Development of a Sustainability Screening Tool for Site Remediation Planning

Golder Associates Ltd.

Montréal, Canada

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GolderSET ©, patent pending

CN

Golder Associates

California Department of Toxic Substances Control

Outline

- Business Drivers for Sustainable Development
- Description of GolderSET-SR
- Compatibility with the U.S. EPA Guidelines
- Case Studies
- Implementation and Benefits

Context

Sustainable Development

"Development that meets the needs of the present without compromising the ability of future generations to meet their own needs."

(Our Common Future, WCED, 1987)

- Sustainability issues are becoming more complex and increasingly unavoidable
- Rising scrutiny and growing expectations from civil organizations, regulators and investors
- Businesses need to find ways of managing their risks and grasping new opportunities arising from the imperatives of sustainability

Translating Policy Into Action

UN Global Compact

Global Reporting Initiative™

WBCSD

FIDIC's Guidelines for SD

Equator Principles

- Resources for measuring and enhancing impacts are numerous but how can they be used to make a difference on the ground?

GolderSET – Adapted to Corporation's Needs

Sustainability Decision Support Tool

- **GolderSET was designed to bring Sustainable Development at the operational level so that business can "Walk the Talk"**
  - **Measuring sustainability of a project**
  - **Balanced, impartial and comprehensive, yet simple to use**
  - **Maximizing efficiency**
  - **Convincing demonstration to stakeholders & regulators**
  - **Transparency of the decision process**
- **Corporation's requirements :**
  - **Transparent decision tool**
  - **Tailored to their activities**
  - **Measure direct and collateral impacts and benefits**
  - **Reduce overall economic impacts through**
  - **re-engineering**

GolderSET-SR – Concept for the SD tool

MCA THAT MEASURES THE IMPACTS WITH INDICATORS

- **Multi-Critera Analysis Tool (MCA) :**
  - Structured system for ranking alternatives
  - Score from 0 to 100 and weight from 1 to 3
  - Results are given by triangular representations

- **Indicators related to three dimensions:**
  - Environmental
  - Social
  - Economical

- **Indicators developed from:**
  - Global Reporting Initiative (GRI, 2006)
  - FIDIC “Project Sustainability Management” guide (PSM, 2004)
  - Corporation’s documents

GolderSET-CN-SR : Main Components

GolderSET has 4 main components:

- **Indicator Descriptions** : List of indicators to measure the impacts of the project
- **Project Description :** Comprehensive site description and impact assessment for each dimension of sustainability
- **Input Data and Results :** Sustainability scores for all the indicators and results of the evaluation
- **Quantitative Indicators :** Certain indicators are quantitative and input into the MCA

1st Component : Measuring Impacts - Indicators

GOAL	THEME	INDICATOR	INDICATOR DESCRIPTION	SCORING SCHEME	REFERENCE	CODE
Rehabilitation of Affected Media	Soil Quality		Assesses the reduction of the risk due to soil contamination. Not applicable if there are no soils exceeding applicable criteria on site.	0 = Risk is not managed 50 = Some soils at risk are rehabilitated 90 = Risk managed in place 100 = All soils are rehabilitated	-	ENV-1
	Water	Groundwater Quality	Evaluates the efficacy of the option in dealing with groundwater presenting a risk to receptors or potential migration. Not applicable if there is no exceedance in applicable criteria.	0 = No intervention on affected groundwater presenting a risk 50 = Partial containment or rehabilitation of affected groundwater presenting a risk 90 = Management of affected groundwater presenting a risk 100 = Complete rehabilitation of affected groundwater	-	ENV-4
		Free Product	Assesses the recoverable and mobile free product (LNAPL or DNAPL) that will be managed by the option. Not applicable if there is no free product on site.	0 = No removal 50 = Partial removal 90 = Free product is not mobile and presents no risk 100 = Complete removal of mobile and recoverable free product	-	ENV-5
Reduction of Water Usage		Water Usage	Measures the depletion of a water source during the course of the rehabilitation project.	A normalized score is derived based on the amount of water used by the different options. The option with the lowest level of water consumption gets 100 and the worst option gets 0.	GRI-G3 (EN8), FIDIC (EN-13)	ENV-7

- All indicators are categorized in one of the three dimensions of sustainability (economic, social & environmental)
- Scoring methodology and references are included here

List of indicators in the tool

ENVIRONMENTAL ASPECT

- Soil Quality
- Sediment Quality
- Groundwater Quality
- Surface Water Quality
- Water Usage
- Soil Vapour Intrusion
- Free Product
- Drinking Water Supply
- Off-Site Migration
- Short and Long Term Impacts on Biodiversity and Species Status
- Short and Long Term Impacts on Habitat and/or Land Use
- Greenhouse Gas Emissions
- Energy Consumption
- Wastes
- Hazardous Wastes

SOCIAL ASPECT

- Public Safety
- Worker's Safety
- Duration of Work
- Quality of life (During the Project)
- Reuse of the Property by the CN
- Use for the Public
- Cultural Heritage
- Local Job Creation & Diversity
- Response to Social Sensitivity
- Standards, Laws & Regulations

ECONOMIC ASPECT

- Net Present Value of Options' Costs
- Potential Litigation
- Financial Recoveries
- Environmental Reserve
- Train Service Reliability & Performance
- Economic Advantages for the Local Community
- Reliability (Maintenance and Repair)
- Technological Uncertainty

2nd Component : Site & Options Description

Site Description

INDICATOR	SITE CONDITIONS Refer to Figure 1 for Site Plan. Refer to List of References below.	OPTION 1 INTERCEPTOR SUMPS	OPTION 2 INTERCEPTOR TRENCH	OPTION 3 MULTI-PHASE EXTRACTION	OPTION 4 WELL-BASED HYDRAULIC BARRIER	OPTION 5 IN-SITU TREATMENT VIA OXYGENATION	WEIGHT
ENVIRONMENTAL ASPECT							
Soil Quality	In general, 3 m of coarse fill are observed over fractured limestone bedrock. Hydrocarbon impacts are typically present near the water table which fluctuates seasonally near the overburden-bedrock interface. Soil remediation is not a priority at this time.	No soil remediation is provided via this option (Score - 0)	No soil remediation is provided via this option (Score - 0)	Some, but less than 50%, of soil presenting a risk will be remediated by this options through the extraction of vapours and free phase (Score - 33)	No soil remediation is provided via this option (Score - 0)	More than 50% of soil presenting a risk will be remediated by this option via bioremediation (Score - 66)	Weight of 1 because of low impact of affected soils.
Sediment Quality	No sediment are present at or in the immediate vicinity of the yard.	Not applicable as there is no sediment is present at or in the vicinity of the yard (Score - NA)					Weight - NA
SOCIAL ASPECT							
Local Resident Safety and Quality of Life	Remedial activities are not anticipated to have an impact on local residents as the impacted area is limited to the site and since the site is located in a primarily commercial/industrial area.	No anticipated impact on the community (Score - 100)	No anticipated impact on the community (Score - 100)	No anticipated impact on the community (Score - 100)	No anticipated impact on the community (Score - 100)	No anticipated impact on the community (Score - 100)	Weight of 1 applied due to low impact, since site located in industrial sector with few local residents.
Worker Safety	Remedial activities are not anticipated to present a risk to worker H&S. All the client and contractor staff required to take the client-specific H&S training.	No anticipated risk to workers, the client-specific H&S training is mandatory (Score - 100+50)	No anticipated risk to workers, the client-specific H&S training is mandatory (Score - 100+50)	No anticipated risk to workers, the client-specific H&S training is mandatory (Score - 100+50)	No anticipated risk to workers, the client-specific H&S training is mandatory (Score - 100+50)	No anticipated risk to workers, the client-specific H&S training is mandatory (Score - 100+50)	Weight of 3 applied since H&S is a priority.
ECONOMIC ASPECT							
Initial Capital Cost Moderation	Capital costs vary depending on the option and range from $175,000 to $550,000	The capital cost for this option depends on the number of extraction sumps installed and could range from $50,000 to $500,000 or more over the life of the project (Score - 60).	Anticipated initial capital cost of $400,000 (Score - 60)	Anticipated initial capital cost of $550,000 (Score - 45)	Anticipated initial capital cost of $175,000 (Score - 90)	Anticipated initial capital cost of $175,000 (Score - 90)	Weight of 3 applied since cost is key consideration in the selection of an option.
Low Annual Operation, Maintenance	Annual operation and maintenance costs for the [illegible]	Annual operating cost of [illegible]	Annual operating cost of [illegible]	Annual operating cost of [illegible]	Annual operating cost of [illegible]	Annual operating cost of [illegible]	Weight of 3 applied since cost is key

Option Assessment & Ranking

Weights

- Comprehensive site description and impact assessment for each dimension of sustainability

3rd Component : Input Data and Result Sheet

INPUT DATA						
ENVIRONMENTAL ASPECT	Option 1	Option 2	Option 3	Option 4	Option 5	Weight
Soil Quality						
Soil Quality Improvement	0	0	33	0	66	1
Sediment Quality						
Sediment Quality Improvement	NA	NA	NA	NA	NA	NA
Water						
Groundwater Quality Improvement	0	33	66	33	66	2
Free Product Removal	33	33	100	33	66	3
Surface Water Quality Improvement	0	0	50	50	50	1
Responsible Water Consumption	100	100	50	100	0	1

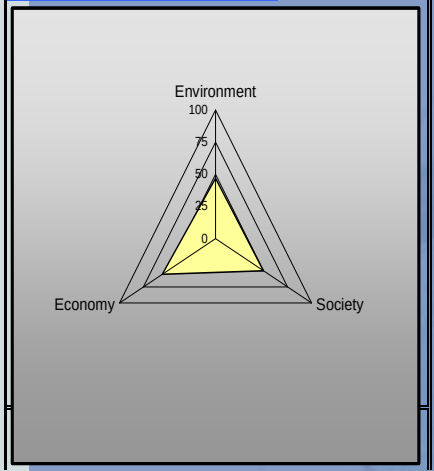
WEIGHTING FACTOR

- Sustainability scores for all the indicators are entered into the input data sheet, for each dimension of sustainable development

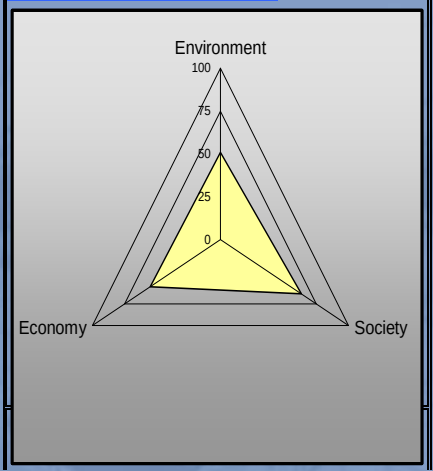
3rd Component : Input Data and Result Sheet

- **The best approach from a sustainability standpoint is dependent on:**
  - **Highest performance in each dimension**
  - **Balanced performance between all dimensions**
  - **Local specificities and objectives must also be considered in selecting the option**

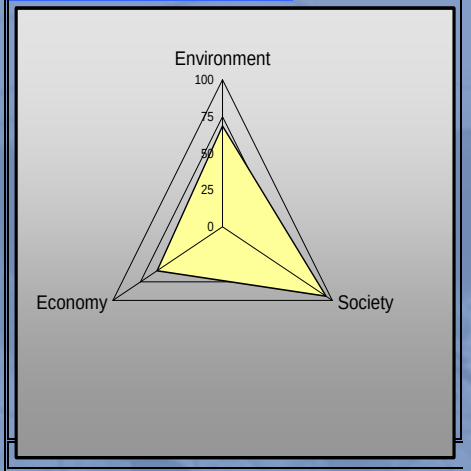
RESULTS - OPTION 1	
ENVIRONMENT	47%
SOCIETY	50%
ECONOMY	55%



RESULTS - OPTION 2	
ENVIRONMENT	51%
SOCIETY	63%
ECONOMY	55%



RESULTS - OPTION 3	
ENVIRONMENT	69%
SOCIETY	94%
ECONOMY	60%



4th Component : Input Data and Result Sheet

Common Quantitative Indicators

Greenhouse Gases

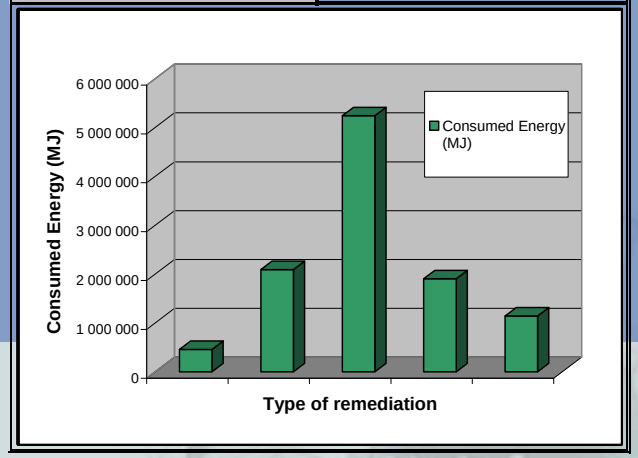
Air Contaminants

Energy Consumption

Water Usage

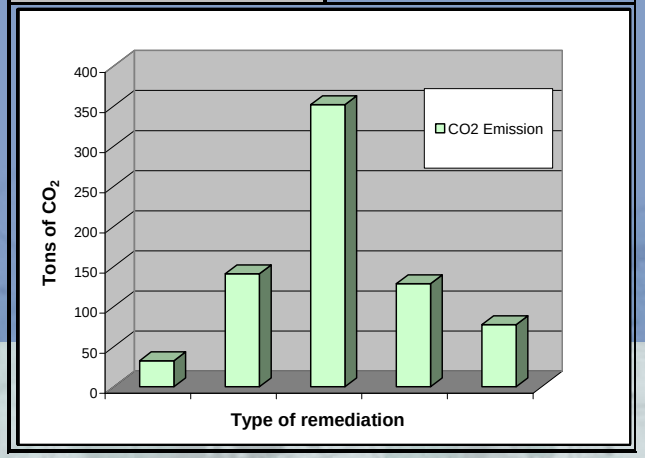
Energy Usage

ENVIRONMENTAL ASPECT	
TYPE OF REMEDIATION	INDICATOR : Consumed Energy (MJ)
Option 1: Interceptor sumps	459 266
Option 2: Interceptor trench	2 094 332
Option 3: Multi-phase extraction	5 245 628
Option 4: Hydraulic barrier	1 908 088
Option 5: Oxygenated water injection	1 144 772



Greenhouse Gases

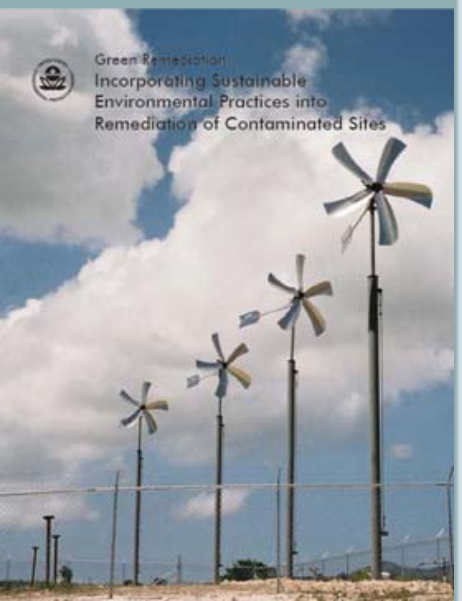
ENVIRONMENTAL ASPECT	
TYPE OF REMEDIATION	INDICATOR : Greenhouse gas emissions (Tons of CO_2)
Option 1: Interceptor sumps	32,4
Option 2: Interceptor trench	140,7
Option 3: Multi-phase extraction	351,7
Option 4: Hydraulic barrier	128,4
Option 5: Oxygenated water injection	77,3



Compatibility of GolderSET with the U.S. Guidelines

- **GolderSET is compatible with the U.S. EPA Guidelines : *Incorporating Sustainable Environmental Practices into Remediation of Contaminated Sites***

Criteria (U.S. EPA)	Indicators (GolderSET-CN-SR)
Core Elements of Green Remediation	
Energy requirements of the treatment system	Environmental Indicator (ENV-15) Economical Indicator (ECONO-3)
Air emissions	Environmental Indicator (ENV-14) Social Indicators (SOC-1, SOC-2, SOC-4)
Water requirements and impacts on water resources	Environmental Indicators (ENV-4, ENV-6, ENV-7, ENV-8, ENV-9)
Land and ecosystem impacts	Environmental Indicators (ENV-1, ENV-2, ENV-10, ENV-11, ENV-12, ENV-13)
Material consumption and waste generation	Environmental Indicators (ENV-16, ENV-17)
Long-term stewardship actions	Environmental Indicators (ENV-14, ENV-15) Social Indicators (SOC-6, SOC-8, SOC-9) Economical Indicator (ECONO-6)
Future Opportunities	
Building Stronger Communities	Environmental Indicator (ENV-15) Social Indicators (SOC-6, SOC-7, SOC-8, SOC-9) Economical Indicator (ECONO-6)
Expanding the Options for Site Reuse	Social Indicators (SOC-5, SOC-6, SOC-7, SOC-8, SOC-9) Economical Indicators (ECONO-2, ECONO-3, ECONO-6, ECONO-7, ECONO-8)
Increasing Economic Gains	Environmental indicator (ENV-15) Social indicator (SOC-10) Economical Indicator (ECONO-3)
Increasing Environmental Benefits of Cleanups	Environmental Indicators (ENV-10, ENV-11, ENV-12, ENV-13, ENV-15) Social Indicators (SOC-9, SOC-10) Economic indicators (ECONO-3, ECONO-6, ECONO-8)



Compatibility of GolderSET with the U.S. Guidelines

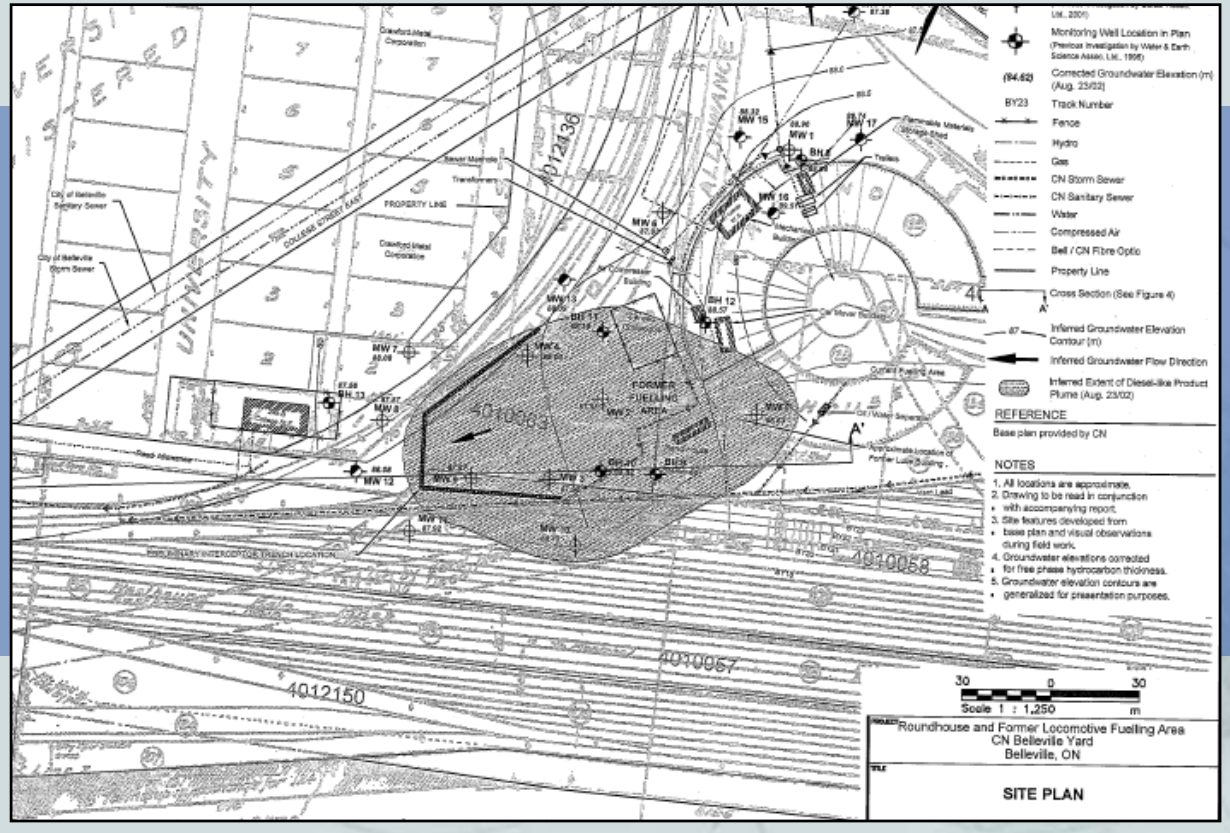
- **GolderSET is compatible with the 9 U.S. EPA Criteria for Risk Management : *Rules of thumb for superfund remedy Selection***

Criteria (U.S. EPA)	Indicators (GolderSET-CN-SR)
Overall protection of human health and the environment	Environmental Indicators (ENV1 to ENV-17)
Compliance with ARARs	Refer to ARAR (United States only)
Long-term effectiveness and permanence	Environmental Indicators (ENV1 to ENV-6; ENV-9; ENV-11; ENV-13)
Reduction of toxicity, mobility, or volume	Environmental Indicators (ENV1 to ENV-6; ENV-9)
Short-term effectiveness	Environmental Indicators (ENV1 to ENV-17, except ENV-11 & ENV-13)
Implementability	Economical Indicators (ECONO-5; ECONO-7; ECONO-8)
Cost	Economical Indicators (ECONO-1; ECONO-2; ECONO-3)
State acceptance	Social Indicator (SOC-10)
Community acceptance	Social Indicators(SOC 1; SOC-3; SOC-4; SOC-6 to SOC-9)

ARAR : Applicable or Relevant and Appropriate Standards, Limitations, Criteria, and Requirements

Pilot Test at CN Yard Site #1

- Presence of a diesel plume covering approximately 11,000 m^2
- Apparent thickness ranges from sheen to 1.5 m
- Potential for off-site impacts
- Free phase product located in fractured bedrock



Remedial Options to be Evaluated at CN Yard Site #1

- **Option 1 – Interceptor sumps with product recovery using a vacuum truck (status quo)**
- **Option 2 – Interceptor trench with pumping, oil-water separator and biological percolation system (BPS) treatment prior to discharge**
- **Option 3 – Full-scale multi-phase extraction (MPE) system, with oil-water separator and BPS prior to discharge**
- **Option 4 – Well-based hydraulic barrier with pumping, oil-water separator and BPS prior to discharge**
- **Option 5 – Injection of oxygenated water for in situ bioremediation and containment**

Results of GolderSET-CN-SR Analysis at CN Yard Site #1

INPUT DATA

ENVIRONMENTAL ASPECT	Option 1	Option 2	Option 3	Option 4	Option 5	Weight
Soil Quality						
Soil Quality Improvement	0	0	33	0	66	1
Sediment Quality						
Sediment Quality Improvement	NA	NA	NA	NA	NA	NA
Water						
Groundwater Quality Improvement	0	33	66	33	66	2
Free Product Removal	33	33	100	33	66	3
Surface Water Quality Improvement	0	0	50	50	50	1
Responsible Water Consumption	100	100	50	100	0	1
Ecosystem and Drinking Water Supply						
Wildlife and Flora Conservation	NA	NA	NA	NA	NA	NA
Drinking Water Supply Conservation	NA	NA	NA	NA	NA	NA
Off-site Migration Prevention	0	50	100	50	50	3
Atmosphere						
Greenhouse Gas Emissions	100	50	0	50	100	1
Consumed Energy						
Energy Conservation	100	100	50	100	150	3
Residual Matter						
Solid Residual Matter Management	100	0	50	50	50	1
Site Contaminant Management	100	100	100	100	100	1
Hazardous Waste Management	NA	NA	NA	NA	NA	NA
Additional Indicators						

SOCIAL ASPECT	Option 1	Option 2	Option 3	Option 4	Option 5	Weight
Health and Safety						
Life	100	100	100	100	100	1
Worker Safety	150	150	150	150	150	3
Impact on Community						
Limited Duration of Work	0	0	66	0	0	1
Staff	0	0	50	0	50	1
Beneficial Use for the Local Community	0	0	0	0	0	1
Equity						
Employee Skill Development	0	50	100	50	50	1
Local Job Creation and Diversity	0	50	50	50	50	1
Corporate Image						
Innovation	50	50	100	50	100	1
Response to Social Sensitivity	0	50	100	50	100	2
Standards, Laws and Regulations						
Standards, Laws and Regulations	50	50	100	50	100	3
Additional Indicators						

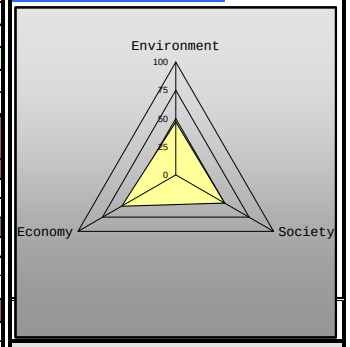
ECONOMIC ASPECT	Option 1	Option 2	Option 3	Option 4	Option 5	Weight
Economic Performance						
Initial Capital Cost Moderation	60	60	45	90	90	3
Low Annual Operation, Maintenance,	80	60	60	80	80	3
Prevention of Potential Litigation	0	0	50	0	50	3
Potential Grants or Subsidies	0	0	0	0	25	1
Environmental Liabilities						
Environmental Liabilities Reduction	33	66	100	66	100	3
Competitivity						
Train Reliability and Performance	100	100	100	100	100	3
Community Economic Growth						
Donations to the Community	NA	NA	NA	NA	NA	NA
Economic Advantages Community	0	50	50	50	50	1
Reliability						
Reliability	100	50	0	50	50	2

REMEDIAL OPTIONS

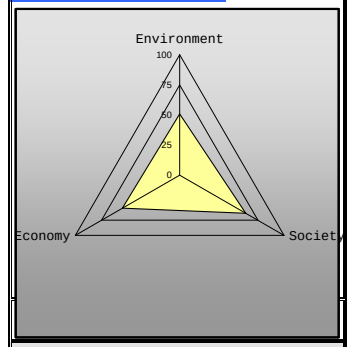
OPTION 1 :	OPTION 2 :	OPTION 3 :
Interceptor sumps	Interceptor Trench with Oil-Water Separator	Full-scale Multi-Phase Extraction System
OPTION 4 :	**OPTION 5 :**	**REMARKS :**
Well-based Hydraulic Barrier	Injection of Oxygenated Water	Working Document

SUSTAINABLE PERFORMANCE OF OPTIONS

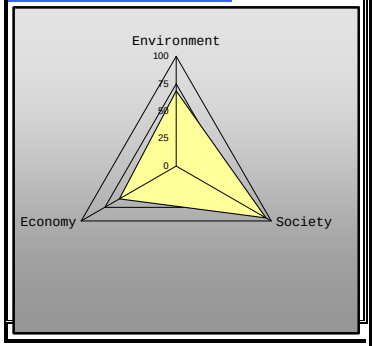
RESULTS - OPTION 1	
ENVIRONMENT	47%
SOCIETY	50%
ECONOMY	55%



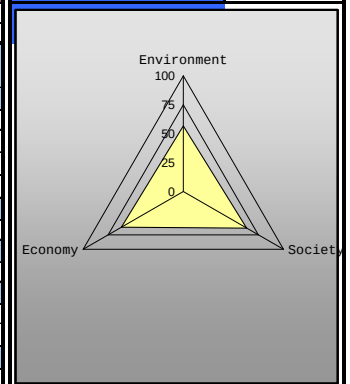
RESULTS - OPTION 2	
ENVIRONMENT	51%
SOCIETY	63%
ECONOMY	55%



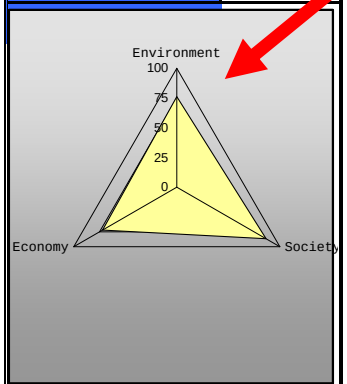
RESULTS - OPTION 3	
ENVIRONMENT	69%
SOCIETY	94%
ECONOMY	60%



RESULTS - OPTION 4	
ENVIRONMENT	57%
SOCIETY	63%
ECONOMY	62%



RESULTS - OPTION 5	
ENVIRONMENT	76%
SOCIETY	87%
ECONOMY	72%



BEST OPTION

Handling of Quantitative Indicators

Common Quantitative Indicators

Greenhouse Gases

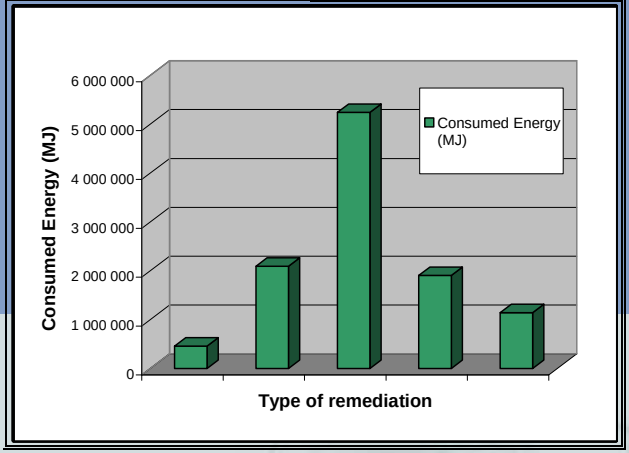
Air Contaminants

Energy Consumption

Water Usage

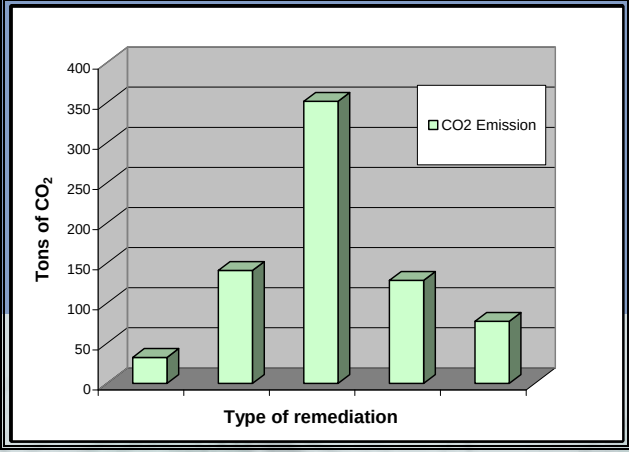
Energy Usage

ENVIRONMENTAL ASPECT	
TYPE OF REMEDIATION	INDICATOR : Consumed Energy (MJ)
Option 1: Interceptor sumps	459 266
Option 2: Interceptor trench	2 094 332
Option 3: Multi-phase extraction	5 245 628
Option 4: Hydraulic barrier	1 908 088
Option 5: Oxygenated water injection	1 144 772



Greenhouse Gases

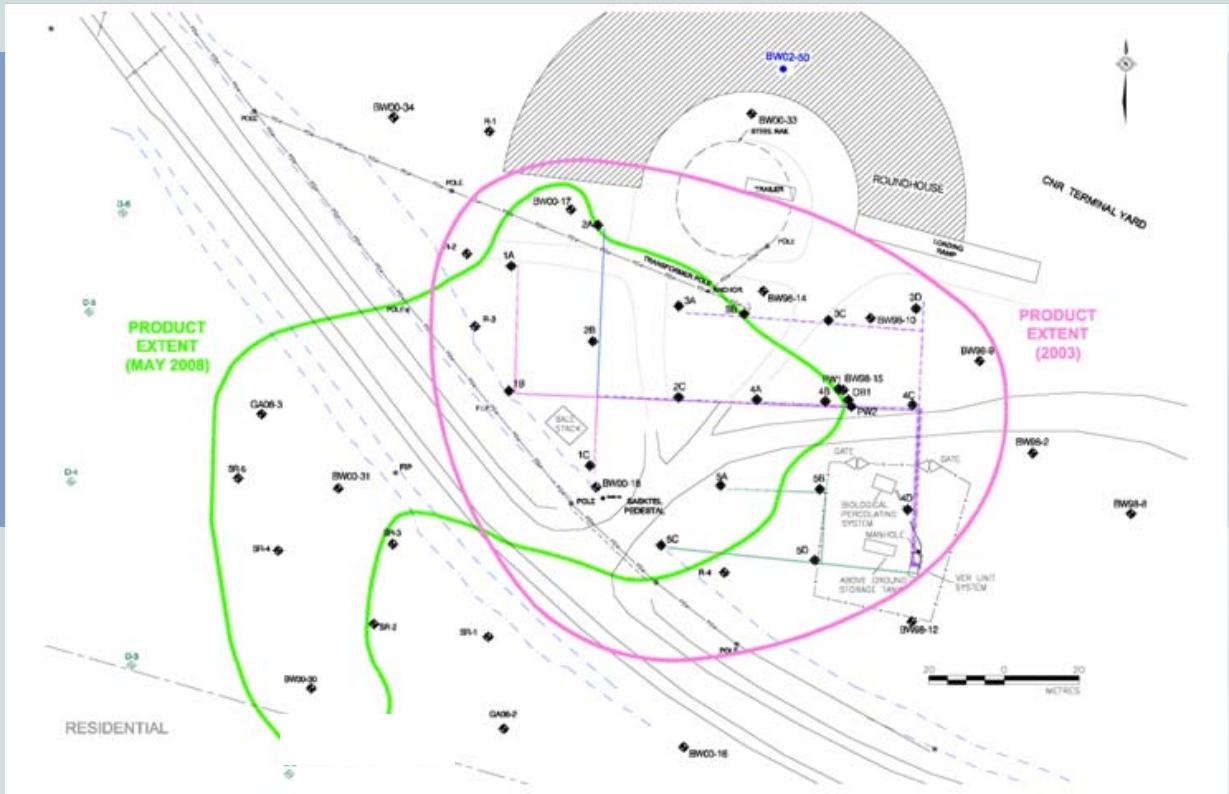
ENVIRONMENTAL ASPECT	
TYPE OF REMEDIATION	INDICATOR : Greenhouse gas emissions (Tons of CO_2)
Option 1: Interceptor sumps	32,4
Option 2: Interceptor trench	140,7
Option 3: Multi-phase extraction	351,7
Option 4: Hydraulic barrier	128,4
Option 5: Oxygenated water injection	77,3



- Option 1 - Status quo : Least amount of energy consumed et CO_2 emitted but does not satisfy the objectives set for the site
- Option 5 - Bioremediation : Best remedial options in term of energy and CO_2
- Option 3 - VER : 4 times more energy and CO_2 than option 5 (however, social advantages – quicker – more complete remediation

Case Study : CN Yard Site #2

- The extend of the original plume was approximately 15 800m^2 (2003) – VER system installed in 2004
- New data obtained in 2007 indicated a much larger plume (5 560 m^2)
- Apparent thickness ranges from sheen to 2 m
- Free phase product located at a depth of 10-15 m



Remedial Options to be Evaluated at CN Yard Site #2

- **Option 1 – Total Fluids Recovery Trench at property boundary with upgradient treated water re-injection and pump product**
- **Option 2 – Pump and treat to prevent offsite migration of groundwater and LNAPL with upgradient treated water re-injection**
- **Option 3 – Install additional Winterized VER System**
- **Option 4 – Status quo**

Case Study : CN Yard Site #2

SUSTAINABLE DEVELOPMENT EVALUATION GRID INPUT DATA - SITE REMEDIATION
Development of a Screening Tool for Sustainable Site Remediation Planning

PROJECT NAME:	COMPLETED BY:	EVALUATED BY :	Checked by :	DATE :	TYPE OF REMEDIATION
08-1324-0037 CN Biggar	J. Graves		H. Richer	2008-08-25	

INPUT DATA

Indicator ID	ENVIRONMENTAL ASPECT	Option 1	Option 2	Option 3	Option 4	Option 5	Weight
	Soil Quality						
ENV-1	Soil Quality Improvement	0	33	33	0		1
	Sediment Quality						
ENV-2	Sediment Quality Improvement	NA	NA	NA	NA		NA
	Water						
ENV-3	Groundwater Quality Improvement	0	66	100	0		2
ENV-4	Free Product Removal	66	66	100	0		3
ENV-5	Surface Water Quality Improvement	0	0	0	0		1
ENV-6	Responsible Water Consumption	0	100	100	NA		1
	Ecosystem and Drinking Water Supply						
ENV-7	Wildlife and Flora Conservation	NA	NA	NA	100		NA
ENV-8	Drinking Water Supply Conservation	NA	NA	NA	NA		NA
ENV-9	Off-site Migration Prevention	0	50	100	0		1
	Atmosphere						
ENV-10	Greenhouse Gas Emissions	100	50	0	NA		1
	Consumed Energy						
ENV-11	Energy Conservation	0	0	0	100		1
	Residual Matter						
ENV-12	Solid Residual Matter Management	100	0	50	NA		1
ENV-13	Site Contaminant Management	50	100	150	NA		1
ENV-14	Hazardous Waste Management	50	50	50	NA		1
	Additional Indicators						
ENV-15							
ENV-16							
	SOCIAL ASPECT	Option 1	Option 2	Option 3			Weight
	Health and Safety						
SOC-1	Local Resident Safety and Quality of Life	100	100	100	50		2
SOC-2	Worker Safety	0	50	50	NA		2
	Impact on Community						
SOC-3	Limited Duration of Work	0	0	33	0		1
SOC-4	Benefits for CN and Subcontractor Staff	0	0	0	0		1
SOC-5	Beneficial Use for the Local Community	0	50	100	0		1
	Equity						
SOC-6	Employee Skill Development	50	50	50	0		1
SOC-7	Local Job Creation and Diversity	50	100	100	0		1
	Corporate Image						
SOC-8	Competitive Advantage through Innovation	0	50	50	0		1
SOC-9	Response to Social Sensitivity	0	50	50	0		1
	Standards, Laws and Regulations						
SOC-10	Standards, Laws and Regulations	50	50	50			1
	Additional Indicators						
SOC-11							
SOC-12							
	ECONOMIC ASPECT	Option 1	Option 2	Option 3			Weight
	Economic Performance						
ECON-1	Initial Capital Cost Moderation	30	60	45	100		3
ECON-2	Low Annual Operation, Maintenance, Monitoring Costs	60	20	20	100		3
ECON-3	Prevention of Potential Litigation	0	50	100	0		1
ECON-4	Potential Grants or Subsidies	0	0	25	0		1
	Environmental Liabilities						
ECON-5	Environmental Liabilities Reduction	33	66	100	0		1
	Competitivity						
ECON-6	Train Service Reliability and Performance	100	100	100	100		2
	Community Economic Growth						
ECON-7	Donations to the Community	NA	NA	NA	0		NA
ECON-8	Economic Advantages for the Local Community	0	0	50	0		1
	Reliability						
ECON-9	Reliability (Moderate Maintenance and Repair)	100	50	0	100		1
	Technological Aspect						
ECON-10	Economic Advantage of More Effective Technology	0	0	50	0		1
ECON-11	Technological Uncertainty Management	0	50	100	NA		2
	Additional Indicators						
ECON-12							
ECON-13							

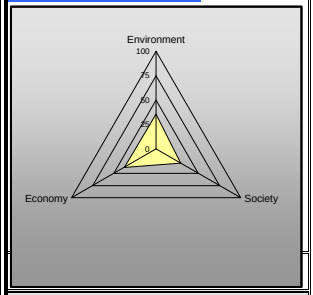
REMEDIAL OPTIONS

OPTION 1 :	OPTION 2 :	OPTION 3 :
RECOVERY TRENCH at property boundary and pump product	PUMP AND TREAT to prevent offsite migration of groundwater and LNAPL	WINTERIZED VER UNIT and annual O&M
OPTION 4 :	**OPTION 5 :**	**REMARKS :**
DO NOTHING		Working Document

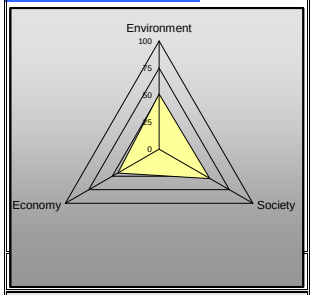
SUSTAINABLE PERFORMANCE OF OPTIONS

A score higher than 50% indicates a net positive impact, below 50% a net negative impact. The largest triangle represents the most sustainable option, particularly if the triangle is equilateral.

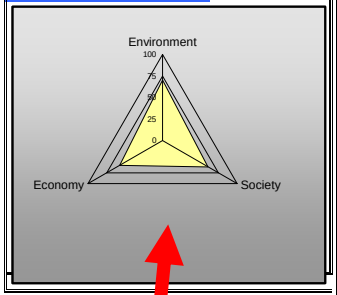
RESULTS - OPTION 1	
ENVIRONMENT	36%
SOCIETY	29%
ECONOMY	38%



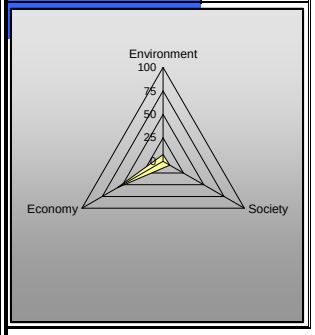
RESULTS - OPTION 2	
ENVIRONMENT	51%
SOCIETY	54%
ECONOMY	44%



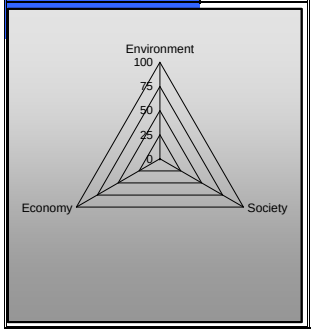
RESULTS - OPTION 3	
ENVIRONMENT	70%
SOCIETY	61%
ECONOMY	58%



RESULTS - OPTION 4	
ENVIRONMENT	7%
SOCIETY	8%
ECONOMY	56%



RESULTS - OPTION 5	
ENVIRONMENT	NA
SOCIETY	NA
ECONOMY	NA



REMARKS :

NA : Non Applicable Indicator

BEST OPTION

Grading Scale
A list of possible grading scores is set for each indicator.

0	50	100
Very negative (Unsustainable)	Neutral	Very positive (Sustainable)

150 : **Bonus points for applying best management practices**

Golder Associates

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Concluding Remarks

- Hands on tool:
  - **Supports transparent decision making**
  - **Simplifies the application of an abstract concept**
  - **Instrumental in managing business risk associated to a project**
- Benefits:
  - **Potential to save money by identifying improvements**
  - **Demonstrates to regulators & stakeholders the total net impacts and benefits**
  - **Re-engineering & optimization**
  - **Good for corporate image**

CN – Stella Karnis

stella.karnis@cn.ca

Golder – Robert Noël-de-Tilly

rnoel-de-tilly@golder.com

GolderSET ©, patent pending