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April 1, 2010

Paul Cho, PG
California Regional Water Quality Control Board, Site Cleanup Unit IV
Los Angeles Region
320 West 4th Street, Suite 200
Los Angeles, CA 90013

Re: Addendum to *Supplemental Investigation Work Plan for Truck Fill Station, Water Tank, and Northeast Settling Pond Areas, Defense Fuel Support Point Norwalk, 15306 Norwalk Boulevard, Norwalk, California*

SCP No. 0286A, Site No. 16638

Dear Mr. Cho:

Parsons on behalf of the Defense Energy Support Center (DESC) is pleased to submit this addendum to the work plan[1] submitted in July 2009 for the DESC Norwalk Site. The July 2009, work plan was approved by the California Regional Water Quality Control Board, in a letter dated September 16, 2009. This addendum presents additional investigations proposed for the truck fill station (TFS), water tank, and northeast corner of the site areas.

1.0 SITE DESCRIPTION

The Defense Fuel Support Point (DFSP) Norwalk facility is a 50-acre facility consisting of 12 aboveground storage tanks that previously stored and distributed jet propellant (JP)-5 and JP-8. Aviation gasoline and JP-4 also were reportedly stored at the facility. Santa Fe Pacific Pipeline, L.P. (SFPP), an operating partner of Kinder Morgan Energy Partners, L.P. (KMEP), leases a 2-acre easement along the southern and eastern boundaries of DFSP for operation of its pipelines, which convey gasoline, diesel, and jet fuel. Within the southern easement lie three active KMEP pipelines, one of which is a 16-inch diameter

[1] Parsons, *Supplemental Investigation Work Plan for Truck Fill Station, Water Tank, and Northeast Settling Pond Areas, Defense Fuel Support Point Norwalk, 15306 Norwalk Boulevard, Norwalk, California*, July 16, 2009.

pipeline, designated LS-1, that bends at the southeastern corner of the facility and continues northward within the eastern easement. An abandoned pipeline, likely owned or formerly operated by Golden West Pipeline, also runs along the eastern boundary of the site. The DESC has decommissioned the site, but KMEP pipelines continue to operate.

2.0 BACKGROUND AND OBJECTIVE

In accordance with the July 2009 approved work plan, supplemental investigations were conducted between September 3 and October 22, 2009 and results were presented in the November 30, 2009 report[2]. The investigation included direct-push technology (DPT) soil sampling at 19 locations and the installation of one groundwater monitoring well, GMW-66.

The investigation report concluded that soil is sill impacted at the TFS and water tank areas and the impacted soil plumes have not been defined. In addition, there appears to be minor impacts to the soil at the northeast corner of the site (former settling pond area) and the source has not been identified.

Therefore, further investigation is needed in these areas to define the impacted soil plumes at the TFS and water tank areas and to determine if a soil hot spot exists at the northeast corner of the site that would require remedial action. Once these objectives have been met, remedial actions for soil will be evaluated and implemented at these areas.

Groundwater will not be addressed under this addendum work plan only soil conditions. Site-wide groundwater remedial actions will be discussed at a later date once certain issues have been resolved (i.e., methyl tert-butyl ether (MTBE)/tert-butyl alcohol (TBA) concerns) and results of the capture analysis have been evaluated.

3.0 PROPOSED INVESTIGATION

The proposed investigations will be conducted to assess the current limits of impacted soil and to propose further remedial action for soil at each area. A brief description of the planned investigation, including technology and sampling locations, for each area is discussed below.

Once impacted soil has been defined in each of these three areas, each area of impact will be calculated to determine the mass of impacted soil. Remedial options will be evaluated specific to each area, including cost analysis, and

[2] Parsons, *Supplemental Investigation Report for Truck Fill Station, Water Tank, and Northeast Settling Pond Areas, Defense Fuel Support Point Norwalk, 15306 Norwalk Boulevard, Norwalk, California*, November 30, 2009.

recommendations will be provided to DESC for remedial action of soil at each of these areas.

3.1 Truck Fill Station

The areas to the north, east, and south of the TFS require additional soil investigation to define the impacted plume. The soil impacts along the western edge of the TFS have been defined and no further soil investigation in this direction is needed. Furthermore, soil around the former pump house located to the south of the TFS is highly impacted with hydrocarbons and will require additional soil investigation in all directions around the former pump house.

In order to define the impacted soil and distribution of contaminants, soil sampling will be conducted using DPT at 14 specific step-out locations to 25 feet below ground surface (bgs) as shown on Figure 1. Sampling points have been strategically located based on data review, including historical and September/October 2009 investigation results. Soil samples will be collected at 5, 10, 15, 20, and 25 feet bgs at each location. Based on field hydrocarbon monitoring of the soil, selected sample depths will be sent to the laboratory to be analyzed for volatile organic compounds (VOC) and total petroleum hydrocarbons (TPH). Soil samples will be field screened using a PID and if concentrations are greater than 25 ppm then the sample will be submitted to the laboratory for TPH and VOC analysis. If the PID reading is between 25 – 10 ppm the sample will be put on hold at the laboratory for further instruction based on results of the samples above and below the selected depth. Samples that exhibit a reading on the PID of < 10 ppm will not be sent to the laboratory for analysis.

Selected soil samples will be submitted for expedited turn-around-time (TAT) in order to determine if the extents of impact have been defined or if additional step-out locations are required. If impacts are still detected in these 14 soil step-out locations, then additional step-out locations will be needed. Since Parsons will be in the field, the DESC will be contacted to obtain verbal authorization for additional soil DPT locations and soil sampling.

3.2 Water Tank Area

Further investigation is needed to conduct step-out DPTs in the water tank area to delineate the impacted soil plume. DPT soil sampling will be conducted at eight locations as identified on Figure 2. Sampling points have been strategically located based on results of data review. Soil samples will be collected at 5, 10, 15, 20, and 25 feet bgs at each location. Based on hydrocarbon field measurements as discussed above, selected samples will be sent to the laboratory for VOC and TPH analysis. Additionally, selected samples will be submitted for expedited TAT as discussed above. The bermed areas to the east

and west prohibit access beyond these points and therefore, there may be areas where the soil plume may not be able to be fully defined as long as the berms remain in-place. If impacted soil is encountered, then additional soil sampling locations may be needed if area is accessible.

3.3 Northeast Corner of the Site

Based on the historical results from 1990-1992 and the small benzene detects in soil during the September/October 2009 investigation, there appears to be a source in the soil in the northeast corner of the site (at the former settling pond) that has yet to be identified. Since the exact area of the former settling pond is unknown, but shown on the aerial photograph from 1952, a GORE™ survey is proposed to identify hot-spot soil gas chemistry.

The Gore™ survey uses a time-integrated, sorbent-based approach to sampling and has a good track record in qualitative identification of chemicals of concern. Additionally, the Gore™ module, with its waterproof, vapor-permeable membrane, can collect soil gas under any conditions, including saturated soils. The module protects the sorbent, while exposure time (one week for this screening event) maximizes sensitivity to a broad range of compounds at low concentrations. The survey will provide plan view area contour maps for TPH, BTEX, and MTBE.

The Gore™ survey will cover the entire northeast corner of the site of an approximate overall area of 250 feet by 150 feet. A 25-foot spaced grid will be used across this area. The approximate location of the former settling pond, 90 feet by 60 feet, will be covered using a tighter grid with 15-foot spacings. The approximate number of Gore™ module sampling points will be 100.

Where the approximate location of Gore™ survey results have shown detects, additional DPT borings will be conducted to define the impacted soil in this area. For these locations, since at this time it is unknown, we have estimated six DPTs. Soil samples will be collected at 5, 10, 15, 20 and 25 feet at each location. Based on hydrocarbon field measurements as discussed above, selected samples will be sent to the laboratory for VOC and TPH analysis. Additionally, selected samples will be submitted for expedited TAT as discussed above. If more DPTs are needed, then the DESC will be contacted for verbal authorization.

4.0 PROJECT PLANNING

Preparation for fieldwork includes acquisition of services, equipment, permits, mobilization, and coordination of communication lines. Parsons will procure

subcontractors for geophysical utility clearance, direct-push unit, laboratory services, and Gore™ survey.

Permitting. A permit to conduct DPT and soil sampling will be filed with the Los Angeles County Department of Public Work Permit Agency. In addition, a construction permit as required by the City of Norwalk will be filed. These permits will be obtained prior to the start of field work.

Utility Clearance. Prior to the start of this investigation, each planned sampling location will be clearly marked with white paint. A geophysical survey will then be conducted at these locations to assess the possible presence of subsurface obstructions (e.g., piping, utilities, metallic debris, etc.). The geophysical survey will use a combination of electromagnetic induction and ground-penetrating radar instruments. In addition to the geophysical survey, Underground Service Alert will be notified at least 48 hours in advance of field operations to clear the proposed sampling locations for any utilities and subsurface lines.

If a utility is identified within 3 feet of the proposed DPT locations, the locations will be moved and the clearance procedures will be repeated.

5.0 PROPOSED FIELD AND SAMPLING PROCEDURES

This section briefly describes the proposed field procedures, including Gore™ survey and soil sampling procedures. For further details see the July 2009 work plan[3] which also describes the following procedures: bore hole logging, sample collection and shipment, laboratory analyses and quality control.

5.1 Soil Sampling

Soil sampling will be conducted within site boundaries around the TFS, water tank, and northeast corner of the site. Using DPT drilling, up to 28 locations will be sampled: 14 at the TFS, 8 at the water tank, and up to 6 in the northeast corner of the site, as shown on Figures 1 and 2. Soil samples will be collected at 5, 10, 15, 20, and 25 feet at each location. Based on field hydrocarbon monitoring, selected samples will be sent to the laboratory and analyzed for VOCs and TPHs. Additionally, selected samples will be submitted for expedited TAT as discussed above.

Soil samples will be collected utilizing a Geoprobe® drill rig. Sampling will involve the collection of a 48-inch length soil sample within an acetate sleeve

[3]Parsons, *Supplemental Investigation Work Plan for Truck Fill Station, Water Tank, and Northeast Settling Pond Areas, Defense Fuel Support Point Norwalk, 15306 Norwalk Boulevard, Norwalk, California*, July 16, 2009.

inside a stainless steel sampler. The drill rods will be driven at four-foot intervals. After driving each interval, the sampler will be pulled to the surface and the filled acetate sleeve removed. The acetate sleeve will be cut open lengthwise using a knife or box cutter, and the two opposing halves of the sample will be laid on a table side by side to facilitate visual observation and logging. The portion of soil for laboratory analysis will initially be cut off and capped on both ends with tight plastic caps, prior to splitting open the remaining portion of the acetate sleeve. The sampler will be decontaminated between each sampling interval as described in Section 5 of the July 2009 work plan.

The collected soil samples will be carefully observed by the field geologist and described in detail in accordance with the Unified Soil Classification System and as described in the July 2009 work plan.

Soil samples collected at five foot intervals will be set aside in Zip-Loc bags for headspace VOC measurements using a PID. The PID will be calibrated to a 100 parts per million (ppm) isobutylene standard.

All lithologic and headspace information will be recorded on Parson's standard boring log form. The boring logs will also document how each boring was sealed and abandoned.

5.2 Gore™ Survey

Parsons proposes to install up to 100 modules across the northeast corner of the site, using a 25-foot spaced grid combined with a localized 6-foot spaced grid (at the suspected former pond location) over a 250 feet by 150 feet area as presented on Figure 3. This density of samples and the proposed locations will allow a proper screening of potential VOCs of concern at this area. Due to access issues or field conditions some locations may not be drilled or sampled.

A ½- to ¾-inch diameter hole will be drilled to a depth of three feet using a rotary hammer drill. No casing will be installed; an insertion rod will be used to push the module in place, and cork the hole to prevent surface contamination. The modules will be left in place for a one week exposure period before recovery. Additional details on the actual Gore™ survey have been included as attachments to this work plan and include a description of soil gas sampling services; storage, installation, and retrieval guidelines; and a list of analytes.

Once recovered, the Gore™ modules are shipped to the laboratory for analysis using modified EPA methods 8260 and 8270, which can provide qualitative mass distribution and optional concentration data. Compound-specific data generated for this program includes TPH and VOCs, including the chlorinated solvents and BTEX constituents detected in site soil gas. Strict quality assurance/quality control (QA/QC) methods specific to the Gore™ probes will be followed for

sample installation and probe retrieval. Analytical procedures for EPA Methods 8260 and 8270 analyses will follow the method requirements. Parsons will compile the field implementation procedures, sampling and analyses methods, analytical data, and color contour maps of VOC contaminants' distribution into a report. The final VOC screening report will be provided to DESC. The findings of the report will be utilized to plan and execute discrete sampling and remedial action in this area.

5.3 Miscellaneous

Decontamination of sampling equipment, management of investigation-derived wastes, and site activity documentation will be conducted following procedures outlined in the July 2009 work plan. In addition, the project-specific health and safety plan (HASP) developed for the DFSP Norwalk facility[4] will be followed during all site activities.

6.0 REPORTING

Following receipt of the soil analytical and Gore™ survey reports, data evaluation will be conducted. A report will be prepared to summarize the findings of this supplemental investigation. The report will include a discussion of the sampling procedures and results, including the Gore™ survey, and will be supplemented with tables, figures, boring logs, and laboratory-certified analytical reports with COC forms. Upon review by DESC, the report will be finalized and submitted to the RWQCB. Recommendations will be made for each area for further investigation if needed and/or remedial action.

If you have any questions please call me at (602) 852-9110 or Mary Lucas at (626) 440-6032.

Sincerely,

Redwan Hassan, PG
Project Manager

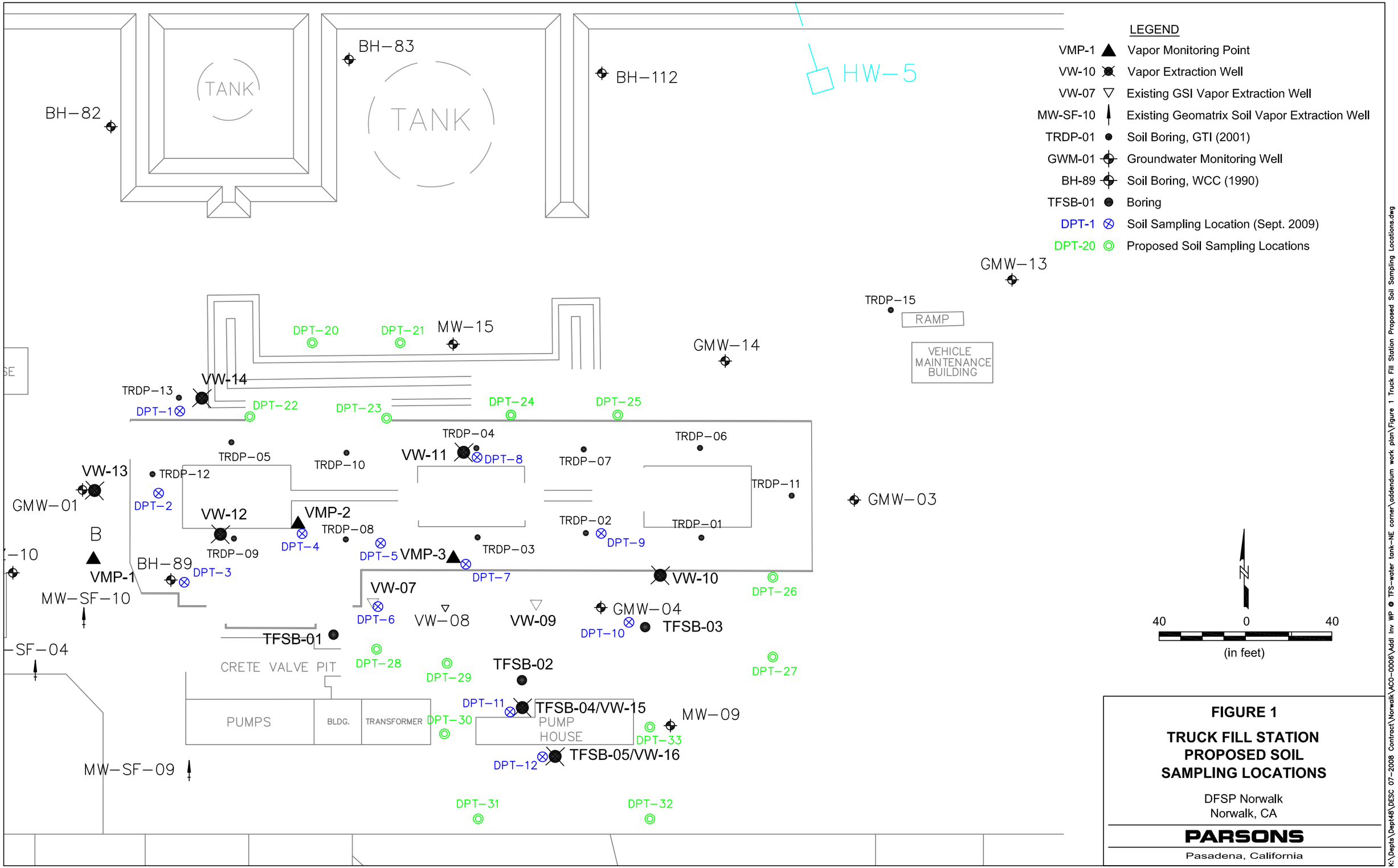
[4] Parsons, 2006b, *Site-Specific Health and Safety Plan, Defense Energy Support Center*, December 4.

Figures:
1. Truck Fill Station Proposed Soil Sampling Locations
2. Water Tank Proposed Soil Sampling Locations
3. Northeast Area Gore™ Survey Sampling Locations

Attachments: GORE™ Technical Information:
Description of Soil Gas Sampling Services; Storage, Installation, and Retrieval Guidelines; Analytical List; USEPA Environmental Technology Verification Report

cc: File
Mr. Kola Olowu, DESC - Fort Belvoir, VA
Ms. Amy Loar, DESC-FPA
Lt. Col. Jon Ramer, DESC
Mr. Jeffrey Hu, RWQCB
Mr. Tim Whyte, URS

FIGURES



LEGEND

VMP-1	Vapor Monitoring Point
VW-10	Vapor Extraction Well
VW-07	Existing GSI Vapor Extraction Well
MW-SF-10	Existing Geomatrix Soil Vapor Extraction Well
TRDP-01	Soil Boring, GTI (2001)
GWM-01	Groundwater Monitoring Well
BH-89	Soil Boring, WCC (1990)
TFSB-01	Boring
DPT-1	Soil Sampling Location (Sept. 2009)
DPT-20	Proposed Soil Sampling Locations

FIGURE 1

TRUCK FILL STATION PROPOSED SOIL SAMPLING LOCATIONS

DFSP Norwalk
Norwalk, CA

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Pasadena, California

K:\Depts\Dept48\DESC 07–2008 Contract\Norwalk\ACO–0006\Addl Inv WP ● TFS–water tank–NE corner\addendum work plan\Figure 1 Truck Fill Station Proposed Soil Sampling Locations.dwg

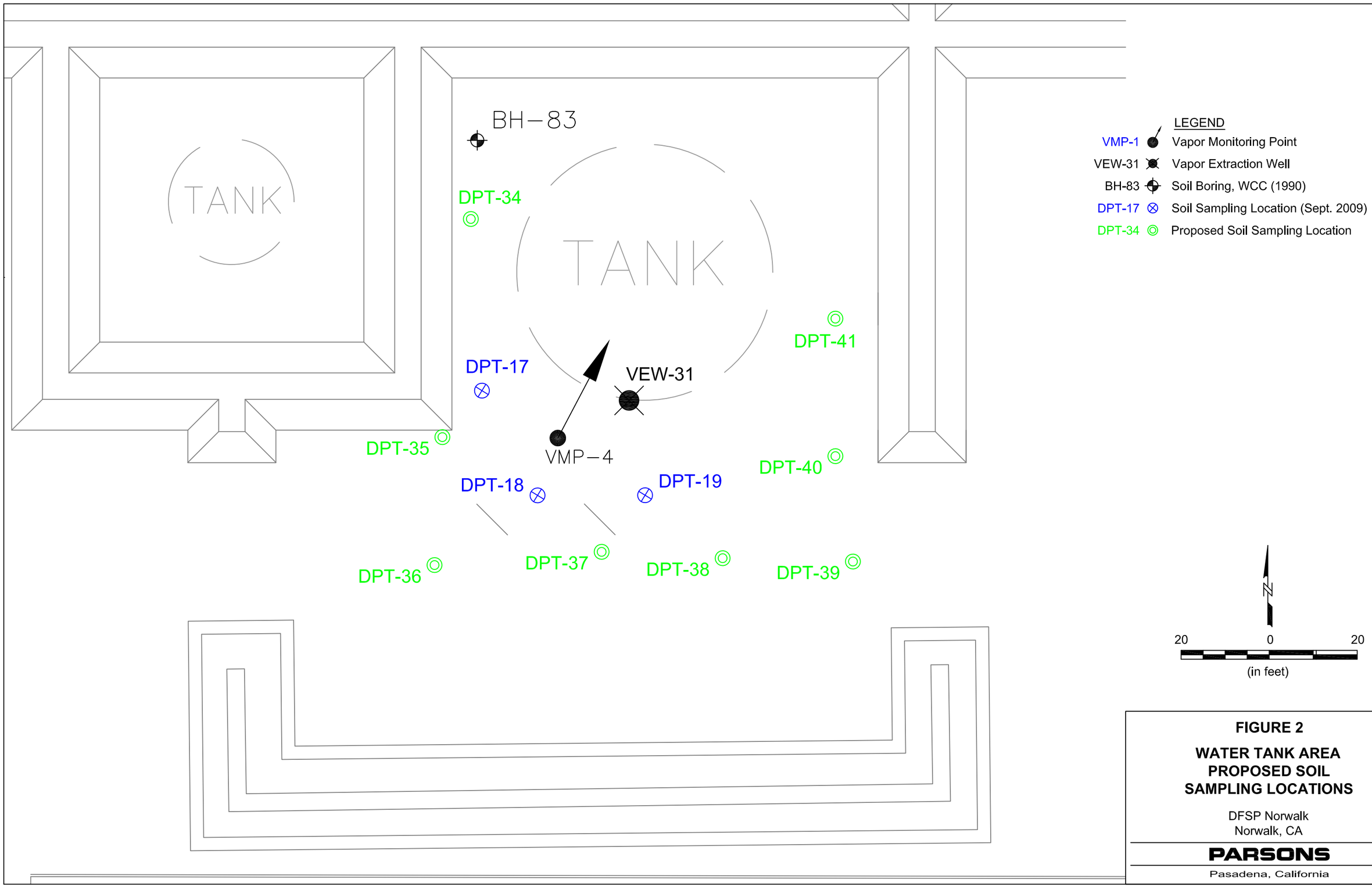

FIGURE 2

WATER TANK AREA
PROPOSED SOIL
SAMPLING LOCATIONS

DFSP Norwalk
Norwalk, CA

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Pasadena, California

K:\Depts\Dept48\DESC 07-2008 Contract\Norwalk\ACO-0006\Addl Inv WP ● TFS-water tank-NE corner\addendum work plan\Figure 2 Water Tank Area Proposed Soil Sampling Locations.dwg

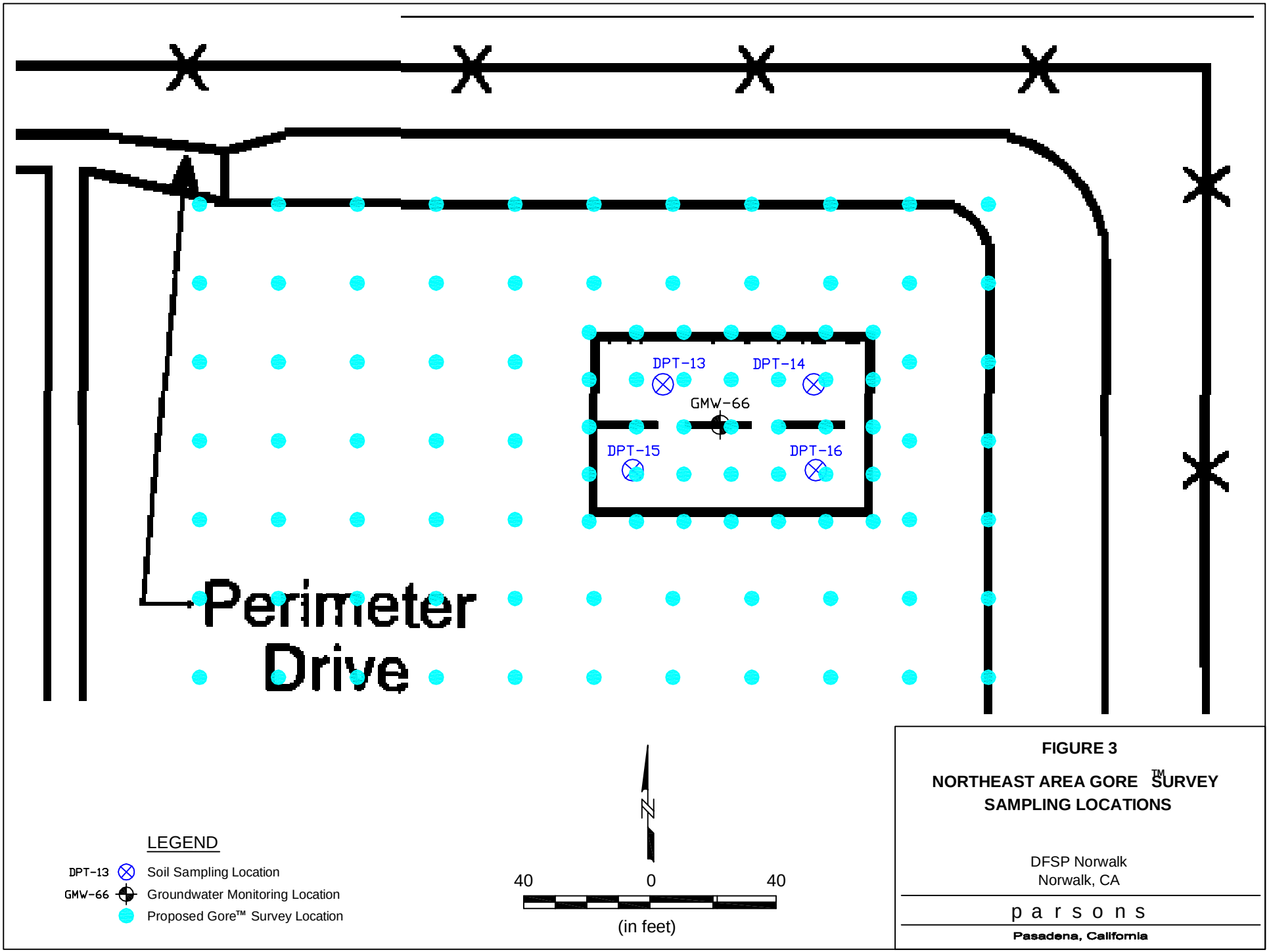

FIGURE 3

NORTHEAST AREA GORE™ SURVEY SAMPLING LOCATIONS

DFSP Norwalk
Norwalk, CA

p a r s o n s

Pasadena, California

K:\Depts\Dept48\DESC 07-2008 Contract\Norwalk\ACO-0006\Addl Inv WP ● TFS-water tank-NE corner\addendum work plan\Figure 3 Northeast Area Gore Survey Sampling Locations.dwg

ATTACHMENTS

GORE™ SURVEYS ENVIRONMENTAL SITE ASSESSMENT

FOCUSING YOUR REMEDIATION EFFORTS.

U.S. ENVIRONMENTAL PROTECTION AGENCY

Environmental Technology Verification Report

The U.S. EPA published the Environmental Technology Verification (ETV) report:

Soil Gas Sampling Technology, W. L. Gore & Associates, Inc.
GORE-SORBER® Screening Survey

The report states...

"VOC Detection and Quantitation: The GORE-SORBER® Screening Survey detected the same compounds in each sample as the reference soil gas sampling method, as well as several VOCs that the reference method did not detect...

The demonstration results indicate that the GORE-SORBER® Screening Survey can provide useful, cost-effective data for environmental problem-solving. The GORE-SORBER® modules successfully collected soil gas samples in clay and sandy soils .The sampler provided positive identification of target compounds and may detect lower concentrations of VOCs in the soil gas than can the reference soil gas sampling method. Based on the results of this demonstration, there appears to be a general correlation between the GORE-SORBER® Screening Survey and reference method data."

R^2 = 0.82 to 0.99

To download a copy of the ETV report log onto the EPA's ETV website at:
http://www.epa.gov/etv/pdfs/vrvs/01_vr_goresorber.pdf

ETV

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Creative Technologies Worldwide

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GORE™ SURVEYS ENVIRONMENTAL SITE ASSESSMENT

FOCUSING YOUR REMEDIATION EFFORTS.

Soil Gas and Subslab Soil Gas Sampling ~~Description of Service~~

Introduction

GORE™ Surveys, utilizing GORE™ Modules (patented, passive, sorbent-based samplers), have been used successfully at thousands of sites to delineate source and extent of subsurface areas impacted by volatile and semi-volatile organic compounds (VOCs, SVOCs). These compounds are associated with a wide range of petroleum and chlorinated products, fuels, solvents, creosotes, chemical agents and explosives.

Common applications include detection of compounds to: 1) delineate source and extent of soil and groundwater contamination in porous and fractured media, 2) monitor progress of subsurface in-situ remedial actions, 3) provide data for real estate transfers and Brownfield investigations, 4) provide vapor intrusion data, 5) reduce groundwater monitoring costs, and 6) provide conceptual site model information. The GORE™ Survey is used in Triad investigations. Prudent use of this technology can optimize and reduce subsequent sampling and monitoring efforts resulting in significant cost savings in any of these applications.

GORE™ Module Description

The GORE™ Module is a patented, passive, sorbent-based sampler, which collects volatile and semi-volatile compounds present in air, soil gas and water. The module is constructed of a GORE-TEX® membrane tube. The membrane is chemically-inert, vapor permeable and waterproof. The membrane has over 80% open area and pore sizes that are 1,000 times larger than the largest semivolatile organic vapor molecule. The membrane does not adsorb compounds or offgas chemicals. Engineered adsorbents are housed within the GORE-TEX® tube. The adsorbents were selected due to their affinity for a broad range of organic compounds while having minimal water vapor uptake. The adsorbents are located near the bottom of an approximately one (1) foot length of the membrane tube which is fashioned with a loop. The loop is used as a means of tying the module to a string to facilitate installation and retrieval.

The unique membrane is hydrophobic and excludes liquid water, and does not retard vapor transfer, thus allowing VOC and SVOC vapors to penetrate the module freely and collect on the adsorbent material. This ability to protect the sorbent media from contact with ground and soil pore water, without retarding soil vapor diffusion, facilitates the application of the GORE™ Survey in virtually any geological site condition, while protecting sample integrity.

Quality Assurance (QA) Measures

As standard practice, all modules are individually numbered and tracked throughout the manufacturing, field deployment, analytical, mapping and reporting steps. Completed modules are sealed into clean glass vials, with caps having an identical serial number (barcode). All modules are transported to and from the customer's site in the vials and boxes supplied by GORE, with custody seals. Additional modules are included as trip blanks, and travel to and from the site. Associated method, manufacturing, and trip blanks are tested as QA controls. A rigorous quality system is maintained with documented procedures for all QA measures.

Installation and Retrieval Procedures

Installation of the modules is typically performed by the customer. GORE™ Modules can be installed to any depth. For soil gas sampling, a slam bar or electric rotary hammer-drill is used to drive a 1/2 to 1-inch (2.5cm) diameter hole to a depth of three or more feet (1 meter) below grade. Subslab soil gas sampling is similar, but requires a rotary hammer or coring tool to advance the hole through the slab. Casing the hole is optional.

A length of string or cord is tied to the loop in the GORE™ Module and to a supplied impermeable cork. The module is inserted into the hole, using the supplied stainless steel insertion rod. After each module insertion, the rod is removed, cleaned, and used at the next sample location. The cork is tamped flush with the surface to seal the hole. The cork provides an effective seal against air infiltration. If additional security is needed, a bentonite patch can be applied over the cork.

Modules identified as trip blanks should be noted on the Installation/Retrieval log and left unopened in the shipping box for the duration of the field exposure. The log is updated along with the sitemap and any other required field notes.

Module retrieval requires that field personnel locate the module, remove the cork, grasp the cord and manually pull the module from each location. Corks and cord are separated from the modules and discarded properly. The exposed modules are returned to their respective numbered shipping vials, sealed, and placed in the shipping box. Boxes with field-exposed modules and trip blanks are shipped with the Chain-of-Custody (COC) form, Install Log and insertion rod, to GORE's laboratory in Elkton, MD via overnight courier.

Separate detailed installation and retrieval instructions are available and are provided with each sampler shipment.

Module Exposure Time

For site assessment applications, the suggested exposure time for soil gas sampling is 7 to 10 days, but can be less if the site is believed to be highly impacted. For concentration reporting, the exposure time may be less depending on the known or suspected chemical concentrations.

Analytical Procedures

Upon receipt of the modules at the GORE laboratory, the inbound shipment is inspected and reconciled. The samples are logged and the COC is reviewed and signed.

Analytical instrumentation consists of gas chromatographs and mass selective detectors, as well as automated thermal desorption units. Sample preparation involves cutting the tip off the bottom of the GORE™ Module and transferring an exposed sorber to a thermal desorption tube for analysis. No further sample preparation is required. The replicate samples are retained for approximately two weeks after the initial analysis. Results are reported electronically in MS-Excel formatted data tables.

Analytical Method Quality Assurance

All GORE™ Modules are analyzed following a modified EPA method 8260/8270. At the beginning of each analytical sequence, instrument and method blanks are analyzed, mass spectrometer tuning is verified, and a five level calibration is performed. The tuning and system cleanliness is re-verified after every 30 samples/or trip blank analyses. Positive identification of target compounds is determined by the presence of the target ion, at least two secondary ions, retention time versus reference standard, and the analyst's judgment. All analytical data are typically reported as a mass of analyte in micrograms (μg) per sample.

Vapor concentration data are available. Measured, compound-specific uptake rates for the module, adsorption/desorption efficiencies, and masses desorbed are entered into a model developed from ASTM[1], MDHS[2], and other approved and accepted methods, which report concentration data in vapor from passive, sorbent-based diffusion samplers. For soil gas concentrations, the resistance to diffusion in the soil is accounted for by entering total porosity and water-filled porosity into the model. The terms and procedures were adopted from the research of Johnson and Ettinger[3] (1991) and Millington and Quirk[4] (1961).

Soil Gas Data Interpretation

In general, the detection of VOCs and SVOCs in field-exposed modules indicates that potential sources (i.e. soil adsorbed-, dissolved- and separate-phase organics) of the detected compound(s) may exist in proximity to the GORE™ Module location. The module will adsorb migrating gases present in the adjacent media (soil or water). The processes that govern the movement of gases in the subsurface are complex, involving interactions between the soil, soil moisture, pore gasses, groundwater, natural and human-made barriers, and the volatile contaminant. Chemical and microbiological processes can further influence the presence of soil gases, by reacting with or metabolizing these compounds.

Vapor pressure, water solubility, molecular weight, and the Henry's Law partitioning coefficient, are important chemical parameters to consider when interpreting soil gas data. The Henry's Law coefficient reflects a compound's behavior when partitioned into air and water, which aids in understanding an organic chemical's likely state in the subsurface. An understanding of the site geology (geologic structure, geochemistry), hydrogeolology and operational history are also important when interpreting the distribution of soil gases.

A strong correlation is often observed between the soil gas mass levels and the compound concentrations located in the subsurface during subsequent sampling.

Contour Maps

Graphic presentation of the soil gas and subslab soil gas data extracted from GORE™ Modules is normally presented by overlaying the contamination patterns (contours) onto CAD maps supplied by the customer. Either minimum curvature or kriging interpolation are available. Standard "B-sized" (11" x 17") color contour plots are included with each project. Larger plots are available upon request. The site plan basemap(s) provided by the customer must include a scaled drawing with relevant site features, and a layer containing the GORE™ Module locations and module serial numbers for the survey. Contour maps are provided electronically as PDF files, and are also available in a variety of other electronic formats.

Tentatively Identified Compounds (TICs)

The GORE™ Modules may contain non-target analytes (compounds not on GORE's target list). GORE can provide tentative identification of prominent non-target compound peaks (TICs). These compounds can include non-target soil gas analytes, and contaminants introduced during sample transport and installation/retrieval activities.

Final Reporting

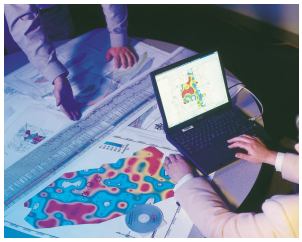
The results of the GORE™ Survey are summarized in a brief report, which will include the chain of custody, analytical data summary table, sample chromatograms, comments, and color contour maps. A full laboratory analytical data deliverables package incorporating calibration information, analysis, results of samples, standards and blanks, and mass spectra compared to standards for all detects, can be provided as an option. The Final Report and maps are available in electronic (PDF) format. Hardcopy maps and report can be provided upon request.

REFERENCES

1. ASTM Methods 6306-98, 4597-03, 6246-02, and 5314-93
2. MDHS Methods, 27, 70, and 80
3. User's Guide for the Johnson and Ettinger (1991) Model for Subsurface Vapor Intrusion into Buildings. 2000. PN 050240.004. www.epa.gov/sperfund/programs/risk.airmold/johson_ettinger.htm
4. Millington, R.J. and J.M. Quirk. 1961. "Permeability of Porous Solids." Trans. Faraday Soc. 57:1200-1207.

1) SAMPLE

2) ANALYZE



3) REPORT

www.gore.com/surveys

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Fax. 1-410-506-4870

Sale Offices:
Europe: +49-89-4612-2198
San Francisco: 1-415-648-0438

Email: environmental@wlgore.com

Soil Gas & Sub-slab Soil Gas Sampling
Storage, Installation and Retrieval Guidelines

NOTE: If you have any questions regarding installation and retrieval, please call:
Jay Hodny, Jim Whetzel or Hilary Tretheway
(410) 392-7600

GENERAL

Always obtain utility clearance before any subsurface sampling.

Soil Gas & Sub-slab Soil Gas
For soil gas sampling, the GORE™ Modules can be placed on the surface or installed to any depth, in uncased or cased holes, and can include vertical profiling. The installation hole is sealed effectively against air infiltration with an impermeable cork. The prescribed practice is to place the passive sampler (i.e., the adsorbent) at the desired sampling depth. Generally, for soil gas sampling, depths of three feet or more are favored to minimize the effects of near surface and surface variables (e.g., soil temperature, barometric pressure, air pollution, natural organic content) on the soil gas signal of interest.

Similarly, subslab soil gas can be collected by placing the module at the slab/soil interface, at depth beneath the slab, or both, in permanent or temporary installation holes. An installation hole is advanced through the slab, and sealed with the cork after module insertion. For soil gas and subslab soil gas sampling, the installation is flush with the surface with no equipment remaining on the surface.

Site activities which may disturb the natural soil gas migration should not be conducted during the time when the GORE™ Modules are in the subsurface. Such activities include, but are not limited to, installation/operation of soil vapor extraction systems, drilling (e.g., air-rotary), excavation, air sparging, etc.

The following items are provided by Gore:
- shipping container, partitioned box(es) containing individually numbered GORE™ Modules - recyclable cardboard (DO NOT DISCARD SHIPPING CONTAINER OR PARTITIONED BOXES),
- insertion rod (please return after use),
- corks with screw eyes,
- string,
- Chain of Custody and Installation/Retrieval Log
- custody seals
- these instructions.

STORAGE
GORE™ Modules are carefully cleaned, sealed, and stored after manufacturing. They must remain sealed in their vials in the shipping boxes until deployment and after retrieval. **DO NOT** store near potential sources of organic vapors such as petroleum fuels and exhaust, solvents, adhesives, paints, etc.

REQUIRED TOOLS/SUPPLIES
A narrow diameter hole (approximately 1/2 to 1-inch; 2.5cm) is drilled or driven to the desired sampling depth. Simple hand tools such as a slam bar or rotary hammer drill are used to create the installation hole in soil. A hammer drill or similar coring tool is required to advance the hole through a slab. Direct-push or auger-type tools are usually needed for deeper installations.

Additional tools (to be supplied by the customer) required for installation may include:
- equipment to lay out and mark sample locations (scaled map, measuring tapes, pin flags, GPS);
- disposable gloves and equipment decontamination supplies
- slide hammer/tile probe (slam bar) or electric rotary hammer drill (AC power outlet or portable generator and extension cords) with carbide-tipped bits or augers (1/2 to 1-inch; 2.5cm diameter, three feet; 1 meter or more, in length).

- Optional: bentonite patching material

If sample locations need to be hidden to prevent damage by vandalism or animals, push the cork farther into the hole, place a metal washer or nut on top of the cork, and covered with soil and sod. Use a metal detector to locate modules for retrieval.

The cork provides an effective seal against infiltration of air in soils and through slabs. For additional security, a thin layer of bentonite can be applied over the cork.

The following vendors supply installation hole drilling equipment. The information is provided as a courtesy and does not represent any endorsement of these products or suppliers:

Item	Supplier	Phone No.
* Slide Hammer/Tile Probes	Forestry Supplies	(800) 647-5368
* Carbide Drill Bits (36" long)	1. Kerfoot Technologies, Inc. 2. the Blade Runner	1. (508) 539-3002 2. (610) 444-6708
* Rotary Hammer Drill	SKILL-BOSCH Power Tools	(800) 334-5730

* Art's Manufacturing Supply (dba AMS) has all these items (800) 635-7330

TRIP BLANKS

An additional number (specified) of GORE™ Modules are included as trip blanks. The customer selects which modules to be used/treated as trip blanks, and notes this on the Chain of Custody and Installation/Retrieval Log. These modules remain unopened, travel to and from the site during installation and retrieval, and while in storage away from Gore's facility.

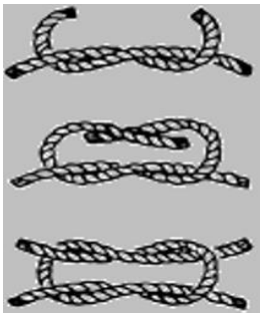
MODULE INSTALLATION

- The sample grid can be laid out beforehand (recommended) or during the module installation. Do not use spraypaint or similar materials to mark locations, or drill through locations marked with spraypaint.
- To facilitate the installation of the modules, it is recommended that the cord and corks be prepared prior to going to the field. As an example, for a three foot installation, cut a piece of the supplied cord to a length of approximately 7.0 feet or 2.25 meters. Tie the ends of the cord together using a non-slip knot (square knot is suggested, Figure 1). Pass the looped cord through the eyelet in the cork and pull it back through itself. Wrap the remainder of the cord around the cork and secure the cord/cork combination with a rubber band. The cork and cord are now ready to attach to the module after the installation hole is created.

Square knot instructions (Figure 1)

1. *Take an end of the cord in each hand.*
2. *Pass the left-hand cord over the right-hand cord and wrap it around the right-hand cord.*
3. *Take the cord end that is now in your right hand, place it over the cord end in your left hand and wrap it around that cord.*
4. *Pull the cord carefully to tighten the knot.*

Figure 1. Square Knot



- **We do not recommend installation of modules within 15 feet (5 meters) of monitoring wells, utility trenches or other conduits, unless that is the sampling objective.** These features may act as preferential pathways for soil vapor migration. The results may not be representative of the subsurface contamination.
- Drive/drill the narrow installation hole at the desired pre-marked location. In sandy soils, occasionally the hole will collapse after the drill or tile probe is removed. Adding deionized water to the sandy soil will temporarily compact the soil and keep the hole open for module insertion.
- Wearing clean surgical gloves, remove module from the numbered jar and re-seal the jar. The barcode on the jar lid should correspond with the serial number on the module - please verify.
- Attach the cord and cork to the module by passing the looped cord through the loop on the module and pull the cord/cork back through itself.
- Place the insertion rod into the pre-cut pocket at the base of the module and lower the assembly into the hole. If you encounter resistance remove the module and ream the hole and re-insert the module.
- Once deployed to the desired depth, press the insertion rod against the side of the hole and twist slightly to release the module. Remove the rod and push any excess cord into the hole and plug it with the cork (Figure 2).
- Indicate the module number, date and time of installation and any pertinent comments on the installation/retrieval log. Write the module serial number on the site map adjacent to the appropriate map location.
- **To minimize sample location errors, it is preferable to record the GORE™ Module serial number on the field map. However, if another sample numbering system is used, information relating the sample number system to the GORE™ Module serial numbers must be provided either on the Installation and Retrieval Log, or in a separate table.**
- Clean the tile probe or drill bit and the insertion rod prior to use at the next location. Replace the surgical gloves as necessary.
- Following module installation, the modules selected as **trip blanks** should be kept in the sample box provided and stored as described above in "STORAGE" until sample retrieval.

MODULE RETRIEVAL

- Following the module exposure period identify and check each location in the field using the site map.
- Remove the cork with a penknife, screwdriver or corkscrew. Grasp the cord and pull the module from the ground; **verify the module ID number**. Cut off and discard the cork and cord. Place the entire module to its labeled jar and secure the lid.
- **Use caution when screwing down the lid on the sample jars. Clean any soil/debris from the threads of the jar and lid, and make sure no part of the module is pinched between the jar and lid. Be sure the seal is tight. Over-tightening may cause breakage.**
- **Affix a custody seal to the side of the jar and jar lid. Do not cover the barcode with the seal.**
- Place the jar in the supplied partitioned box.
- Complete the module retrieval date/time on the Installation/Retrieval log.

PACKAGING FOR RETURN

- Place boxes with modules back into outer shipping container using appropriate packing materials to protect fragile contents.
- **Do not** use Styrofoam "peanuts" as packing material. Bubble packing is acceptable.
- Label box to indicate fragile contents.
- There is no need to return the shipment in coolers with ice.
- **Return the GORE™ Modules, insertion rod and paperwork (preferably by overnight courier) to**:

Screening Modules Laboratory
W.L. Gore & Associates, Inc.
100 Chesapeake Blvd.
Elkton, MD 21921
Phone: (410) 392-7600
Attn: NOTIFY LAB IMMEDIATELY UPON DELIVERY!!

IMPORTANT: Samples should not be shipped for weekend or holiday delivery.

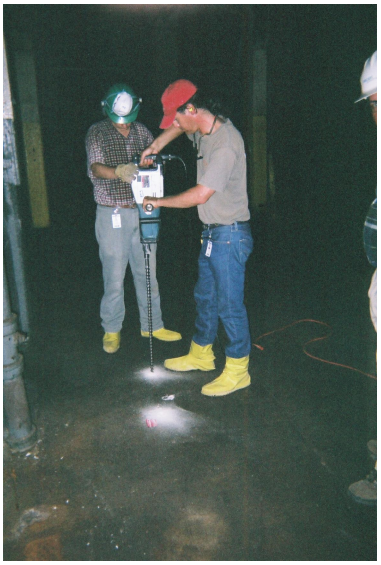
Soil Gas and Sub-slab Soil Gas Sampling

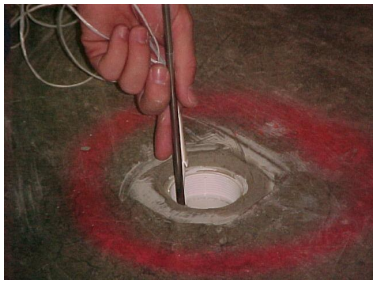
Slide hammer

Rotary hammer drill

Initial insertion

After insertion,
impermeable cork sealed

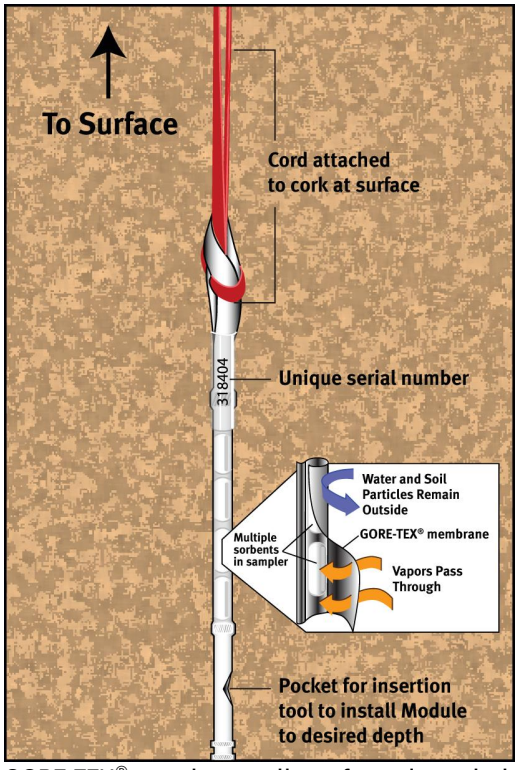




Initial insertion into permanent sampling port.

Rotary hammer drill

Note: Dry cleaner operations continue, no obstructions on surface after installation.



GORE-TEX® membrane allows for unimpeded migration of soil gas to adsorbent, while protecting the adsorbent from liquid water and soil.

GORE
Creative Technologies Worldwide

www.gore.com/surveys

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100 Chesapeake Blvd.
P.O. Box 10
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San Francisco: 1-415-648-0438

Email: environmental@wlgore.com

LIT 117.10 031809

GORE™ SURVEYS ENVIRONMENTAL SITE ASSESSMENT

FOCUSING YOUR REMEDIATION EFFORTS.

Basemap Preparation Instructions

To facilitate the contour mapping, generate the sitemap in **AutoCAD® Release 2007** or earlier. If you are using another CAD program, please export and save the file in a format that is directly compatible with AutoCAD or as a compatible DXF file.

Shapefiles are an acceptable file format.
Digital images (e.g., air photos) can be inserted into the contour maps. The photos need to be sent as separate files. Images which are geo-referenced to the sitemap coordinate system are preferred (e.g., GeoTIFs).

Ship files on CD to the address below, attention Jay Hodny or Jim Whetzel, or send by e-mail to jhodny@wlgore.com or jwhetzel@wlgore.com.

To expedite the mapped results, please comply with the following sitemap specifications.

- Upon installation of the GORE™ Modules, a sitemap showing the Module locations identified with the Module serial number should be generated and forwarded to Gore (in advance of the return shipment of exposed Modules). If another sample location identification system is used instead, information that relates that identification number to the Module serial number must be provided.

  The site drawing should:

  - include the spatial extent of the area sampled for soil gas,
  - have a minimum number of layers with no additional hidden or frozen layers; all colored white,
  - have the required cultural features - such as buildings, streets, property lines, monitoring wells, etc.; all colored white,
  - have the Module locations clearly marked and labeled with the Module serial numbers,
  - have a graphical scale, 

  - be drawn in decimal ground units of the survey (i.e., feet as opposed to plot inches or architectural units); checked with the graphical scale. For example, if the graphical scale above is measured on the screen in AutoCAD, the distance will read 100, if drawn in the correct ground units (feet),
  - explode blocks,
  - bind external references.

If a sample location coordinate file exists (x, y, ID), and is based on the coordinates of the survey and the sitemap, please forward that to Gore as well.

Please do not hesitate to contact us with any questions at (410) 392-7600.

AutoCAD is a registered trademark of Autodesk, Inc.

GORE Creative Technologies Worldwide

www.gore.com/surveys

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San Francisco: 1-415-648-0438

Email: environmental@wlgore.com

GORE™ SURVEYS ENVIRONMENTAL SITE ASSESSMENT

FOCUSING YOUR REMEDIATION EFFORTS.

A2 - Analytical Options

The GORE™ Survey service includes:

- GORE™ Modules
- Analysis
- Data reporting
- Up to three contour maps (where applicable)
- Final Report (in duplicate)
- Pre- and post-survey consultation (as needed)

– Analysis is by thermal desorption, gas chromatography, and mass spectroscopy via modified US EPA methods 8260/8270.
– Contour maps in paper and PDF formats.
– The Final Report is issued in paper format (electronic format available upon request).
– The survey does not include field installation and retrieval costs, or shipping costs.

Fuels (A2)
MtBE
Benzene
Toluene
Ethylbenzene
m,p-xylene
o-xylene
Octane
Undecane
Tridecane
Pentadecane
1,3,5-TMB
1,2,4-TMB
Naphthalene
2-Methylnaphthalene
TPH

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