SOIL, SOIL GAS, and GROUNDWATER SAMPLING WORKPLAN

for

Autumnwood Development, Amaryllis Court and Vicinity

Wildomar, California

1.0 INTRODUCTION

This Workplan is primarily for a soil, soil gas, and groundwater investigation to be conducted for the Department of Toxic Substances Control (DTSC) by its site investigation contractor AMEC Environment & Infrastructure Inc. (AMEC). The objective of conducting this assessment is to evaluate the presence of contaminants in the subsurface at Amaryllis Court and around various residential properties in the Autumnwood Development, Wildomar, CA (the Site).

2.0 HISTORICAL INVESTIGATIONS

Prior to construction of the Autumnwood Development, C.H.J. Incorporated (CHJ), of Colton, California, prepared a *Preliminary Environmental Site Assessment* (Phase 1), dated June 13, 2003. Based on aerial photographs dating back to 1949, CHJ indicated that the site was primarily vacant and undeveloped between 1949 and 2001(Adini 2012).

Environmental assessments conducted in May and July 2012 indicated low levels of volatile organic compounds (VOCs) in sub-slab soil gas and indoor and outdoor air samples collected from several of the houses. In September 2012, soil gas and soil samples collected from the surrounding subsurface areas on Amaryllis Court in the Autumnwood Development also detected low levels of VOCs. The Adini report concluded that the chlorobenzene, chloroform, chloromethane, toluene, trichloroethylene, and trichlorofloromethane detected in soil gas did not exceeded their respective residential California Human Health Screening Levels (CHHSLs) for soil-gas below buildings constructed on engineered fill (Adini 2012).

Soil samples were also collected from seven borings for lithologic description and laboratory analysis for VOCs, semi-VOCs, total petroleum hydrocarbons, organochlorine pesticides, and polychlorinated biphenyls. Analytical results for the soil samples indicated that none of the analytes were present above the analytical laboratory's method detection limits in any of the soil samples submitted for analysis (Adini 2012).

Additionally, the South Coast Air Quality Management District (SCAQMD) collected various environmental samples mainly to evaluate indoor air quality and evaluate drinking water quality. The Office of Environmental Health Hazard Assessment (OEHHA) and the California Department of Public Health (CDPH) have also evaluated environmental data collected to date in the Autumnwood Development.

3.0 OBJECTIVES AND SCOPE

In general, the purpose of this investigation is to determine whether VOCs in the subsurface are present in the soil and groundwater and if VOCs are present in sufficient concentrations to pose a health risk via the vapor intrusion pathway.

Risk to human health from VOCs are primarily driven by exposure through the inhalation and ingestion pathways. Residences in this development use municipal water, hence ingestion of groundwater is not considered to be an exposure pathway. Inhalation may be a complete exposure pathway if VOCs are intruding into indoor air spaces. Soil gas sampling is the primary method used to gather data to assess potential vapor intrusion into indoor air and evaluate the resulting risk to human health. Through the Orphan Site Fund, DTSC has received limited funding from United States Environmental Protection Agency (U.S. EPA) to conduct soil, soil gas, and groundwater sampling at sites where there is a potential health risk.

If sufficient VOC contamination is detected, additional sampling may be warranted in a subsequent investigation. A final report detailing the results and recommendations generated from this investigation will be issued following evaluation of the data.

4.0 PROJECT TEAM ORGANIZATION

Title/Responsibility	Name	Telephone Number	Email
DTSC Project Geologist	Theo Johnson	(714) 484-5414	tjohnson@dtsc.ca.gov
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AMEC Project Manager	Joe Bahde	(949) 574-7500	joseph.bahde@amec.com

Work performed pursuant to this Soil, Soil Gas, and Groundwater Sampling Workplan will be under the direction and supervision of the AMEC Project Manager who is a qualified registered professional engineer (PE) and/or professional geologist (PG) in compliance with the requirements of the Professional Engineers Act, Business and Professions Code Sections 6700-6899 and Section 7838, and the Geologist and Geophysicists Act, Business and Professions Code sections 7800-7887.

Key project individuals and their responsibilities are as follows:

- DTSC Program Manager is responsible for overseeing the project. Responsibilities include securing site access, budget and workplan preparation, coordination with AMEC, and data review and approval.

- DTSC Project Manager is responsible for conducting the SSA

- DTSC Toxicologist and Geologist are responsible for reviewing this workplan, providing field oversight, and reviewing the final soil gas and groundwater sampling data.

- DTSC Public Participation serves as the point of contact and liaison between the DTSC and the community; establishes and maintains open dialogue between DTSC and the public; organizes and facilitates meetings, briefings, and workshops; and develops communication materials such as fact sheets, work notices, and PowerPoint presentations that are clear and written in an easy-to-understand format.

- AMEC Project Manager is responsible for project coordination between AMEC and DTSC, including schedule and budget management, soil gas and groundwater sampling activities, technical oversight, health and safety of AMEC employees and subcontractors, QA/QC, overall project quality, and deliverables as described below. The project manager is responsible for completing field activities as described below, obtaining data analysis and for oversight of AMEC's subcontractors.

5.0 SITE LOCATION AND DESCRIPTION

The Site is a residential housing tract identified as the Autumnwood Development in Wildomar, California. The Autumnwood Development is bound by South Pasadena Street on the southeast, Penrose Street on the northwest, Palomar Street on the northeast and drainage canal south of Front Street on the southwest. The development was constructed between 2004 and 2006 and consists of single and multistory homes constructed with slabs on grade (Figure 1 and 2).

6.0 GEOLOGIC AND HYDROGEOLOGICAL SETTING

The site is located in the Perris Block between San Jacinto and Santa Ana Blocks in Peninsular Ranges geomorphic province of California. The Perris Block is bound by the San Jacinto Fault to the north and Elsinore and Chino, Willard, and Wildomar Faults to the South. The Peninsular Ranges province is characterized by northwest-trending mountain ranges and valleys and extends from the San Gabriel and San Bernardino Mountains in the north to California's southern border and beyond, forming Baja California (Adini 2012).

According to the Geologic Map of California, Santa Ana Sheet, the site is located above Quaternary Age alluvium in the Elsinore Fault Zone between the Wildomar Fault, adjacently north, and the Willard Fault approximately 0.5-miles to the southwest. Quaternary alluvium within the Elsinore Fault Zone and Temecula Valley Groundwater Basin is estimated to exceed 2,500 feet in thickness (DWR, 2004). Mesozoic age granitic rock form the Elsinore Mountains to the south the site. Mesozoic age granitic rock and basic intrusive rock form the hills to the north (Adini 2012).

Based boring logs from the Adini 2012 report, soil lithology at the site generally consists of moist, brown, well graded, fine to coarse grained sand from the ground surface to 15 feet below ground surface (bgs), the maximum depth explored.

The site is located within the boundaries of the Temecula Valley Groundwater Basin, California Department of Water Resources (DWR) basin number 9-05, encompassing a surface area of approximately 137 square miles (DWR, 2004). The basin is bound by the granitic rocks of Peninsular Ranges, which isolate the basin with the exception of the northwest boundary where it adjoins the Elsinore Groundwater Basin (Adini 2012).

Groundwater is generally unconfined and is contained in Quaternary alluvial deposits that are estimated to be over 2,500 feet thick (DWR, 2004). The Wildomar and Willard Faults of the Elsinore Fault Zone pass through the western portion of the groundwater basin where they affect groundwater elevations and pressures. The Murrieta Hot Springs Fault also affects groundwater flow along the eastern portion of the basin. Groundwater flow is generally to the south. Beneficial uses for groundwater throughout the basin include municipal, agricultural and industrial uses (Adini 2012).

The State Water Resources GeoTracker database indicates shallow groundwater at other sites in the vicinity ranges from approximately 12 to 28 feet bgs, and generally flows to the south-southeast. Groundwater was not encountered in any of the borings completed at the site to a maximum depth of 15 feet bgs (Adini 2012).

Potable water is provided to the development by the Elsinore Valley Municipal Water District (EVMWD). Information from the Elsinore Valley Municipal Water District (EVMWD) indicates the existing recycled/reclaimed water pipes in the Autumnwood Development are supplied with potable water. Additionally, the EVMWD stated the recycled/reclaimed water system was not physically hooked up (piped) to the reclaimed water system.

7.0 SAMPLING AND ANALYSIS PLAN

This Sampling and Analysis Plan (SAP) will be used to evaluate the potential presence of chemical constituents in soil, soil gas, and groundwater in the study area. The data collected will be used to further assess environmental conditions at suspect portions of the study area identified during the preparation of this Workplan. DTSC and U.S. EPA-approved methods will be used for sampling and analysis, wherever possible.

The following sections describe the sampling strategy, rationale, investigative methods and procedures, sample analysis program, sample handling, decontamination procedures, and management of investigation-derived wastes.

7.1 SAMPLING STRATEGY, RATIONALE, AND APPROACH

The field activities consist of soil, soil gas, and groundwater sampling to further understand the extent of VOCs in the study area. The geologic work will be performed by an AMEC geologist under the supervision of a PG in compliance with the requirements of the Geologist and Geophysicists Act (Business and Professions Code, Sections 7800-7887). The field work will be performed in accordance with the Health and Safety Plan presented in Appendix B (Section 9.0).

A sub-contractor will be retained to conduct the direct-push drilling and sampling to collect the soil, soil gas, and grab groundwater samples as specified in this Work Plan. Soil gas samples will be analyzed by an on-site mobile laboratory. AMEC, with the assistance of the DTSC, will arrange for utility clearance and obtain the required permit(s) before subsurface investigation activities commence. It is anticipated that permits will be required for grab groundwater sampling and encroachment and/or sidewalk closure (issued through the City). A State-certified laboratory will be retained to analyze soil and groundwater samples that are collected during the field program.

The sampling approach for the soil, soil gas, and groundwater programs are described in the following sections. Sample designations are listed in Table 1.

In order to obtain access to the properties, the DTSC Public Participation Specialist will assist in the development and distribution of Access Agreements with the residents.

A Work Notice informing the residents of the date, time, sampling activities and sampling locations will be developed by the DTSC Public Participation Specialist. The Work Notice will be distributed at least 2 weeks prior to the start of sampling activities.

7.1.1 Soil Gas Sampling

The purpose of the soil gas survey is to further assess potential source areas and extent of VOCs in the study area. The soil gas survey will be conducted in accordance with the *Advisory – Active Soil Gas Investigations* (Advisory) [DTSC, 2012] and the *Guidance for the Evaluation and Mitigation of Subsurface Vapor Intrusion to Indoor Air* (Vapor Intrusion Guidance) [VIG 2011] in Appendix C.

Soil gas samples will be collected from fifteen locations at Autumnwood Development (Figure 2). Soil gas samples, with the exception of the three sub-slab sample locations, will be collected at each location from depths of approximately 5 and 15 feet (Table 1). Sub-slab samples will be collected from directly below the slabs for each residence. In addition, three field duplicate quality control samples will be collected at sample locations showing elevated concentrations of VOCs. Thus, a total of thirty three soil gas samples will be collected and analyzed for target VOCs. The soil gas samples will be analyzed by an on-site mobile laboratory for target VOCs.

As recommended by the Advisory, a purge-volume test will be conducted at the first sampling location using 1, 3, and 10 purge volumes. The soil gas survey will not be conducted during rain events or within 7 days after significant rainfall. If groundwater is encountered at proposed sampling depth or shallower and the proposed soil gas sample cannot be collected, a grab groundwater sample may be collected for VOC analysis. Sub-slab samples will also be subject to purge volume testing; however, the rain requirement may be waved based on field conditions in accordance with Section 5.2 and Appendix G of the Advisory.

The protocol for soil gas sampling is discussed in Section 7.2.2. The analytical methods and field QC samples are discussed in Sections 8.0 and 7.2.5, respectively.

7.1.2 Continuous Core Borings and Soil Sampling

The purpose of the continuous core boring and soil sampling is to assess geologic conditions beneath the study area. Previous lithologic logs have described the soil at the study area as well sorted sand with increasing amounts of clay at depths of approximately 10 ft. bgs. The continuous core sample locations will be advanced to the first occurrence of groundwater to depths of approximately 20 to 30 ft. bgs or until groundwater is encountered. Lithologic logs will be prepared for the continuous core borings.

At both continuous core boring locations and location 9 (Figure 2), soil samples will be collected at five foot intervals to 15 ft. bgs. The soil samples will be collected from the soil core using a soil sampler and will be prepared for laboratory analysis in accordance with U.S. EPA Method 5035 protocols (See Appendix D). The soil samples will be analyzed for semi-volatile organic compounds, polychlorinated biphenyl, metals, and organochlorine pesticides using appropriate U.S. EPA Methods.

Grab groundwater samples will be collected from the two continuously cored borings (Section 7.1.3).

The soil sampling methods and procedures are discussed in Section 7.2.3. The analytical methods and field QC samples are discussed in Sections 8.0 and 7.2.5, respectively.

7.1.3 Grab Groundwater Sampling

The purpose of the grab groundwater sampling is to assess the potential for contaminants in groundwater. In addition to the grab groundwater samples collected from the two continuously cored borings, two additional grab groundwater samples will be collected from borings (Table 1). The grab groundwater samples will be collected from each boring using a temporary 3/4-inch polyvinyl chloride (PVC) well, transferred to appropriate sample containers provided by the laboratory, and submitted for laboratory analysis of VOCs and formaldehyde using U.S. EPA Methods 8260B and 8315A, respectively.

The grab groundwater sampling methods and procedures are discussed in Section 7.2.4. The analytical methods and field QC samples are discussed in Sections 8.0 and 7.2.5, respectively.

7.2 SAMPLING METHODS AND PROCEDURES

This section describes the methods and procedures used to conduct a utility clearance and to collect soil, soil gas, and grab groundwater samples.

7.2.1 Utility Clearance

AMEC will contact underground service alert (USA) before commencement of field activities to locate subsurface utilities. As part of this task, a site walk will be conducted to confirm and mark proposed sample locations. The proposed drilling locations will be clearly marked with white paint or surveyor's flagging as required by USA. USA will contact the utility owners of record within the site vicinity and notify them of AMEC's intention to conduct a subsurface investigation. The utility owners of record, or their designated agents, will be expected to clearly mark the position of their utilities on the ground surface throughout the area designated for subsurface investigation.

AMEC will retain a subcontractor to conduct a geophysical survey of proposed sample locations. The purpose of the survey will be to locate and delineate any privately-owned utilities, pipelines, or other buried structures that may exist in the study area.

If any suspect buried structures or pipelines are delineated by the geophysical survey, sample locations may be moved accordingly to avoid the delineated or suspected subsurface features.

7.2.2 Soil Gas Sampling

Soil gas probes will be installed and analyzed using a direct push Geoprobe-type rig and an onsite mobile laboratory, respectively. As described in Section 7.1.1, soil gas sampling will not occur during any rainfall or within seven days after a heavy rain event. A general description of the probe installation and soil gas sampling is presented below. Any requirement of the Advisory not specifically described below is incorporated by reference to the Advisory (See Advisory, Appendix C).

The soil gas probes will be installed following the method described in the Advisory, Section 3.2. Depending on subsurface conditions, soil gas probes may be installed using either permanent or temporary emplacement methods. Hollow steel drive rods will be hydraulically pushed to the desired sampling depth. The sample probes will be completed as follows:

1) Install a sand pack to minimize disruption of airflow to the sampling tip. A tremie pipe should be used for soil gas wells deeper than 15 feet to avoid bridging or

segregation during placement of the sand pack and bentonite seal. The sand pack should be a minimum of six inches thick. Place the probe tip midway in the sand pack;

2) Emplace at least six inches of dry granular bentonite on top of each sand pack. Following the dry bentonite, fill the borehole to the surface with hydrated bentonite. The bentonite should be hydrated in a container at the surface and then slowly poured into the borehole. Follow a similar procedure for deep well construction with multiple probe depths, in that one foot of dry granular bentonite should be emplaced on top of the sand pack encasing each probe, followed by hydrated bentonite. The hydrated bentonite should continue until the next sand pack, as shown on Figure 1 of the 2012 ASGI. A cement/bentonite mixture may also be used above the dry bentonite layer to seal the borehole annulus, consistent with California Department of Water Resources Bulletin 74-90 (California Well Standards) (DWR 1991). Dry and hydrated bentonite layer thicknesses may be adjusted based on probe use. The completed soil gas probes will be left undisturbed for a minimum of 2 hours (depending on the probe installation method used) before sampling to allow the soil gas to equilibrate.

The sample tubing will be purged an appropriate purge volume before sampling (based on results of the purging test described in Section 7.2.2.2 below). The air flow rate during purging and soil gas sampling will be between 100 and 200 milliliters per minute with pressure not exceeding 100 inches of water, in accordance with the 2012 Advisory. Details of sampling procedures are described in the subcontractor's standard operating procedures (SOP) included as Appendix A.

7.2.2.1 Shut-In Test

Prior to purging or sampling, a shut-in test should be conducted to check for leaks in the above-ground sampling system. To conduct a shut-in test, assemble the above-ground valves, lines and fittings downstream from the top of the probe. Evacuate the system to a minimum measured vacuum of about 100 inches of water using a purge pump. The test is conducted while the sampling canister, if used, is attached with its valve in the closed position. Observe the vacuum gauge connected to the system with a "T"-fitting for at least one minute or longer. If there is any observable loss of vacuum, the fittings are adjusted until the vacuum in the sample train does not noticeably dissipate. After the shut-in test is validated, the sampling train should not be altered. The vacuum gauge should be calibrated and sensitive enough to indicate a water pressure change of 0.5 inches.

7.2.2.2 Leak Test

At each soil gas probe, a leak test will be conducted with a tracer gas such as isobutane or isopropanol placed near the surface seal and all tubing connections to check for potential intrusion of ambient air.

7.2.2.3 Purge Volume Test

The purpose of purging is to remove stagnant air from the sampling system so that representative samples can be collected from the subsurface. A purge volume test is used to establish the optimal purge volume for a site. The step purge volume test is conducted by collecting and analyzing a sample after removing one, three and ten purge volumes. The purge volume test samples should be analyzed with the same analytical method as the site's constituents of concern. The site purge volume is selected from the step purge test results yielding the highest contaminant concentrations. If VOCs are not detected in any of the step purge tests, a default of three purge volumes should be used.

One purge volume includes the following:

- The internal volume of the tubing and probe tip.
- The void space of the sand pack around the probe tip.
- The void space of the dry bentonite in the annular space.

Following sampling, the tubing will be removed and the borings will be destroyed by backfilling them with bentonite grout. The surface will be patched with concrete, asphalt, or native soil as appropriate.

7.2.2.4 Probe Equilibration Time

Prior to sampling, at least two hours of time should elapse following installation of a probe to allow the construction materials to cure and allow for the subsurface to equilibrate.

7.2.2.5 Probe Material, Sample Containers, and Sample Analysis

To minimize purge volume, use small diameter (1/8 to 1/4 inch) sampling tubing from the vapor probe tip to the ground surface, made of material which will not react or interact with site contaminants.

The collection of soil gas samples should follow the procedures in Cal/EPA's 2012 Advisory. During sub-slab sampling, avoid air breakthrough from nearby foundation cracks within the slab by using sampling containers with volumes of less than or equal to one liter. Soil gas samples will be collected in a gas-tight syringe or in a glass bulb.

Soil gas sample analysis should be performed using U.S. EPA Method 8260B. All methods should meet the site-specific data quality objectives (DQOs) and the analytical method reporting limits should be low enough for risk determination.

7.2.2.6 Sub-slab Sampling

After removal of the floor covering, a small-diameter hole should be drilled through the concrete of the foundation slab. Typically, holes are 1.0 to 1.25 inches in diameter.

Either an electric hand drill or concrete corer is used to drill the holes. All sub-slab utilities, such as water, sewer, and electrical, should be located and clearly marked on the slab prior to drilling. Sub-slab holes should be advanced three to four inches into the engineering fill below the slab. All drill cuttings should be removed from the borehole.

A general description of the probe installation and sampling processes are presented above in Sections 7.2.2 (1) and (2) and 7.2.2.1 through 7.2.2.5. Any requirement of the Advisory or VIG not specifically described is incorporated by reference to the Advisory Appendix C and the VIG Appendix G.

Alternate soil gas and sub-slab sampling probes and/or procedures may be employed with the review and approval of DTSC.

7.2.3 Soil Sampling

Soil samples will be collected from the two continuous core borings, location 1 and 11, at every five feet from the surface to 15 feet bgs. During drilling operations, an organic vapor meter (OVM), such as a photoionization detector (PID), will be used to monitor the presence and relative concentration of organic vapors in the borings and in the soil sample headspace. These organic vapor readings will be recorded on soil boring logs prepared during drilling activities.

The drilling company, method of drilling, sampler size and type, total depth of the borehole, any attempts to re-sample due to subsurface obstructions, and the logger's name will be noted on each soil boring log. The following sampling information will be recorded on the soil boring logs: soil boring number and location; sample identification numbers; date and time; sample depth; lithologic description in accordance with the Unified Soils Classification System (USCS) including soil type, particle size and distribution, color, and moisture content; sample recovery; description of any evidence of soil contamination, such as odor or staining, subsurface obstructions and OVM readings.

Following sampling, the soil borings will be destroyed by backfilling them with bentonite grout and the surface will be patched with concrete, asphalt, or native soil as appropriate.

Soil samples will be analyzed for VOCs by U.S. EPA Methods 5035 (see Appendix D)/8260B, semi-volatile organic compounds by Method 8270D, organochlorine pesticides by Method 8081B, polychlorinated biphenyls by Method 8082A, and CAM by Method 6010B.

7.2.4 Grab Groundwater Sampling

A temporary 3/4-inch PVC casing and well screen will be used to facilitate collection of the grab groundwater samples from the selected depth in each soil boring. New PVC materials will be used at each location. The grab groundwater samples will be collected using disposable bailers and disposable nylon string. If disposable bailers are not available, a stainless steel bailer will be used to collect the grab groundwater samples. Before initial use and between sampling locations, the stainless steel bailer and any other non-dedicated sampling equipment will be cleaned in accordance with the methods described in Section 8.5.

Each grab groundwater sample will be transferred to appropriate containers that contain required preservatives. For VOC analysis, the grab groundwater sample will be transferred to VOA vials, which will be filled until there is no headspace. Groundwater samples will also be analyzed for formaldehyde.

An electronic water level meter will be used to measure depth to groundwater and the data will be recorded on a field form. Field water quality parameters (pH, temperature, specific electrical conductance, and turbidity) will also be measured and recorded on field forms.

7.2.5 Field Quality Control Samples

Two types of field quality control samples are planned for this investigation. These include:

- Field duplicates (soil, soil gas, and groundwater samples), and
- Trip blanks (soil and groundwater samples).

The field QC sampling procedures are discussed below.

7.2.5.1 Field Duplicates

A field duplicate is a sample that is collected and analyzed in the same manner, and at the same time and location, as a primary sample. Field duplicate samples will be collected and analyzed to evaluate sampling and analytical precision (reproducibility). Agreement between primary and duplicate sample results will indicate good sampling and analytical precision. The precision goal for water results will be plus or minus 30 percent relative percent difference (RPD) compared to the primary results. The precision goal for soil and soil gas field duplicate results will be plus or minus 50 percent RPD compared to the primary results.

For soil and soil gas samples, a field duplicate sample will be collect by obtaining a second volume, at the initial sample location, immediately after the initial sample is collected. For groundwater samples, a field duplicate sample will be collected by obtaining the second volume water sample immediately after the initial sample is collected.

Field duplicate samples will be collected from one soil sample location, three soil gas sample locations, and one grab groundwater sample location. The field duplicate samples will be submitted to the laboratory “blind” (i.e., given a fictitious name so that the laboratory will not recognize them as duplicates). The soil gas field duplicates will be selected in the field from a location showing detectable levels of VOCs.

7.2.5.2 Trip Blanks

A trip blank is a sample that is prepared by the analytical laboratory using laboratory grade deionized water and shipped with the sample cooler to the office for delivery to the project site.

The trip blank is used to assess the potential for contamination during transport of the sample from the laboratory to the field, through the sampling program and its return to the laboratory. One trip blank will be submitted with each sample cooler containing samples to be analyzed for VOCs.

7.2.6 Field Equipment and Calibration

Field equipment includes water quality meters, air monitoring pumps, organic vapor meters, and other similar equipment. Routine preventative maintenance of field equipment is performed according to manufacturer's recommendations. All field equipment will be examined and serviced as needed before job start-up. Sufficient numbers of back-up equipment and spare parts will be available to minimize down time. In addition, sufficient quantities of field equipment supplies (e.g. soil gas tubing, disposable bailers, sample containers, field materials/consumables) and back-up supplies will be available at the site. Any repairs and maintenance completed on equipment during the investigation will be recorded on the daily field records.

Before use each day, field equipment will be calibrated according to the manufacturer's recommendations. The date, method, and results of field equipment calibration will be recorded on a field instrument calibration sheet.

8.0 SAMPLE ANALYSIS, HANDLING, AND CUSTODY

All samples will be handled in accordance with approved procedures specified herein. The U.S. EPA-approved analytical methods will be used to produce definitive-level data for use in the investigation. Screening-level data will be obtained from field instruments such as PID readings, and from grab groundwater samples collected from temporary PVC wells.

Groundwater sample analytical results will be considered screening-level data due to the method of sample collection, even though U.S. EPA-approved analytical methods will be used.

Soil gas samples will be analyzed using an on-site mobile laboratory.

8.1 SAMPLE CONTAINERS AND PRESERVATIVES

The laboratory will provide sample containers before each sampling event. The containers will be pre-cleaned to meet U.S. EPA standards and will not be rinsed in the field before sample collection. Before delivery, the laboratory will add preservatives, as required, to the containers for soil and aqueous samples.

All soil and groundwater sample containers will be labeled, placed in re-sealable plastic bags, placed in an ice chest, and delivered to the Environmental Laboratory Accreditation Program (ELAP)-certified laboratory. If any water sample container (other than VOA vials) is not filled completely, the sample volume level will be marked on the outside of the container with indelible ink.

8.2 SAMPLE PACKAGING AND SHIPMENT

A sample label will be affixed to each sample container for proper identification in the field and for tracking in the laboratory. The sample labels will include the following information:

- Job number;
- Sample identification number;
- Sampler's initials;
- Date and time of collection; and
- Preservative, if any.

Following collection and labeling, samples will be immediately placed in a sample cooler for temporary storage. The following protocol will be followed for sample packaging:

- Sample containers will be placed in clear, plastic, leak-resistant bags before placement in the ice chest. Sample sleeve liner caps or container screw caps will be checked for tightness and sealed before placing the sample in the bag.

- Samples to be shipped will be placed in a sturdy cooler lined with a large plastic trash bag before placing samples therein. The bottom of the cooler will be lined with bubble wrap. Glass sample containers will be wrapped in bubble wrap. Empty space in the cooler will be filled with bubble wrap or Styrofoam peanuts to prevent movement and breakage of samples during shipment. Vermiculite may also be placed in the cooler to absorb spills.

- Ice packs will be contained in double leak-resistant plastic bags and placed in the coolers to keep samples at a chilled temperature of 4^{o}C plus or minus 2^{o}C during transport to the analytical laboratory. When ice is used, the drain plug of the cooler will be secured with glass fiber tape to prevent melting ice from leaking out of the cooler.

- The chain-of-custody form will be placed in a water-resistant plastic bag taped to the inside of the cooler lid.

- Strapping tape (or equivalent) may be placed around each cooler to secure the lid before transport to the laboratory.

- A self-adhesive custody seal will be placed across the front closure of the cooler any time it is not in someone's possession or view before shipping. Just before shipping, custody seals will be affixed to the front, right, and back of the cooler. All custody seals will be signed and dated.

A temperature blank will be enclosed in each sample-shipping container when samples requiring preservation by chilling are transported to the laboratory. The temperature blank will consist of a 40-mL vial filled with distilled or potable tap water, clearly marked to indicate its purpose to the laboratory. The temperature blank will be placed next to the investigation samples during packaging. The temperature of the water in the temperature blanks will be recorded upon arrival at the laboratory. The target sample temperature is 4^{o}C, ±2^{o}C.

Every effort will be made to transport the samples to the analytical laboratory at the end of each sampling day. However, for sampling days that continue after the laboratory operating hours, the samples will be stored overnight in a secured location (e.g., in the AMEC office) under appropriate chain-of-custody procedures, and the samples will be shipped to the laboratory the next day. During overnight storage, the cooler(s) will be restocked with new ice to maintain the samples in a chilled state of 4^{o}C, ±2^{o}C. Alternately, samples may be shipped to the laboratory by overnight courier under chain-of-custody requirements specified herein.

8.3 SAMPLE DOCUMENTATION

Daily field records will be used to document where, when, how, and from whom any vital project information was obtained. All entries will be complete and accurate enough to permit reconstruction of field activities. Each daily field record will be dated and the time of entry noted in military time. All entries will be legible, written in black ink, and signed by the individual making the entries. If an error is made, corrections will be made by crossing a line through the error and entering the correct information. Corrections will be dated and initialed. No entries will be obliterated or rendered unreadable.

Entries in the daily field record will include at a minimum the following for each day:

- Site name and address;
- Recorder's name;
- Team members and their responsibilities;
- Time of site arrival/entry on site and time of site departure;
- Other personnel on-site;
- Weather conditions including approximate air temperature precipitation, or high wind conditions;
- A summary of any on-site meetings;
- Deviations from the sampling plan or the site health and safety plan;
- Changes in personnel and responsibilities as well as reasons for the changes;
- Levels of safety protection; and
- Calibration readings for any equipment used and equipment model and serial number.

At a minimum, the following information will be recorded during the collection of each sample:

- Sample identification number;
- Sample location and description;
- Site sketch showing sample location and measured distances to physical reference points;
- Sampler name(s);
- Date and time of sample collection;
- Designation of sample as composite or grab;
- Type of sample (e.g., matrix);
- Type of preservation;
- Type of sampling equipment used;
- Lot numbers of vendor-supplied sample containers or specialty-grade water;
- Field observations and details important to analysis or integrity of samples (e.g., heavy rains, odors, colors);
- Instrument readings (e.g., PID);
- Chain-of-custody form numbers;
- Shipping arrangements (by overnight courier delivery company including air bill number, or laboratory pickup including name of personnel and time of departure); and
- Recipient laboratory(ies).

8.4 CHAIN OF CUSTODY RECORDS

Chain-of-Custody (COC) records are used to document sample collection and shipment to the laboratory for analysis. A COC record will accompany each sample shipment to identify the contents of each shipment and maintain the custodial integrity of the samples. A sample is considered to be in someone's custody if it is either in someone's physical possession, in view, locked up, or kept in a secured area restricted to authorized personnel. Until received by the laboratory, the custody of the samples will be the responsibility of the sample collector or courier.

After placement of each sample in its protective plastic bag, the bag will be sealed. The shipping containers in which samples are stored (usually a sturdy picnic cooler or ice chest) may also be sealed with custody tape any time the containers are not in someone's possession or view and during shipment to the laboratory. These seals will be signed and dated by the sample collector.

8.5 DECONTAMINATION PROCEDURES

All equipment coming into contact with potentially contaminated soil or water will be decontaminated consistently to assure the quality of samples collected. Disposable equipment intended for one time use will not be decontaminated, but will be packaged for appropriate disposal. Before initial use and between sampling locations, reusable sampling equipment or containers will be properly decontaminated. The sampling equipment and devices used will be decontaminated using the following procedures:

- Non-phosphate detergent and tap water wash, using a brush if necessary;
- Tap-water rinse;
- Initial deionized/distilled water rinse;
- Final deionized/distilled water rinse; and
- Set on clean plastic sheeting to air dry.

Equipment will be decontaminated in a pre-designated area on pallets or plastic sheeting, and clean bulky equipment will be stored on plastic sheeting in uncontaminated areas. When not in use, decontaminated sampling equipment will be wrapped in or covered with clean plastic.

8.6 INVESTIGATIVE WASTE MANAGEMENT

In the process of collecting environmental samples, different types of potentially contaminated investigation-derived wastes (IDW) may be generated. These IDW may include the following.

- Used personal protective equipment (PPE);
- Disposable sampling equipment;
- Decontamination fluids;
- Purged groundwater and excess groundwater collected for sample container filling; and
- Soil cuttings.

The U.S. EPA’s National Contingency Plan requires that management of IDW generated during such investigations comply with all applicable or relevant and appropriate requirements (ARARs) to the extent practicable. Listed below are the procedures that will be followed for handling any IDW. These procedures have enough flexibility to allow the site investigation team to use its professional judgment for the proper disposal method for each type of IDW generated at each sampling location. Any waste storage containers such as 55-gallon drums will be sealed and labeled (including date) and placed in a secure area of the site.

- Unless there is contact with apparently contaminated material, used PPE and disposable equipment such as acetate liners, will be double bagged and placed in a municipal refuse dumpster. These wastes are not considered hazardous due to the limited amount of site media that may adhere to this solid material and can be sent to any acceptable municipal landfill. Any PPE and disposable equipment that is to be disposed of that can still be reused will be rendered inoperable before disposal in the refuse dumpster. If field personnel are uncertain as to the level of contamination remaining on the PPE or solid material, this material will be contained in sealed 55-gallon drums for eventual disposal based on the results of sample analysis. The associated sample location and date that is the source of the apparently contaminated material will be indicated on the 55-gallon drum to aid in this determination.

• Decontamination fluids that may be generated during these sampling activities include deionized water, residual sample/purge water, and water with non-phosphate detergent. The fluids will be poured into 55-gallon drums and labeled as “decontamination water.” Purged groundwater will be poured into 55-gallon drums, labeled as “purge water” with the sample location and date. The drums will be sealed upon completion of the field activities.

• Soil cuttings will be placed into 55-gallon drums that will be labeled with the source material sample locations and sealed. While soil from various borings may be placed in the same container, soil that is apparently contaminated will be sequestered, if possible, and identified by boring location and sample interval.

Containers filled with PPE/solid waste, decontamination water, groundwater, and soil will be stored in a secure location pending analytical results. After review of the analytical results, and any additional analyses required for waste handling and disposal, the containers will be transported to an appropriate off-site disposal facility. AMEC will not sign waste manifests;

DTSC will identify the person(s) authorized to sign the manifests.

9.0 HEALTH AND SAFETY PLAN

A site-specific Health and Safety Plan (HSP) will be prepared for the field work described in this Work Plan. This HASP is presented in Appendix B. All AMEC personnel will be required to follow the procedures set forth in the HASP. Subcontractors will have access to a copy of the HASP; however, they are responsible to provide proper safety procedures and monitoring for their own personnel.

10.0 REPORT PREPARATION

A final report will be prepared presenting the results of the investigation. The report will include site background and environmental setting information, field documentation and observations, and summaries of the analytical data obtained for the soil, soil gas, and groundwater samples collected during the investigation. Supporting documentation that may include, but not be limited to, soil boring logs, laboratory reports and chain-of-custody records, and data review results will be included as appendices to the report.

Once sampling results are available, the Public Participation Specialist will work with the team to develop an appropriate mode of communicating the sampling results and future course of actions with the public.

Based on the investigation findings, recommendations will be made, as appropriate, for any additional actions to further assess conditions in the study area. If further action is recommended, the report will identify remaining data gaps and/or investigative needs/strategies.

11.0 REFERENCES

Ami Adini and Associates, Inc. 2013. *Preliminary Environmental Assessment Report Autumnwood Development Amaryllis Court, Wildomar, California 92595*. Prepared for Swanson Law Firm, September 27, 2013.

California Department of Water Resources (DWR), *California Groundwater Bulletin 118, Temecula Valley Groundwater Basin,* February 27, 2004.

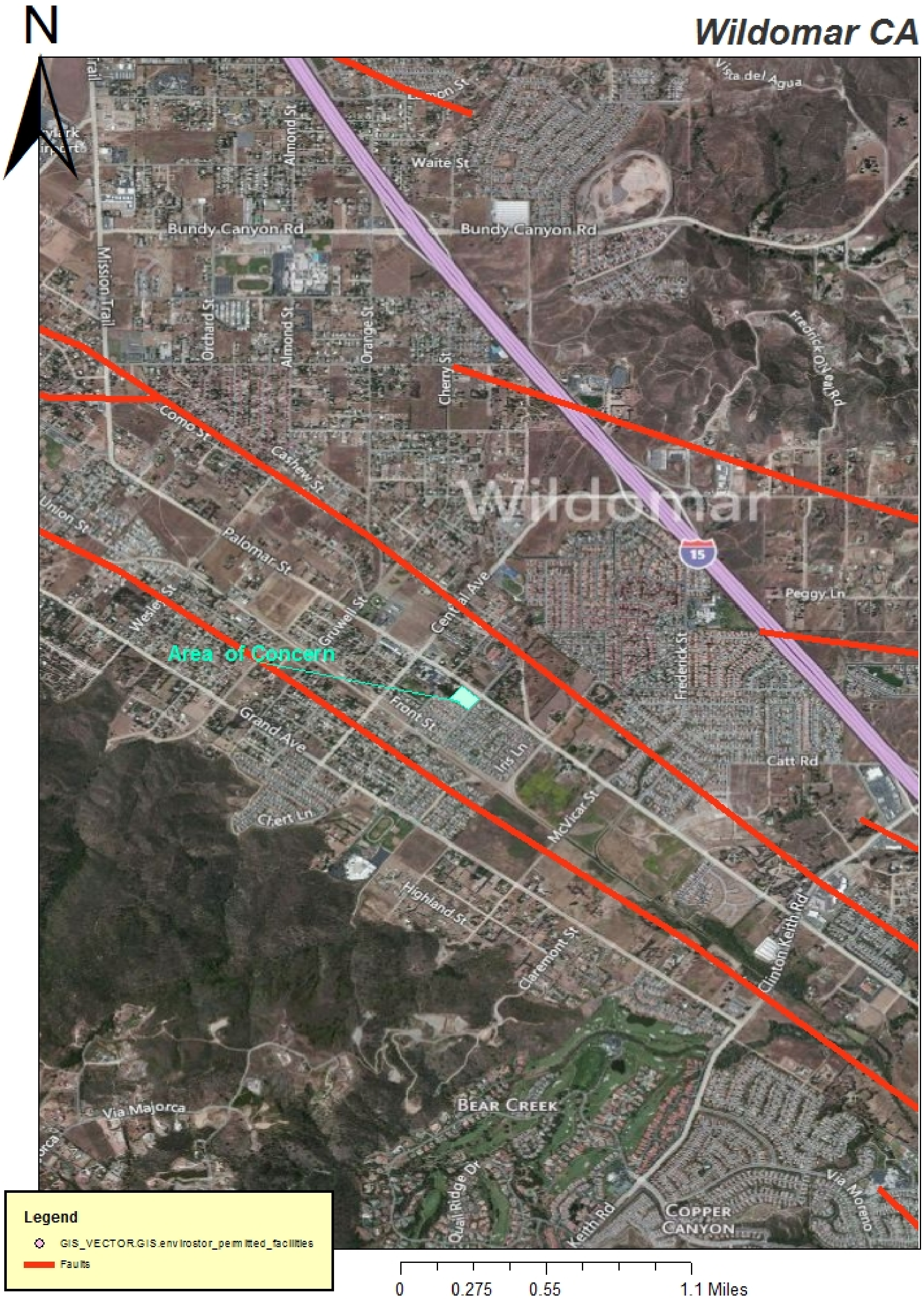
TABLE 1

TABLE 1

Wildomar Sampling Schedule				
Location	**Soil***	**Soil Gas****	**Groundwater*****	**Continuous Core**
1		X	X	X
2		X		
3		SS		
4		X		
5		X		
6	X	X		X
7		X	X	X
8	X	X		X
9		X		
10		SS		
11		X	X	X
12	X	X		X
13		X	X	X
14		SS		
15		X		

*	Soil samples collected at 5 foot intervals (Surface to 15 ft bgs)
**	Soil gas collected at 5 and 15 ft bgs
***	Groundwater samples collected at first water (~20-30 ft)
SS	Sub-slab sample

FIGURES 1, and 2
SITE LOCATION and BORING LOCATION


N
Wildomar CA
Bundy Canyon Rd
Bundy Canyon Rd
Waite St
Mission Trail
Orchard St
Almond St
Orange St
Cherry St
Fredrick O'Neal Rd
Como St
Cashew St
Union St
Palomar St
Wildomar
Central Ave
Peggy Ln
Wesley St
Gruwell St
Area of Concern
Front St
Grand Ave
Iris Ln
Frederick St
Catt Rd
Chert Ln
McVicar St
Highland St
Claremont St
Clinton Keith Rd
Via Majorca
Bear Creek
Quail Ridge Dr
Keith Rd
Copper Canyon
Via Moreno
Legend
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Faults
0
0.275
0.55
1.1 Miles

Wildomar CA

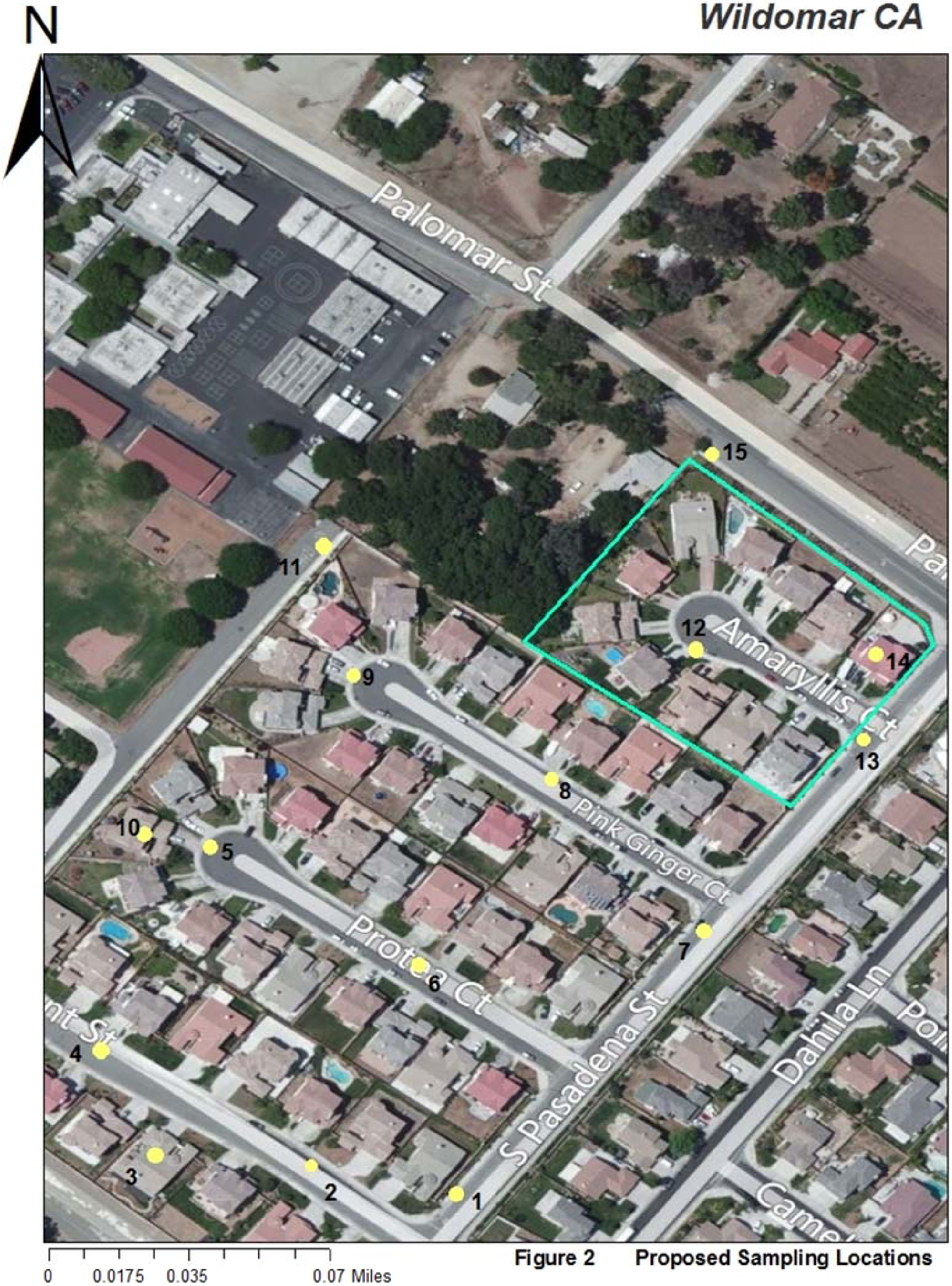

Figure 2 Proposed Sampling Locations

APPENDIX A
SOIL GAS SUBCONTRACTOR SOP

APPENDIX B
HEALTH AND SAFETY PLAN

APPENDIX C

Advisory – Active Soil Gas Investigations (Advisory) [DTSC, 2012] and the *Guidance for the Evaluation and Mitigation of Subsurface Vapor Intrusion to Indoor Air* (Vapor Intrusion Guidance) [VIG 2011]

APPENDIX D
SOIL SAMPLING
US EPA 5035