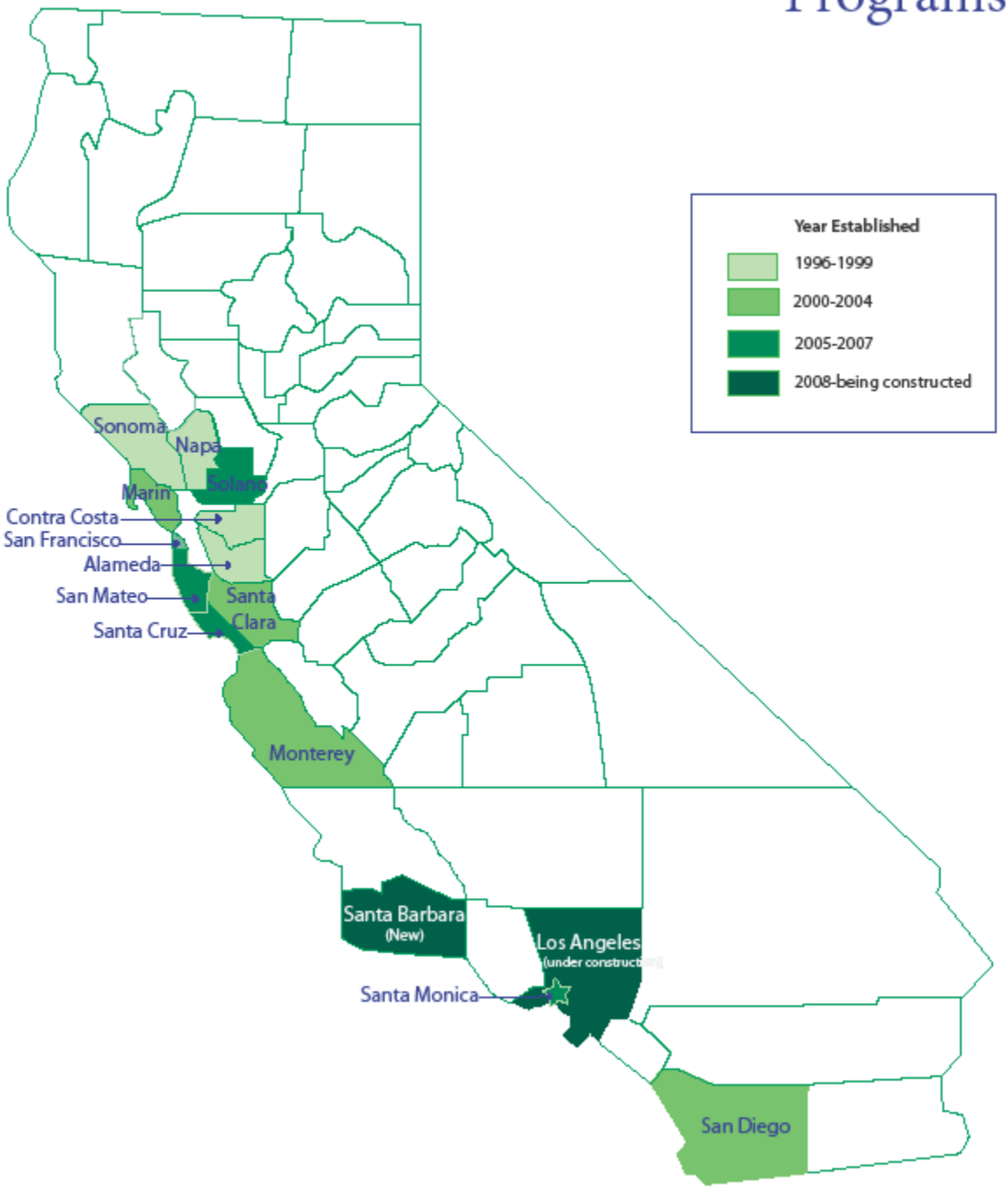
FIGURE A: Geographic gaps in Green Business Program coverage



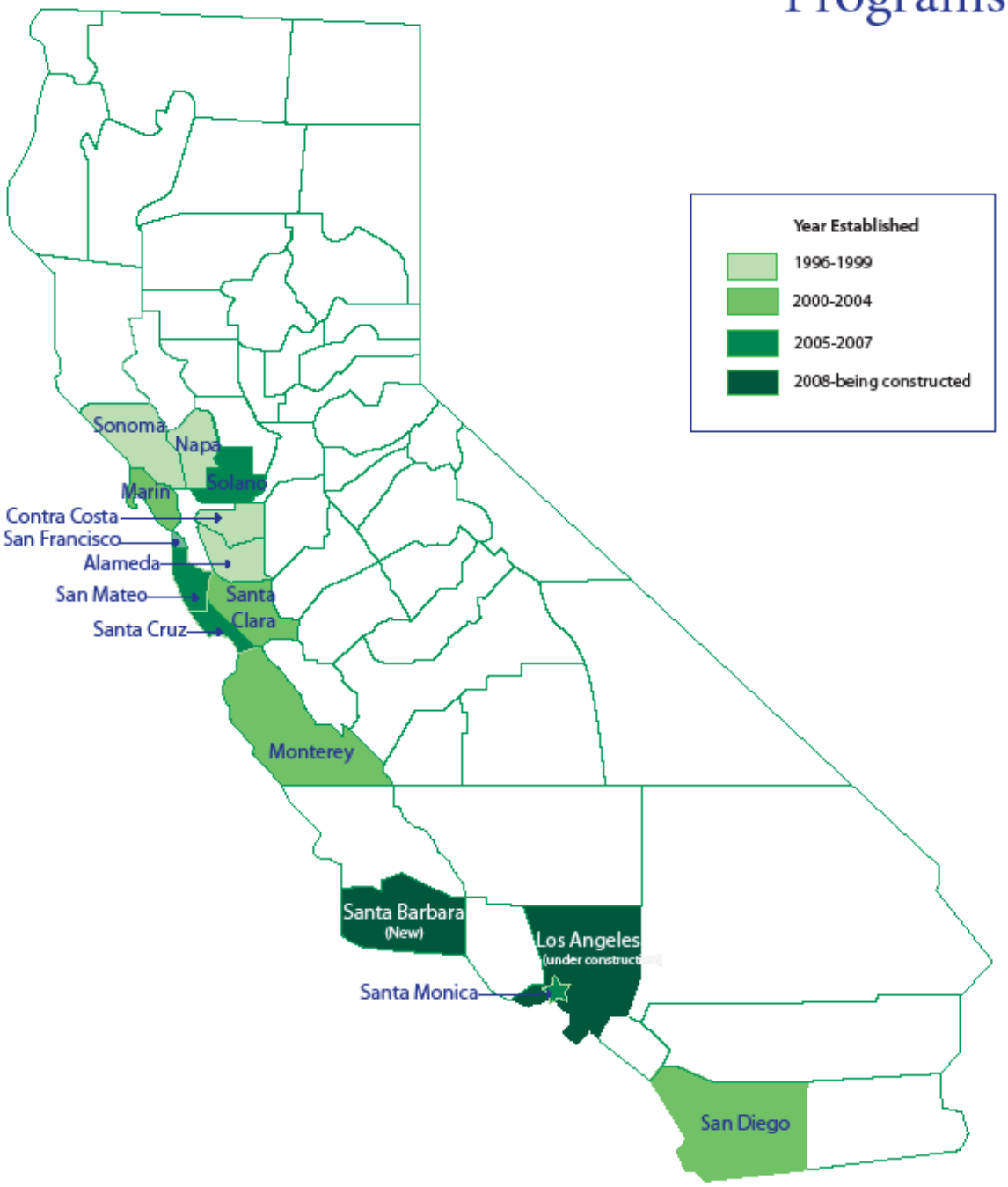
Establishment of California Green Business Programs



Establishment of California Green Business Programs



Establishment of California Green Business Programs



Establishment of California Green Business Programs

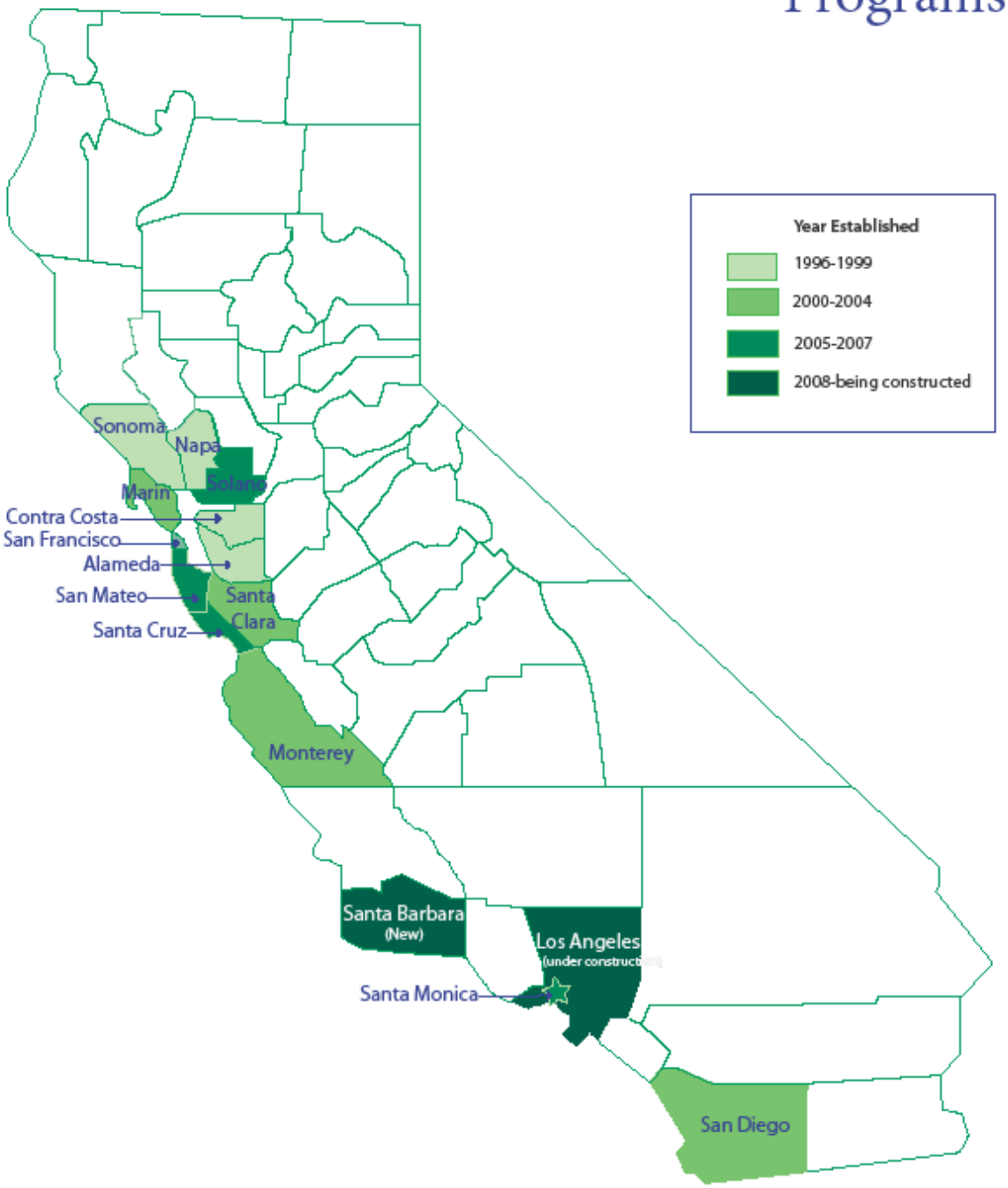
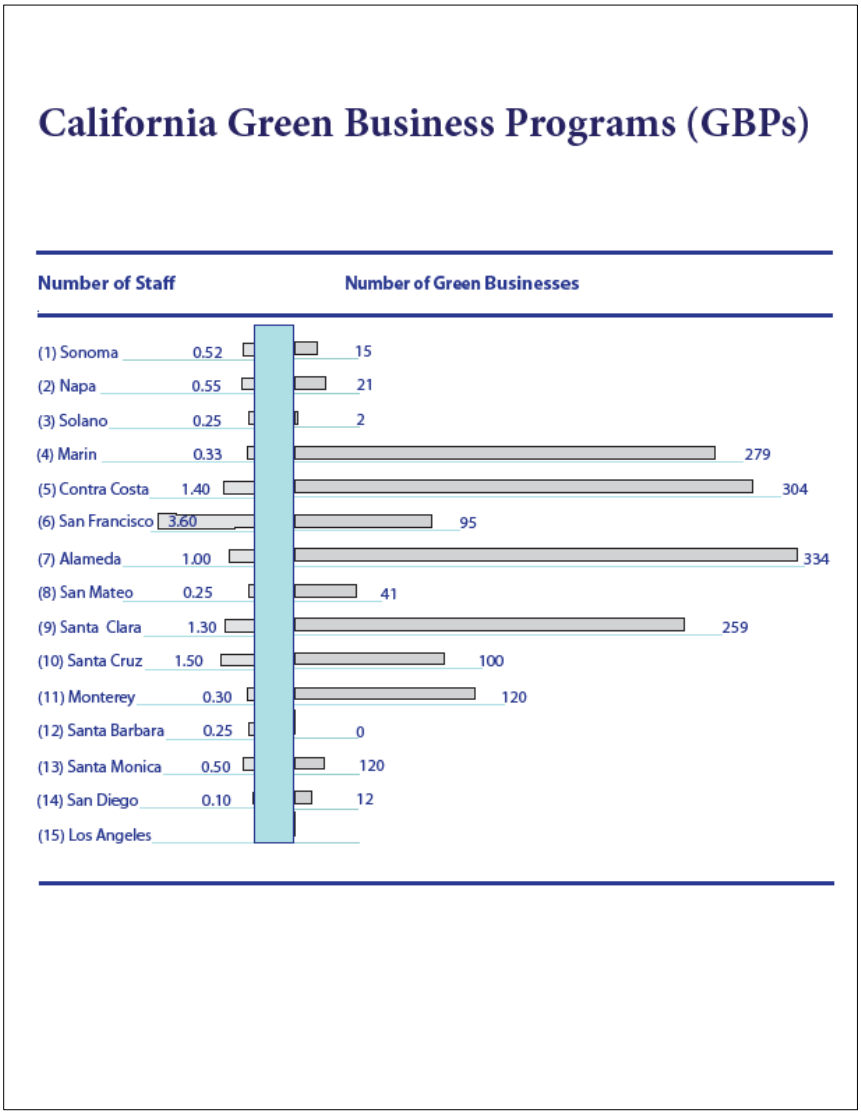
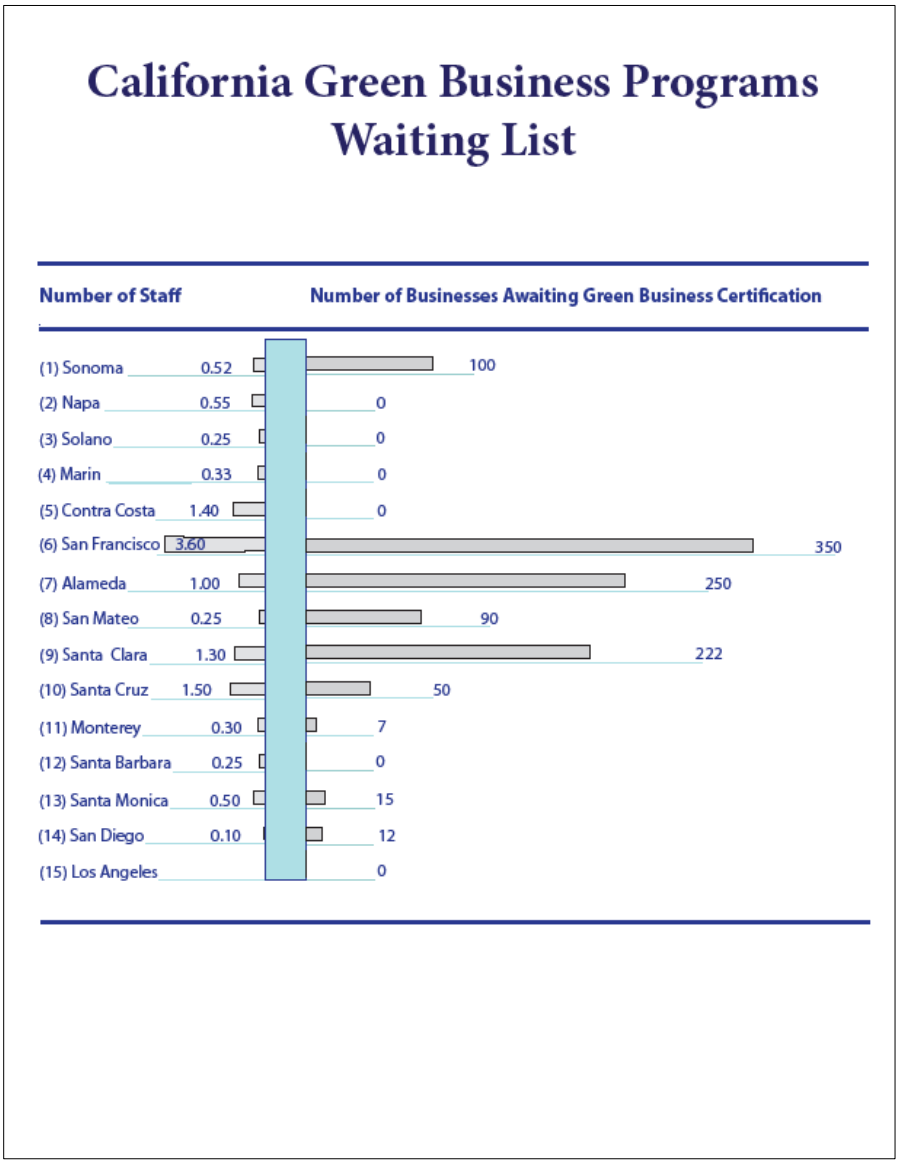


FIGURE B: Staffing levels and green business enrollment[12]



[12] Variable staffing-level-to-outcome ratios should be viewed in light of the date of each program's establishment (Figure A), among other factors, and should not be used to gauge individual programs' comparative levels of effectiveness.

Figure C: Businesses awaiting green certification



DTSC can greatly increase harvest of this low-hanging fruit -- eager potential green businesses in areas with waiting lists for certification, and potentially eager businesses in areas unserved by any existing green business program -- by designing an enhanced funding and staffing mechanism for green business programs. With additional State resources, DTSC and green business program leaders could collaborate in pursuit of federal Green Jobs Act or other funding to create a green-business job corp program. Such a program would generate a pool of inspectors/certifiers to increase existing local programs' capacity, and ultimately, provide statewide green business program coverage.

In a parallel effort, DTSC has already begun to work with existing green business programs to conduct a needs assessment that would enable DTSC technical staff to develop pollution-prevention and green tech educational materials responsive to the needs of businesses seeking certification. The existence of a robust statewide network of green business programs would in turn directly benefit the P2 Office's source reduction work, as green business program coordinators are among the best agents for dissemination of DTSC-generated pollution prevention materials and messages to relevant sectors.

This recommendation could be implemented through slightly increased DTSC staffing (2 PY) to work with green business coordinators on conceptual design of the green job corps program and curriculum, coupled with Agency support for inclusion of this element in a California proposal for federal Green Job Act grant monies.

APPENDIX D-4

KEY ELEMENT

TRAIN A NEW GENERATION OF SCIENTISTS AND ENGINEERS

Team Leader: Jeff Wong, PhD, DTSC

California needs experts trained to think holistically about chemicals. California universities should offer scholarships, promote research and development, issue technology licenses and train students in eco-toxicity, life-cycle analysis and Green Chemistry principles.

Team Members:
Lloyd Tran, Ph.D., International Association of Nanotechnologies
Michael Wilson, Ph.D., University of California, Davis
Invited to participate: Silicon Valley Leadership Group, Agilent Technologies, Ella Baker Center, Proctor & Gamble, San Bernardino Community College

California Workforce 2020: Clear Vision for Green Chemistry

Executive Summary

Through the California Green Chemistry Initiative, the California Department of Toxic Substances Control (DTSC) wants to facilitate the development of a scientific and industrial workforce that produces safer alternatives for materials and products in terms of (1) design and makeup, (2) manufacturing, (3) application and (4) disposition at end-of-life.

DTSC intends to pursue a coalition of educational institutions and training organizations, private sector companies, venture capital, and community organizations to (1) show scientific and technical leadership in green chemistry and “cradle-to-cradle” practices, (2) see successful and safe integration into infrastructure, (3) train the workforce of tomorrow, (4) inform and engage communities, and (5) promote innovation and provide the highest level of environmental and public health.

Strengthened partnerships with the University of California, the State Universities, the Community Colleges, California industry and communities will be the tools to pursue development of a California workforce with “clear vision” for Green Chemistry by 2020. To develop a skilled workforce the State of California (DTSC) will work with the University of California to establish new green technology curricula; provide “continuing education” in Green Chemistry principles, sustainable production, and life-cycle analysis for established

industrial cultures of scientists and engineers in the "high and clean tech" sectors; re-train displaced scientists, engineers and high technology workers to think in green chemistry principles and innovate toward "cradle-to-cradle" production; and prepare disadvantaged communities for employment opportunities as high technology technicians in the industrial sector.

Perspective: The need for Green Chemistry in California

Each day, a total of 42 billion pounds of chemical substances are produced and imported in the U.S. for commercial and industrial uses, 90% of which are produced using fossil fuel feedstocks.[1] (Translated into tonnage, this would be approximately 7.7 billion tons per year. While estimates vary, it is conservatively estimated that this could lead to the generation of approximately 250 million tons of hazardous waste per year.) Global chemical production is doubling every 25 years, rapidly outpacing global population growth.[2]

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1 National Pollution Prevention and Toxics Advisory Committee (NPPTAC), Broader Issues Work Group. How can EPA more efficiently identify potential risks and facilitate risk reduction decision for non-HPV existing chemicals? (2005)

(http://epa.gov/oppt/npptac/pubs/finaldraftnonhpvpaper051006.pdf) On page 4, Table 3 shows that the total pounds produced or imported in 2001, as reported under the 2002 TSCA IUR, is 15,208,921,689,779 pounds, or 41,668,278,602 pounds per day.

U.S. Department of Energy, Office of Industrial Technologies, Renewables Vision 2020, Executive Steering Group. The Technology Roadmap for Plant/Crop-based Renewable Resources 2020 (http://www1.eere.energy.gov/biomass/pdfs/ag_vision.pdf) p. 8. Washington, D.C.:U.S. Government Printing Office, 1999.

National Academy of Sciences, National Research Council. Bio-based Industrial Products: Priorities for Research and Commercialization. National Academy Press, Washington, D.C., 2000.

In this report, the NRC evaluated biobased materials in the U.S. and proposed national targets for their adoption. They reported as follows:

		National targets	
Biobased product	**2000 level**	**2020 level**	**2090 level**
Liquid fuels	1-2%	10%	50%
Organic chemicals	10%	25%	90%
Materials	90%	95%	99%

2 The Organization for Economic Cooperation and Development (OECD), UK Chemicals Industry Association and the American Chemistry Council predict an annual growth rate ranging from 0.026 to 0.035 leading up to 2020. Organization for Economic Cooperation and Development (OECD). *Environmental Outlook for the Chemicals Industry* (http://www.oecd.org/dataoecd/7/45/2375538.pdf) p. 34-36 (2001). This is consistent

Many of these substances come in contact with people – in the workplace, in homes, and through air, water, food and waste streams – and most of them enter the earth's ecosystems at some point during their lifecycle. The potential threat to public health and the environment by these industrial chemicals and their associated waste streams are of great importance to policymakers, state regulators, and the public at large.

Green Chemistry is the best way to reduce these threats. It is a preemptive strategy to innovatively move toward the production and use of less toxic material and away from attempting to merely manage the risks of current hazardous materials.

Green Chemistry is the design of products that do not generate hazardous substances. Green Chemistry focuses on improving the building blocks of manufacturing – the molecules, the feed stocks, and the catalysts used to make things – so products can be engineered to be safer, not persist in the environment and be easily reused. Fewer hazardous substances mean healthier air quality, a safer workplace and cleaner drinking water. Green Chemistry changes the nature of a chemical product so it doesn't threaten human health or the environment. The goal of Green Chemistry is to make things "benign by design."

The Green Chemistry Science Advisory Panel Findings of 2008

A Green Chemistry Initiative Science Advisory Panel was created in the fall of 2007. This Panel consisted of leading academics, industrialists, environmentalists and proponents of green chemistry, whose expertise included chemistry, chemical engineering, environmental law, toxicology, public policy, pollution prevention and cleaner production, environmental and public health, risk analysis, materials science, nanotechnology, chemical synthesis, and research.

The panel believes that California can motivate new investment and innovation in green chemistry by addressing existing data, safety and technology gaps. Their report offers a variety of "supply" side and "demand" side options for green chemistry (and associated processes, technologies and approaches) that could be used to accomplish such..

The Panel's two broad sets of options are defined and described below.

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with production trend data from 1992-2002. ACC: *Guide to the Business of Chemistry,* p 78 (2003).

The population data are from United Nations, Department of Economic and Social Affairs. World Population to 2300. (http://www.un.org/esa/population/publications/longrange2/WorldPop2300final.pdf) New York: United Nations (2004) 4.

"supply" side options – initiatives in education, research, economic incentives, etc. that will help to facilitate the creation and dissemination of greener chemicals, processes and technologies, and

"demand" side options – chemicals policy elements that will drive demand for these greener chemicals, processes and technologies, by better informing the market, providing a level playing field on which greener options can fairly compete, and creating a regulatory climate that drives both the development and the adoption of greener alternatives

The Panel's report further states that *"Investing in green chemistry for the future in California requires special attention to the state's educational services. Teaching green chemistry concepts in primary and secondary schools could attract students to science by positioning chemistry as a tool to meet environmental and health challenges. Reformulating college curricula and offering fellowships and internships would prepare new scientists to be innovative in a critical field. Thus, as California businesses adopt green chemistry practices and strive for new green product development, the state will have prepared its workforce in advance to meet these needs."*

They offered the following eight "supply" side options:

Option 1: Train K-12 Science Educators *- Develop a program to train K-12 science education teachers in the concepts of Green Chemistry*

Option 2: Develop K-12 Green Chemistry Teaching Materials *- Expand California's science education materials programs to include training and laboratory materials for conveying concepts in green chemistry to K-12 classrooms suited to each grade level.*

Option 3: Develop Green Chemistry Interdisciplinary Education Courses *- Develop programs to introduce interdisciplinary green chemistry into the general education curriculum for undergraduates in California colleges and universities.*

Option 4: Integrate Green Chemistry into Higher Education Chemistry and Chemical Engineering Curricula *- Reformulate conventional graduate and undergraduate chemistry and chemical engineering curricula in California colleges and universities to emphasize green chemistry and to include aspects of toxicology, health related issues, ecology, environmental science and environmental law.*

Option 5: Develop Fellowships and Internships in Green Chemistry *- Develop a program to support graduate education fellowships and both undergraduate and graduate internships focused on green chemistry research and application.*

Option 6: Promote Green Chemistry in Business School Education *- Commission the development of practical teaching cases in green chemistry that can be incorporated into the curricula of business schools through the university systems in California.*

Option 7: Support new Faculty Positions in Green Chemistry *- Encourage and financially support the hiring of faculty qualified in green chemistry throughout the state's colleges and universities.*

Option 8: Introduce Green Chemistry into Vocational and Workforce Development Training Programs *- Support and fund a green chemistry program for vocational schools and other workforce development programs.*

Development of a Skilled Workforce

Through the California Green Chemistry Initiative, the California Department of Toxic Substances Control (DTSC) wants to facilitate the development of a scientific and industrial workforce that produces safer alternatives for materials and products in terms of (1) design and makeup, (2) manufacturing, (3) application and (4) disposition at end-of-life. Strengthened partnerships with the University of California, the State Universities, the Community Colleges, California industry and communities will be the tools to pursue development of a California workforce with "clear vision" for Green Chemistry by 2020.

Within its current FY 2008-2009 resources, DTSC will initially focus on **Options 3, 4** and **8. Option 1** and **Option 2** will be addressed by an ongoing educational initiative by the Office of the Secretary for Environmental Protection. The approach to **Options 5, 6,** and **7** is described below in the context of future efforts.

1. **Train a new generation of scientists and engineers**. The State of California (DTSC) will work with the University of California to establish new curricula.

    a. **Short Term Approach:** Work with UCB COEH and the UCOP to establish a green chemistry curriculum at an "RO-1" University (national research powerhouses). This is inherently challenging because the RO-1s are conservative; they include MIT, UCB, UMICH, UWASH, Harvard and others, with UCB being the Nation's #1 chemistry school for many years.

        i. Proposed approach for green chemistry at UCB is to hire post doctoral fellow Dr. Amber Wise (Ph.D. in Chemistry, UCB) to develop a course in green chemistry.
        ii. They seek $100,000 to support the fellowship and sending her to a summer institute at University of Oregon for training on setting up GC curriculum under Dr. James Hutchinson. We proposed in providing partial funding and working with UCB COEH in getting funding from the private sector (ie. Silicon Valley Leadership Group).
        iii. This course in green chemistry will be used initially as a part of a four course certification in Green Design and Manufacturing, organized by Professor Arpad Horvath in engineering.
        iv. COEH will convene a meeting with COEH leadership and Steve Rappaport, Martyn Smith, the Dean of Chemistry, the

Dean of Chemical Engineering (who is supportive) and the DTSC leadership, to convey the importance of the course in California. This will help in cross listing and generating support among chemistry faculty for the course. With support, the course will be "cross listed" as a course for engineering, chemistry and public health.

v. The course could be launched during the Spring Quarter of 2009 as a national model the capstone for a full green chemistry and engineering degree program.

vi. **Option 3** (*Develop Green Chemistry Interdisciplinary Education Courses)* and **Option 4** *(Integrate Green Chemistry into Higher Education Chemistry and Chemical Engineering Curricula)* could be satisfied here.

b. Long Term Approach: Establish the California Institute for Green Chemistry and Green Engineering at UCB and UCLA.

i. Work with UC COEH to develop mission, vision and goals. Develop short-term and long-term resource plan and funding proposal with draft strategic plan.

ii. Meet with Michelle Moskowitz of the Chancellor's Immediate Office (who is very supportive of our GC work) and ask for and scope out a meeting with the Chancellor of UCB.

iii. Meet with the Chancellor and various Vice Chancellors and advocate how the State of California would like to see a California Institute for Green Chemistry and Green Engineering established on the Berkeley and UCLA campuses, beginning with UCB, and that it should include technical, scientific, legal, economic and policy aspects of GC implementation in California.

iv. Gain support from the Governor for such the Institute and from the Legislature.

v. Work jointly with UC on the funding proposal and development in the $10-20 million range for FY 2010-2011.

vi. Dependent upon implementation, the following could be obviously tailored to meet the objectives of described in Panel's **Option 5** *(Develop a program to support graduate education fellowships and both undergraduate and graduate internships focused on green chemistry research and application)***, Option 6** *(Commission the development of practical teaching cases in green chemistry that can be incorporated into the curricula of business schools through the university systems in California)*, and **Option 7** *(Encourage and financially support the hiring of faculty qualified in green chemistry throughout the state's colleges and universities).*

c. Alternative Long-term Approach: Alternative to the above is to pursue "new" GC curriculum at the State University level or at

another UC campus (or consortium of campuses other than UCB (e.g. UC Davis, Riverside and Merced).

i. No State University or UC Merced contacts have been developed.
ii. Dependent on depth of approach and the need to develop a team between these entities and the State of California (DTSC), this effort would likely move toward draft proposals for FY 2012-2013.

2. **Provide "continuing education" in Green Chemistry principles, sustainable production, and life-cycle analysis for established industrial cultures of scientists and engineers in the "high and clean tech" sectors.**

   a. **Build public-partnership with Industry:** develop DTSC-industry coalitions for "in-house" course development and deployment in Green Chemistry in the "Clean Technology Sector."
      i. Negotiate with the International Association of Nanotechnology (IANANO) to develop Green Chemistry "continuing education" in Green Chemistry principles, life-cycle concepts and sustainability. Course would be directed at trade and professional continuing education.
      ii. Develop initial scope of work for green chemistry curricula to focus upon California*'s* biotechnology, clean technology and nanotechnology sectors**.** Seek State funding (through either current contract resources and/or BCP FY 09/10).
      iii. Seek extramural private sector funding for "public-private" partnership for curricula development and deployment. Seek support and funding from Silicon Valley Leadership Group and California Space Authority.
      iv. Negotiate support for this effort from ACC, CICC, P&G, etc.
      v. Jointly pursue and secure Federal funding under the Federal Green Jobs Act of 2007 for curricula development and deployment in green chemistry.

   b. **Build public partnership with community college system**: develop DTSC-community college coalition to "test" in-house course material and to expand course development and deployment options.
      i. Developed course in nanotechnology and the importance of green chemistry for the high technology sector at the San Bernardino Community College's Donald F. Averill Applied Technology Training Center.
      ii. Jointly pursue Federal funding under the Federal Green Jobs Act of 2007 for curricula development in green chemistry.

3. **Re-train displaced scientists, engineers and high technology workers to think in green chemistry principles and innovate toward "cradle-to-cradle" production.**

    a. **Build public-partnership with Industry:** develop DTSC-industry coalitions for course development and deployment in Green Chemistry for the "displaced" high technology workforce.
        i. Negotiate with the International Association of Nanotechnology (IANANO) to develop Green Chemistry "continuing education" in Green Chemistry principles, life-cycle concepts and sustainability. Course would be directed at trade and professional re-training.
        ii. Develop initial scope of work for green chemistry curricula to focus upon California's displaced workforce from manufacturing, aerospace, biotechnology, clean technology and nanotechnology sectors**.** Seek State funding (through either current contract resources and/or BCP FY 09/10).
        iii. Seek extramural private sector funding for "public-private" partnership for curricula development and deployment. Seek support and funding from California Employment Development Department and the private sector.
        iv. Negotiate support for this effort from the private sector.
        v. Jointly pursue Federal funding under the Federal Green Jobs Act of 2007 for curricula development and deployment in green chemistry with selected non-profit organizations.
        vi. DTSC to teach course for nanotechnology and clean technology sectors workforce re-training in risk, hazard and green chemistry principles at the "Work2Future" center in San Jose, California.

    b. **Build public partnership with community college system**: develop DTSC-community college coalition to develop course material and education curricula in green chemistry and "cradle-to-cradle" concepts for the re-training of the "general" workforce.
        i. Developed course and curricula on green chemistry for the general work force at the San Bernardino Community College's Donald F. Averill Applied Technology Training Center and other community colleges.
        ii. Jointly pursue Federal funding under the Federal Green Jobs Act of 2007 for curricula development in green chemistry.

4. **Prepare disadvantaged communities for employment opportunities as the private and public sector moves toward green chemistry and "Cradle-to-Cradle" strategies:** California needs to harness human

resources available in disadvantaged communities to safely work as high technology technicians in the industrial sector.

a. **Build public-private partnerships with "non-govermental organizations"**: develop DTSC-NGO coalition to develop course material and education curricula in green chemistry and "cradle-to-cradle" concepts for the re-training of the "general" workforce from "disadvantaged" communities.
    i. Develop NGO contacts.
    ii. Work with Ella Baker Center during July 2008 to find partners within the Apollo Alliance.
    iii. Jointly pursue Federal funding under the Federal Green Jobs Act of 2007 for course and curricula development in green chemistry.
    iv. Work toward model programs to commence by FY 2010-2011.

APPENDIX D-5

KEY ELEMENT

INCLUDE GREEN CHEMISTRY PRINCIPLES IN AN EDUCATION AND THE ENVIRONMENT INITIATIVE

Team Leader: Andrea Lewis, Cal/EPA

Students from kindergarten through 12th grade will be tomorrow's workforce and consumers. Environmental education curriculum should be expanded to include understanding of toxic chemicals, risk, consumer choice and sustainability.

Team Members:
Office of Education and the environment, CIWMB
California Resources Agency
California Department of Education
California State Board of Education
California's Office of the Secretary for Education
Heal the Bay
The National Geographic Society
The State Education and Environment Roundtable
National, state, and local partners
Universities and academic agencies
Professional organizations (CSTA, California State PTA, etc)

Executive Summary

California is currently poised to lead the nation in environmental literacy as a result of the Education and the Environment Initiative (EEI). A landmark education law, the EEI requires the development and dissemination of a Kindergarten-12th grade environment-based education program for all K-12 grade students in the State's public schools. The sweeping legislation that established the EEI presents a unique opportunity to formally include environment-based education into California's schools.

The mission of the EEI is to provide teachers with K-12 instructional materials that will produce environmentally literate students using a standards-driven curriculum. The EEI curriculum will empower California's teachers to provide public school children with a standards-based instructional program that encourages environmental literacy for the next generation. The curriculum will be supported through a statewide professional development initiative for teachers.

Although not a requirement by law, the EEI curriculum will include the subject-matter of green chemistry, as appropriate to California academic content standards and grade levels.
Introduction

California is currently poised to lead the nation in environmental literacy as a result of the Education and the Environment Initiative (EEI). A landmark education law dating back to 2003,

the EEI requires the development and dissemination of a Kindergarten-12th grade environment-based education program for all K-12 grade students in the State's public schools. The sweeping legislation that established the EEI presents a unique opportunity to formally include environment-based education into California's schools. The California Environmental Protection Agency and the California Integrated Waste Management Board jointly manage the EEI, and work in cooperation with the State Board of Education, the Curriculum Development and Supplemental Materials Commission, Office of the Secretary for Education, the Department of Education, the Resources Agency and two, key external State of California partners, the National Geographic Society and Heal the Bay.

The mission of the EEI is to provide teachers with K-12 instructional materials that will produce environmentally literate students using a standards-driven curriculum, a curriculum that is designed to be taught in the classroom in conjunction with existing textbooks. In January 2010, the California State Board of Education is scheduled to announce approval of the Education and the Environment Initiative's (EEI) curriculum, comprised of 85 units encompassing a K-12 grade span in the subject-matter areas of Science and History-Social Science.

The EEI is focused on education about the environment, California's public schools (teachers, students, and administrators), California's academic content standards, and adopted instructional materials. In addition, the law specifies collaboration among State of California entities to coordinate environmental education materials and regulatory consistency.

The law specifies the EEI Environmental Principles & Concepts (EP&C) and curriculum will address fourteen environmental subject-matter areas (below). We will also be addressing climate change and green chemistry in applicable curriculum units.

- Environmental sustainability
- Water
- Air
- Energy
- Forestry
- Fish and wildlife resources
- Oceans
- Toxics and hazardous waste
- Integrated waste management
- Integrated pest management
- Public health and the environment
- Pollution prevention
- Resource conservation and recycling
- Environmental justice

The law also specifies the EEI curriculum will address the core disciplines of science, history/social science, English/language arts, and mathematics, K-12. As a result of a comprehensive alignment process between California's academic content standards and California's EP&C, we have identified 101 standards that will be addressed in 85 EEI curriculum units. The unique goal of the EEI curriculum is to teach California's standards – *and* the EP&C – to mastery, enabling teachers to readily embrace the curriculum materials as a viable element in the classroom. The EEI curriculum will be presented to the SBE for approval in early 2010.

Upon approval by the SBE, the EEI curriculum will be made available to California's public school teachers and students throughout the state via the Internet, by law, free of charge. Our goal, however, is to provide every teacher, K-12, for Science, History/Social Science and English/Language Arts printed grade-level unit packages, including maps, DVD's, CD's, student materials, etc. In addition, we plan to engage every California school district in supporting the integration of the EEI curriculum into everyday classroom teaching, with a direct correlation to the State's adopted instructional materials.

The Challenge

Being the first State Board of Education-approved environmental education curriculum spanning K-12 for California's public school system (planned for January 2010), there are numerous challenges at the present time and in the future: 1) fiscal needs with the creation of 85 curriculum units and associated supporting materials (maps, readers, Big Books, handouts, etc.), printing, and distribution; 2) production-related in terms of appropriate personnel to support development of 85 curriculum units (writers, editors, etc.); 3) operationally, with distribution to California's school districts, incorporation into district plans, teacher awareness, professional development, and use, etc.; 4) incorporation into existing, approved instructional materials (textbooks, etc.); 5) professional development for teachers, others; and 6) evaluation.

Background

The legislative drive for the EEI was initiated by the Heal the Bay, a Santa Monica-based environmental organization, in cooperation with Assemblymember Fran Pavley. The EEI gained both public and private support, which resulted in the passage of signing of AB 1548 in 2003. This law is now referred to as the Education and the Environment Initiative (EEI). .Signed into law by former California Governor Gray Davis, bipartisan support for the EEI has grown under Governor Schwarzenegger. As a result, in 2005 with the wide-range backing of collaborating agencies and the Legislature, Governor Schwarzenegger's budget allocated $7.0 million to fund the development of the K-12 EEI curriculum. As an update, the Governor's budget includes $1.167 million in FY 08/09 and $917,000 in FY 09/10 for the EEI. From the very beginning, the EEI has represented a successful model of public-private partnership.

The key legal mandates include:

- Develop Environmental Principles & Concepts (EP&C)
- Support Academic Content Standards
- Incorporate EP&C into Instructional Materials Adoption Criteria
- Create Model Curriculum for K-12
- Encourage Regulatory Consistency
- Coordinate State Agency Environmental Information for Children and Teachers

The Opportunity

The EEI is jointly managed by Cal/EPA's Office of the Secretary and the California Integrated Waste Management Board (CIWMB). The CIWMB's Office of Education and the Environment is codified in law as the State's long-term implementation entity for the EEI. The EEI management team has been joined by the National Geographic Society and Heal the Bay and we work in partnership with the State Board of Education, Department of Education, Office of the Secretary for Education, and the Resources Agency.

Major strategies (actions):
The EEI recently received funding to launch a strategic planning process. Based on our experiences to date, in advance of robust strategic planning analyses and formal plan, we consider our primary strategies to be: 1) funding, short and long-term and budget, short and long-term; 2) the pursuit of philanthropic and other funding support; 3) curriculum development, review, and approval; 4) legislative, bipartisan support of the EEI; 5) outreach to school districts and teachers; 6) professional development for districts and teachers; 7) publisher integration of the EEI into adopted instructional materials, and 8) evaluation.

Major milestones (timeline): Please see attached.

Institutional structure: The EEI is jointly managed by the Office of the Secretary of Cal/EPA and the CIWMB.

Metrics: We are field testing (and soon to be pilot testing) in some 20 school districts throughout the State of California. Feedback is being received from teachers on specific EEI curriculum units. In addition, feedback is being received via the Internet on curriculum units in field testing stage. We are documenting feedback, per curriculum unit, and making changes as needed. However, the broader picture regarding the impact of the EEI in terms of learning and behavior has yet to be measured. These metrics are a long-range goal of the EEI.

Recommendation(s): The EEI curriculum will bring education about the environment into California's public schools, in the classroom and in conjunction with adopted instructional materials. This mainstream approach is unprecedented, as is the approval of an environmental education-related curriculum by California's State Board of Education. Although not a prescribed requirement of the law, the EEI will include green chemistry information, as appropriate to the academic content standards and grade levels. Thus, we recommend full support by the Department of Toxic Substances Control, with associated financial support as deemed appropriate and feasible to curriculum development and implementation.

APPENDIX D-6

KEY ELEMENT

ACCOUNT FOR CHEMICAL TOXICITY AND IMPACTS IN STATE PROCUREMENT DECISIONS

Team Leader: Stan Lau, DTSC

California must lead by example and adhere to the same standards it proposed for the private sector. State agencies can leverage their influence in the marketplace by including cradle-to-cradle and life-cycle cost analyses in purchasing decisions.

Team Members:
Anne Blake, Anne Blake Consulting
Kathy Frevert, CIWMB
Claudia Polsky, DTSC
Debbie Rafael, San Francisco
Bob Tetz, DGS
Charleen Fain-Keslar, DGS
Antoinette Stein, DGS

Executive Summary

The California Environmental Protection Agency directed the Department of Toxic Substances Control to lead Cal/EPA's Green Chemistry Initiative with the goal of significantly reducing public health and environmental impacts, as well as costs, by affecting the redesign of product formulations and manufacturing processes. The initiative gathered policy options through a "Conversation with California." As part of the "Conversation with California", the Green Chemistry Initiative Science Advisory Panel prepared a report, "Green Chemistry Options for the State of California."

A Key Element outcome from the "Conversation with California" is to account for chemical toxicity and impacts in state procurement decisions. California law directs the Department of General Services, in consultation with Cal/EPA, to provide state agencies with information and assistance regarding environmentally preferable purchasing. DGS has established a framework for environmentally preferable purchasing (EPP) throughout its procurement activities to meet its obligations under Public Contract Code, sections 12400-12404. The State should continue its EPP efforts, develop a strategy to strengthen the state's existing environmentally preferable purchasing activities, and broaden the scope of its efforts to provide green chemistry solutions to consumers beyond state government.

Introduction

Secretary for Environmental Protection Linda S. Adams stated in her memo announcing the California Environmental Protection Agency's (Cal/EPA) Green Chemistry Initiative that California needs to "develop a coordinated, comprehensive strategy designed to foster the development of information on the hazards posed by chemicals, ways to reduce exposure to dangerous substances, approaches that encourage cleaner and less polluting industrial processes, and strategies to encourage manufacturers to take greater responsibility for the products they produce."

Secretary Adams directed the California Department of Toxic Substances Control (DTSC), in collaboration with the other Cal/EPA boards, departments, and offices and other state agencies, to initiate a broad public process to generate ideas and identify policy options. The Conversation with California involved over 600 participants and consisted of five major components: brainstorming sessions, Green Chemistry symposia, a web log, the Science Advisory Panel, and preparation of a report, "California Green Chemistry Initiative, Phase 1: A Compilation of Options."

The Phase 1 Report identified Key Elements that recurred throughout options that were received from the Conversation with California. As identified in the Phase 1 Report, one Key Element is "Account for chemical toxicity and impacts in state procurement decisions. California must lead by example and adhere to the same standards it proposes for the private sector. State agencies can leverage their influence in the marketplace by including cradle-to-cradle and life-cycle cost analyses in purchasing decisions."

To engage the scientific community, the Green Chemistry Initiative Science Advisory Panel was assembled, consisting of 23 of the nation's leading scientists and engineers. The panel is a public advisory group structured to provide DTSC with a balanced, expert assessment of scientific matters pertaining to the advancement of green chemistry. Following seven months of discussion, the panel prepared a report, "Green Chemistry Options for the State of California." All members of the panel agreed on one central concept – "the advancement of green chemistry in California is an effective vehicle to promote innovation in ways that also protect human health and the environment and provide new economic opportunities to the people of California."

The Science Advisory Panel identified a range of options to increase the demand for greener chemicals, products, process and technologies. The first group of options under "Information and Tools" provides access to information and develops tools that help producers, sellers, purchasers and consumers of chemical products and services to select greener alternatives. The second group of options under "Market Promotion of Green Chemistry" promotes the adoption of greener products in the marketplace. One option in the Market Promotion of Green Chemistry is to incorporate green chemistry criteria into state procurement processes.

California can support green chemistry through its role as a consumer of environmentally preferable goods and services. This option would leverage the collective purchasing power of the Department of General Services (DGS), other state agencies, city and county governments, and public schools as well as other states through leveraged regional contracts such as the Western States Contracting Alliance (WSCA). WSCA was formed by the state purchasing directors as a means wherein participating states may join together in cooperative multi-state contracting to achieve cost-effective and efficient acquisition of quality products and services. Cooperative purchases are developed by member states. Enlarging the scope of the state's existing environmentally preferable purchasing (EPP) activities could enable green chemistry solutions to be recognized and considered in ongoing decisions, thereby expanding demand for these environmentally preferable products.

The Challenge

State government as a consumer is an entity that is comprised of over 200,000 employees working within a vast organizational structure. Within the community of state employees, thousands are involved in some aspect of purchasing, such as those who oversee an organization's purchases, procurement and contracting officials, employees who place orders for products, and local government and other organizations (such as the University of California, California State University, California Community Colleges, and other school facilities throughout the state) that utilize state contracts.

Some aspects of state purchasing are centralized through Department of General Services and its divisions, such as Real Estate Services Division and Procurement Division. The scope of DGS' purchasing oversight is apparent, considering the breadth of the services it provides. The Real Estate Services Division (RESD) provides real estate services to state agencies. These services include asset management and planning, property sales and acquisition, project management, architectural and engineering services, leasing and planning, property management and building maintenance, construction management, energy efficiency and supply programs, and environmental assessments. RESD manages over 24 million square feet of space in state owned or managed facilities.

The Procurement Division sets state procurement policies, provides purchasing services, delegates purchasing authority, certifies small/disabled veteran businesses to do business with the state, sponsors the Small Business Council, participates in the Disabled Veterans Business Enterprise Council, and provides innovative purchasing methods. The Procurement Division oversees approximately 295 commodity contracts with approximately 450 suppliers, administers more than 1,800 California Multiple Award Schedule (CMAS) contracts, and administers 343 Master, 70 Western State Contract Alliance (WSCA) and 100 Software Licensing Program (SLP) agreements.

The task of accounting for chemical toxicity and impacts in state procurement decisions is daunting, considering the sheer number of end-users and purchasing decision

makers, the complexity of state government's organizational structure, and the number of products purchased and services utilized by over 200,000 state employees. The addition of a directive to account for chemical toxicity and impacts, that is to purchase environmentally preferable products and services, may pose a challenge to existing resources.

However, investing in EPP is an investment in California's future. EPP provides a variety of benefits that can range from financial, human health and the environment, to larger societal benefits. Financial costs and benefits can be quantified by weighing the purchasing price and frequency of purchase against operating costs, maintenance repair and replacement costs, occupational health costs, and liability. In contrast, environmental and societal costs and benefits are much harder to quantify and incorporate into decision making.

Commonly cited environmental benefits include, but are not limited to, reducing materials consumption, providing a useful outlet for collected recycled material, reducing greenhouse gas emissions, conserving water, conserving energy, increasing the use of renewable products, and reducing the presence of toxic and hazardous substances in the workplace and environment. These benefits in turn improve public and occupational health and safety, improve wildlife habitats, decrease air, water, and soil contamination, improve compliance with regulations, decrease costs associated with waste management, disposal, and cleanup, promote a sustainable economy, and develop markets for environmentally preferable goods and services (U.S. EPA, EPA530-N-01-002). While these benefits are difficult to measure, and are in some cases incommensurable, they are the types of considerations that can be analyzed with life cycle analyses. Life cycle measurements and assessments, as discussed in Appendix of the Green Chemistry Initiative's Policy Recommendations Report, can effectively account for many of these benefits and incorporate their values into purchasing decisions.

Background

Assembly Bill 498 (Chan, Chapter 575, Statutes of 2002) added sections 12400-12404 to the Public Contract Code (PCC) and directs DGS, in consultation with Cal/EPA, members of the public, industry, and public health and environmental organizations, to provide state agencies with information and assistance regarding environmentally preferable purchasing. Environmentally preferable purchasing (EPP) is defined in state law as "the procurement or acquisition of goods and services that have a lesser or reduced effect on human health and the environment when compared with competing goods or services that serve the same purpose." Unlike other laws that may focus on one toxic component or environmental pathway, this law requires the comparison of human health and environmental effects of competing goods and services to include, to the extent feasible, multiple attributes such as "raw materials acquisition, production, manufacturing, packaging, distribution, reuse, operation, maintenance, disposal, energy efficiency, product performance, durability, safety, the needs of the purchaser, and

cost." With regard to performance and cost, state law specifies that EPP does not require the "acquisition of goods or services that do not perform adequately for their intended use, exclude adequate competition, or are not available at a reasonable price in a reasonable period of time."

DGS, the California Integrated Waste Management Board, and over 100 state employees from about 16 state agencies, created an online Environmentally Preferable Purchasing Best Practices Manual. The EPP Best Practices Manual serves as a guide to help EPP practitioners, including state agencies with purchasing authority, find and select environmentally preferable products. The Best Practices Manual helps purchasing officials write environmental specifications into bid solicitations, access Web sites and other resources related to EPP, choose more environmentally preferable products and services in numerous categories, become educated about the environmental impacts associated with the manufacture and purchase of numerous products and services, identify ways to reduce waste in the office, shop, or facility, and locate surplus and reuse programs to obtain low-cost or used equipment and supplies. DGS continues to add and update the Best Practices Manual, which now contains 35 chapters on specific commodities.

DGS incorporated some environmentally preferable attributes in contracts for 28 commodities or services. These contracts cover a variety of commodities and services including air filters; recycled plastic benches and tables; binders; carpet; cleaning products; computers; monitors; copiers and associated services; electronic waste recycling services; envelopes; fluorescent lamps; glass spheres for traffic paint; paper grocery bags; lockers and storage cabinets; lube, oil, and grease; maintenance, repair and operations; mattresses; office supplies, recycled paint; copy paper; newsprint paper; uncoated offset book paper; printers; signs; remanufactured toner cartridges; trash bags; hybrid vehicles; and alternative fueled vehicles. As an ongoing practice DGS uses a process of continual improvement to advance the environmentally preferable features of contracts each time the contracts are renewed.

AB 498 directs DGS to increase EPP through the development of statewide policies. DGS issued Administrative Order 06-04, a sustainable copy paper policy, with support from the Governor's Green Action Team, as part of the State's efforts to promote sustainable paper use strategies and promote energy savings. The policy requires DGS' Procurement Division, the Business Services Office, and all purchasing agents for the DGS to purchase only 100 percent post consumer recycled content copy paper. This policy also adopted measures to help reduce consumption of paper such as purchasing equipment that automatically print or copy on both sides of a sheet of paper and expanded the use of electronic communications.

DGS has an MOU with the Center for a New American Dream, a non-profit organization, to provide California with pro bono support to accomplish two principal objectives: revamp the Best Practices Manual to expand the scope of outreach to include individual consumers as well as suppliers and to develop marketing tools to

publicize the revised manual; and develop a methodology for evaluating product standards and independent third party certification processes.

The California Procurement & Contracting Academy (Cal-PCA) provides free professional development courses and seminars to the state procurement and contracting community so they can acquire essential knowledge that will improve the state's contracting processes. DGS' Procurement Division and the California State University (CSU) System coordinate and deliver all the courses, workshops, and certificates. As part of this effort, DGS developed a workshop offered through the Cal-PCA on environmentally preferable purchasing. The workshop acquaints state buyers and other interested parties with California's EPP and State Agency Buy Recycled Campaign (SABRC) programs. Upon completion of the workshop, students understand: the elements of EPP; how to identify key environmental attributes of a product; how to specify environmentally preferable products; green products available on State contracts; how to use EPP Best Practices Manual; how to interpret eco-labels and recognize false claims, or "greenwashing;" the elements of the SABRC program; and how to comply with SABRC reporting requirements.

The Opportunity

DGS has established a framework of EPP throughout its procurement activities and continues to meet its obligations under AB 498. In the near term the following options are recommended to address the goals of the Green Chemistry Initiative and strengthen the existing EPP framework.

1. DGS should continue to incorporate environmentally preferable attributes in contracts for commodities and services. Currently, DGS has 28 contracts in place, however, DGS oversees over 295 commodity contracts. This represents a huge opportunity to expand the EPP program to additional commodities and services.

2. DGS' MOU with the Center for a New American Dream Outreach is expected to result in additional outreach beyond state employees to individual consumers as well as suppliers. The development of a methodology for evaluating product standards and independent third party certification processes would hasten the incorporation of such standards and certified processes into contracts, thereby increasing the state's purchase of environmentally preferable products and services.

3. As California implements its strategy to meet the goals established by Secretary Adams, "to develop a coordinated, comprehensive strategy designed to foster the development of information on the hazards posed by chemicals, ways to reduce exposure to dangerous substances, approaches that encourage cleaner and less polluting industrial processes, and strategies to encourage manufacturers to take greater responsibility for the products they produce," it is crucial for coordination between GCI and DGS to ensure that disclosure and data needs are met to promote environmentally preferable purchasing. Vendors are constantly promoting new products

with claims of enhanced characteristics to meet end user needs. Information gathered and disseminated in the consumer outreach key element can help DGS to distinguish environmentally preferred products and evaluate new products, such as those containing nanomaterials.

DGS, in the role of the state's business manager, requires scientific and engineering support to evaluate the environmental claims of products and services purchased by the state. Under a longer time-frame, the following options would require participating agencies to identify and designate resources to help accomplish these activities.

4. In a coordinated effort, state agencies including Cal/EPA, DGS, and the Department of Public Health could develop general product protection goals to protect the State and the public from environmental health impacts from chemicals in products for the products' life cycle. These goals would be used to evaluate existing product standards.

5. The state purchases thousands of different products, many with claims of environmental benefits. To help focus DGS' resources dedicated to promoting EPP, GCI should define a priority list of product categories for evaluation and inclusion in solicitations in order to reduce exposure risks.

6. GCI, in collaboration with applicable state agencies including the Department of Public Health, Cal/EPA, and DGS, should develop a tool box of broad based product evaluation criteria, specifications, and standards to address toxic chemical exposures and impacts across the entire life cycle of products including those pertaining to the supply chain.

7. GCI, in collaboration with applicable state agencies including the Department of Public Health, Cal/EPA, and DGS, could develop standardized transparent product life cycle impact assessment (LCIA) metrics specifically applicable to toxic chemicals for general use for procurement. This development would include energy, resource, and toxicity calculation and baseline rules that may be applied for Statewide EPP use. As defined by USEPA, the life cycle impact assessment (LCIA) phase of a life cycle assessment (LCA) evaluates potential human health and environmental impacts of the environmental resources and releases identified during the life cycle inventory. Impact assessment should address ecological and human health effects as well as resource depletion. LCIA attempts to establish a linkage between the product or process and its potential environmental impacts.

8. DGS, Procurement Division should conduct a pilot product project using the GCI developed tool-box and the LCIA metrics to determine their effectiveness as a part of the EPP procurement process and will report on any criteria found that can be applied to other statewide product purchases and where new and more tailored standards may be needed for future procurements of products.

APPENDIX E

Draft Example: Toxicity and Hazard Trait Data from Existing Regulatory Programs and Authoritative Sources

End-points, hazard traits, etc.

Toxicity and Hazard Trait Data from Existing Regulatory Programs and Authoritative Sources

DATA SOURCE	Prop 65		PBT	EDC	Mutagen	Allergen	Neurologic	Organ	Lung	Hormones	Epigenetic	Breakdown	Ecologic	Concentration / Dose		Exposure Limits			Exposure Routes			Chronic	Acute	Physical and Chemical Properties						
	Cancer	Developmental/ Reproductive Effects	Persistent, Bioaccumulative, Toxic	Endrocrine Disruptor	Mutagenicity/ Genetic toxicity	Immunological Effects/ Sensitization	Neurological / Neurodevelopment Effects	Liver, Kidney, Eye, Blood, Heart Effects	Respiratory Effects	Disruption of signaling and hormone systems	Epigenetic Effects	Degradation Product Effects	Ecological Effects, Aquatic, Avian, Reptilian, Mammal	TCLo (lowest published toxic concentration)	TDLo (lowest published toxic dose)	OSHA: TWA, STEL, Action Lelve	ACGIH: TWA, STEL, A2	NIOSH: TWA, MAK, Peak	Inhalation	Ingestion	Skin / Eye contact	Chroni Effects	Acute Effects	Flash Point	Flammable Limits	Explosive / Reactive	Incompatible	Synonyms / Trade Names	Micorbiological	
California Proposition 65	•	•																												
EU REACH	•			•	•	•																								
Canadian CEPA Act		•	•	•	•																									
National Toxicology Program	•	•	•	•	•				•	•									•	•	•									
IARC[1]I	•																													
Toxic Release Inventory[2] 581 list			•																											
Clean Air Act Hazardous Air Pollutants									•																					
California ATCMs[3]						•			•																					
SARA EPCRA[4] 313 List			•																											
FWPCA 126 priority pollutants list	•		•		•		•					•																		
CERCLA												•	•						•	•	•									
Clean Water Act Water Quality Criteria		•																											•	
NPDES[5]												•	•																	
NIOSH							•	•	•							•	•	•						•	•	•	•	•		
OSHA																•	•	•	•	•	•									
DBPCAN[6]	•																													
TSCA														•	•	•	•	•	•	•	•	•	•							
High Product Volume	•	•	•	•	•	•	•	•	•	•																				
LOUS [7] Danish	•	•	•	•	•	•			•			•	•																	
E Chem Portal			•									•	•											•	•	•	•	•		
California Green Chemistry Matrix	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•

[1] International Agency for Cancer Research Agency (IARC)
[2] TRI updated/ lowered the EPCRA section 313 reporting thresholds from 25,000 pounds for the manufacture or processing of a chemical and 10,000 pounds for otherwise use of the chemicals on the list. The quantities were lowered to 100 and 10 pounds, respectively.
[3] Airborne Toxic Control Measures (ATCMs)
[4] Community Right to Know List
[5] National Pollutant Discharge Elimination System (NPDES)
[6] Disinfection By Product Chemicals Carcinogenicity Estimates Database(DBPCAN) – 209 found in drinking water
[7] List of Undesirable Substances (LOUS) Danish

APPENDIX F

Examples of Environmental Scorecards, Footprint Calculators, and Similar Metrics

APPENDIX F

ENVIRONMENTAL FOOTPRINT CALCULATORS

Examples of Current Environmental Footprint Calculators

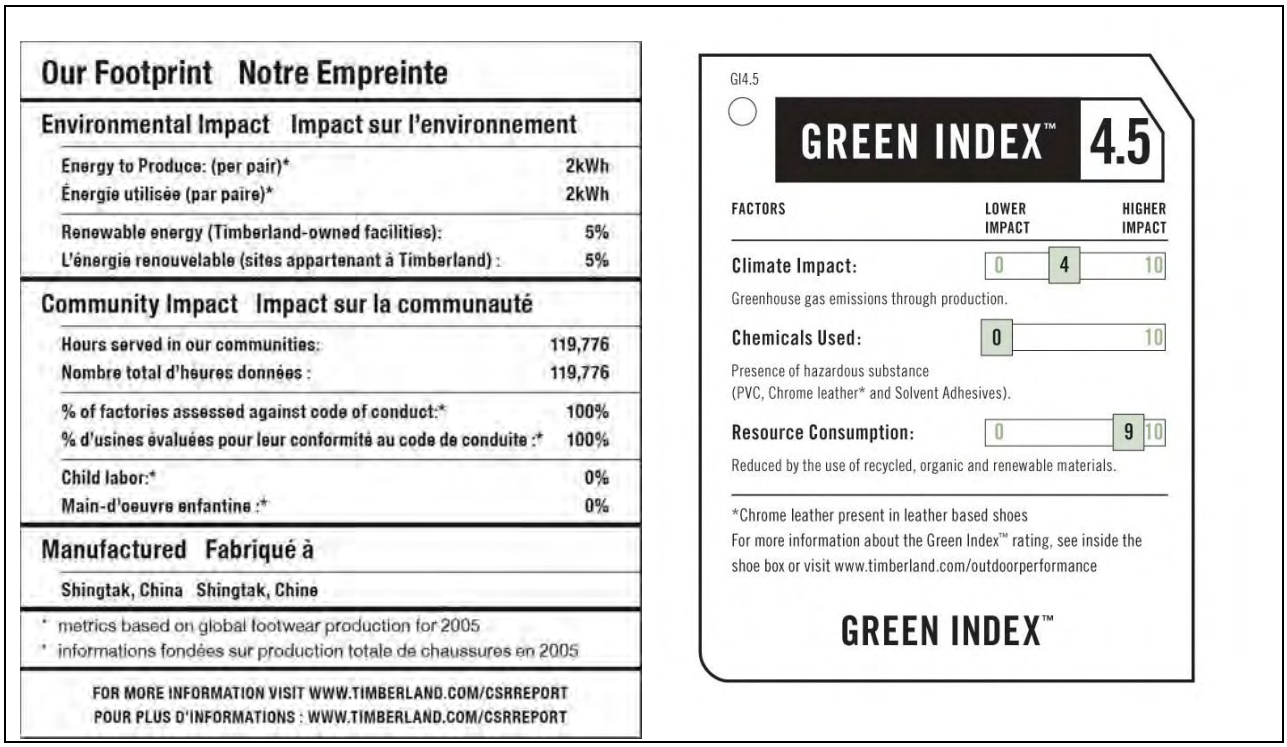
The Leadership in Energy and Environmental Design (LEED) ® Green Building Rating System, for example, provides a suite of standards for environmentally sustainable construction Is one example The designated levels in the LEEDs model – green, silver, gold and platinum correspond to the degree that a building meets specified criteria. While LEED establishes metrics and scores for buildings, there are other types of environmental footprint calculators and lifecycle management metrics for other product types (e.g., carpets, household cleaners, and clothing).

> ***LEEDs*** *is the Leadership in Energy and Environmental Design (LEED) Green Building Rating System™ encourages and accelerates global adoption of sustainable green building and development practices through the creation and implementation of universally understood and accepted tools and performance criteria.*

Patagonia ® for example, launched, *Patagonia's Footprint Chronicles* ®, an interactive mini-website that allows consumers of Patagonia products to track the impact of several Patagonia products from design through delivery. The site allows individuals to click on up to 10 products currently on the website. After the product is selected, the next screen provides a summary of the good; the bad; what we think; and an opportunity for individuals

Figure F-1. Patagonia's footprint Chronicles.

While Patagonia's model relies on a web based system, Timberland ®, another clothing manufacturer provides a label that resembles the "Nutrition Facts" label found on food and beverage products and offers consumers a recognizable format to learn more about the company's efforts.



Our Footprint Notre Empreinte

Environmental Impact Impact sur l'environnement

Energy to Produce: (per pair)*	2kWh
Énergie utilisée (par paire)*	2kWh
Renewable energy (Timberland-owned facilities):	5%
L'énergie renouvelable (sites appartenant à Timberland) :	5%

Community Impact Impact sur la communauté

Hours served in our communities:	119,776
Nombre total d'heures données :	119,776
% of factories assessed against code of conduct:*	100%
% d'usines évaluées pour leur conformité au code de conduite :*	100%
Child labor:*	0%
Main-d'oeuvre enfantine :*	0%

Manufactured Fabriqué à

Shingtak, China Shingtak, Chine

* metrics based on global footwear production for 2005
* informations fondées sur production totale de chaussures en 2005

FOR MORE INFORMATION VISIT WWW.TIMBERLAND.COM/CSRREPORT
POUR PLUS D'INFORMATIONS : WWW.TIMBERLAND.COM/CSRREPORT

GI4.5

GREEN INDEX™ 4.5

FACTORS	LOWER IMPACT	HIGHER IMPACT
Climate Impact:	0	4 / 10
Greenhouse gas emissions through production.		
Chemicals Used:	0	10
Presence of hazardous substance (PVC, Chrome leather* and Solvent Adhesives).		
Resource Consumption:	0	9 / 10
Reduced by the use of recycled, organic and renewable materials.		

*Chrome leather present in leather based shoes
For more information about the Green Index™ rating, see inside the shoe box or visit www.timberland.com/outdoorperformance

GREEN INDEX™

Figure F-2. Timberland Clothing and Footwear. Timberland's "Our Footprint" label appears on the side of each footwear box and provides consumers with insight into Timberland's environmental and community impact.

The label consists of three sections:

- Environmental Impact: Provides the average amount of kilowatt hours (kWh) needed to produce a pair of Timberland® footwear; in addition, it indicates the amount of Timberland's energy that is generated from renewable resources such as the sun, wind or water.
- Community Impact: Details what percentage of factories are assessed by against the company's code of conduct, reiterates Timberland's strict no child labor policies, and shares the total number of hours volunteered in the community by Timberland employees.
- Manufactured: Lists the name and location of the factory where the product was made.

In addition, Timberland Company has launched a new marketing campaign, Earthkeeper, with a goal of recruiting one million people to become part of an online network designed to inspire environmental change. A new Earthkeeper product collection has also been unveiled. The campaign includes online social networking tools, including partnerships with Changents.com, a Facebook page, a YouTube Earthkeeper Brand Channel and an Earthkeeper blog.

Wal-Mart ®, the world's largest retailer, began using its Sustainable Packaging Scorecard, announced in 2006. The scorecard rates suppliers on their progress toward developing sustainable packaging as well as their ability to help Wal-Mart reduce their environmental impact. Wal-Mart's goal is a 5% reduction in packaging by 2013. To achieve this goal they must rely on changes made by the manufacturers that supply the products. According to some estimates, that goal could help reduce carbon emissions by 700,000 metric tons.

Figure F-3. Wal-Mart's Sustainable Packaging Scorecard & Sustainability Education for Suppliers.

All Wal-Mart Stores, Inc. and Sam's Club suppliers must attend a Sustainability Education Training Session. These training sessions enable suppliers to learn how to efficiently enter packages into the retailers' Sustainable Packaging Scorecard and how to find ways to improve their package scores. Although Wal-Mart's approach to sustainability has many components, its current approach to improve its environmental footprint in packaging by requiring suppliers to attend sustainability education could serve as an important example to other retailers.

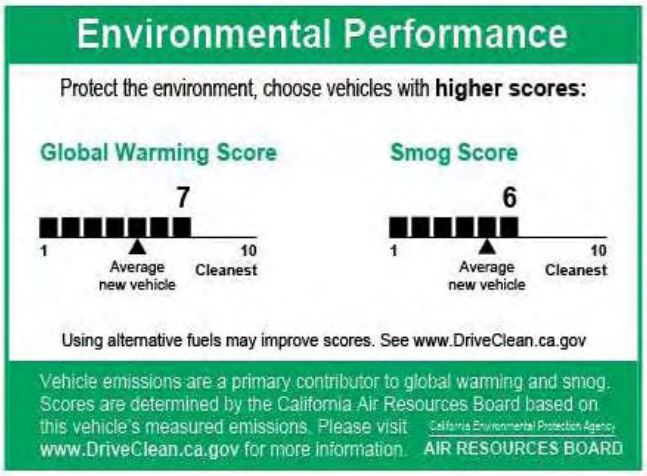


Figure F-4. ARB's Carbon Footprint Label. ARB developed this label to readily convey a product's carbon footprint.

Disclosure by manufacturers assists not only retailers but also helps consumers make informed decisions and gives them opportunities to reduce their own environmental footprint. Given that a primary goal and objective of the Green Chemistry Initiative is to stimulate a demand for greener products through improved information, any labeling on products should be made consistent so as not to inappropriately grant merits to products that are not truly "green" products. Figure F-5 shows a compilation of labels commonly found on consumer products today, each with its own independent goal. Not only are standards for labeling lacking the large number of labels, logos or green advertising images on products produces a NASCAR effect. In the future through the efforts outlined in this proposal, however, California could help the general public to understand the basic concepts of product labels, ingredient disclosure, what the information means, and where they can find more information. Appendix D: Key Element 1 and its discussion on consumer outreach provides more specific activities.

Figure F-5. NASCAR effect of Common Labels on Consumer Products

The combined efforts outlined in the framework could eventually lead to the development of one label as depicted in Figure F-6, that combines all the existing environmental labels (such as, energy star ratings, Zero Emissions Vehicle (ZEV) and Ultra Low Emission Vehicle (ULEV) air emissions ratings, carbon footprints, recycled content, toxicity data, Prop 65) into a single label that shows overall lifecycle impacts or the environmental footprint of a product. A label with validated consistent information would give consumers a quick, easy way to make more environmentally-preferred and less-toxic choices.

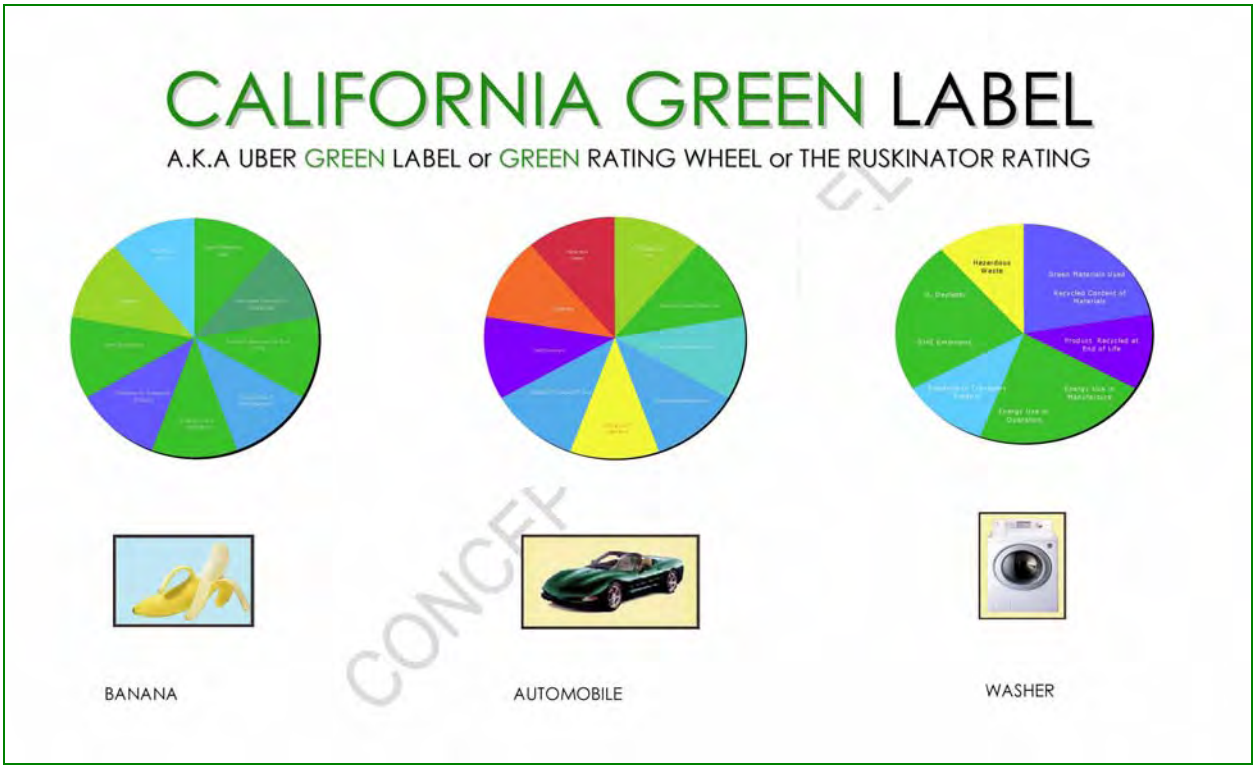


Figure F-6. California Green Label Prototype

In addition to a labels, a rating system similar to Consumer Reports® (an independent non profit organization whose mission is to work for a fair, just, and safe marketplace for all consumers and to empower consumers to protect themselves) could be developed. Consumer Reports® independently tests thousands of products and then reports on the findings. Figure F-7, summarizes Consumer Report's findings related to Laundry detergents. A similar approach could be developed to inform consumers on the health and ecological impacts of a range of products to enable them to make informed decisions. Scanners placed in many retail centers to allow consumers to can scan barcodes of products to check prices – could someday be used to check a products comparative environmental footprint.

Figure F-7. Consumer Reports Quick Rating on Laundry Detergents.

The Greenshare® system, developed by James Ross Consulting, brings us another step closer to such readily accessible information. Greenshare® is a web based sustainability reporting tool that provides data on packaging materials and supply chain processes across global markets. It allows users to collect and evaluate information about the environmental metrics of the packaging, energy, shipping, disposal and cost associated with products using inventory control identifiers such as the product's SKU number (stock-keeping unit). Greenshare® works globally, allowing comparisons of data across industries, technologies, markets and products. This web-based system provides dashboard-type data summaries accessible through a products bar code, in the store or through the internet. Figure F-8 depicts examples of Greenshare® SKU dashboard reports.

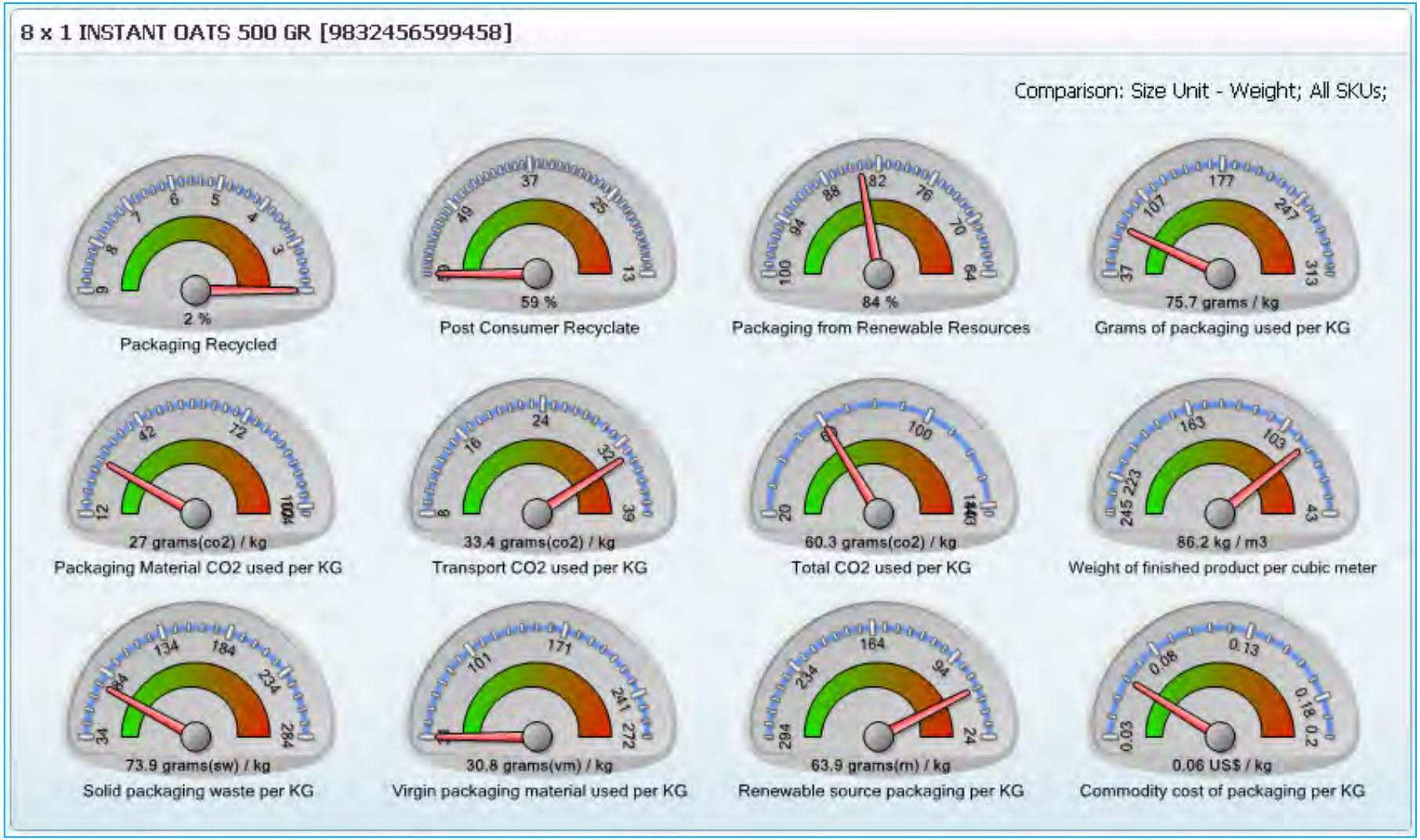


Figure F-8. Greenshare® SKU Dashboard Reports