APPROVAL PAGE
FIELD SAMPLING PLAN
for
PHASE I: SOIL GAS SURVEY
Hillcrest Community Environmental Investigation
Corpus Christi, Texas

Suzanne Green — Date
Project Manager
Geo Strata Environmental Consultants, Inc.

Taryn Scholz — 4/30/10 — Date
Project QA Manager
Quality Assurance Associates (QAA)

Steve Thornley — 4.30.2010 — Date
Laboratory QA Manager
Beacon Environmental Services

Carlos Castro — ACTING LAB DIRECTOR — 5/3/2010 — Date
Laboratory Director
Xenco Laboratories

Neeraja Erraguntla — 5/3/2010 — Date
Toxicologist
TCEQ

5/3/10

Omar Vallez
Project Manager
TCEQ

Date

F I N A L

FIELD SAMPLING PLAN

HILLCREST COMMUNITY ENVIRONMENTAL INVESTIGATION

PHASE I: SOIL GAS SURVEY

CORPUS CHRISTI, TEXAS

Prepared in cooperation with the Hillcrest Community by
Texas Commission on Environmental Quality
Austin, Texas

Project: HCEI

April 2010

To be implemented under the direction and oversight of TCEQ and the Hillcrest Community by:

Geo Strata Environmental Consultants, Inc.
4718 College Park
San Antonio, Texas 78249
Tel: (210) 492-7282
Fax: (210) 492-8935

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List of Acronyms and Abbreviations

AL	Assessment Level
Beacon	Beacon Environmental Services
°C	Degrees Celsius
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
C-O-C	Chain-of-Custody
COC	Chemical of Concern
DCRP	Dry Cleaners Remediation Program
DOT	Department of Transportation
DQO	Data Quality Objective
DUR	Data Usability Review
DUS	Data Usability Summary
ELS	Environmental Laboratory Services
EPA	Environmental Protection Agency
ER	Exception Report
FM	Farm to Market Road
FSP	Field Sampling Plan
G	glass
Geo Strata	Geo Strata Environmental Consultants, Inc.
HCL	hydrochloric acid
HDPE	high-density polyethylene
LCRA	Lower Colorado River Authority
LORP	Level of Required Performance
LRC	Laboratory Review Checklist
µg/kg	micrograms per kilogram
mg/kg	milligram per kilogram
mg/L	milligram per liter
MQL	Method Quantitation Limit
MS/MSD	matrix spike/matrix spike duplicate
O&M	Operation and Maintenance
PCL	Protective Concentration Levels
ppm	parts per million
PM	Project Manager
PST	Petroleum Storage Tank
QA	Quality Assurance
QAA	Quality Assurance Associates
QAPP	Quality Assurance Project Plan
QC	Quality Control
RBEL	Risk Based Exposure Level
SAP	Sampling and Analysis Plan
SDL	Sample Detection Limit
SOP	Standard Operating Procedure
SPLP	Synthetic Precipitation Leaching Procedure
SQL	Sample Quantitation Limit
TAC	Texas Administrative Code
TCEQ	Texas Commission on Environmental Quality
TNRCC	Texas Natural Resource Conservation Commission
TRRP	Texas Risk Reduction Program
Xenco	Xenco Laboratories

1.0 INTRODUCTION

1.1 BACKGROUND

Texas A&M University Health Science Center scientists and the Citizens for Environmental Justice conducted a pilot study in 2008 that detected benzene in the blood of some residents in the Hillcrest Community in Corpus Christi, Texas. In response to the results of this study and at the request of the Hillcrest community at the December 1, 2009, neighborhood meeting, the Texas Commission on Environmental Quality (TCEQ) is planning an investigation, the Hillcrest Community Environmental Investigation (HCEI). The HCEI will attempt to determine whether there are environmental impacts from volatile organic compounds (VOCs) to soil, groundwater, or ambient air.

TCEQ is undertaking a Soil Gas Survey in the Hillcrest Community. TCEQ, in cooperation with the Hillcrest Community, shall direct and oversee Geo Strata Environmental Consultants, Inc. (Geo Strata) in the performance of sampling activities at the site under Work Order (WO) No.219-0030, in accordance with the TCEQ Contract No. 582-9-91033. TCEQ has drafted this project-specific Field Sampling Plan (FSP), incorporating community input, for use in Phase I of the HCEI.

1.2 PURPOSE

This draft FSP presents the requirements and procedures for collecting soil gas samples from the site. This project-specific draft FSP has been prepared to ensure that:

- Field sampling protocols are documented and performed in a consistent manner; and
- Data is collected in a scientifically valid and legally defensible manner; and
- Data quality and data integrity are preserved throughout all phases of the investigation.

This project-specific draft FSP and the TCEQ Quality Assurance Project Plan (QAPP) for the Petroleum Storage Tank (PST) Program FY 2010 (Document No. 201009.0), hereafter referred to as the QAPP, will constitute, by definition, a Sampling and Analysis Plan (SAP) for characterization of the site. The FSP is required reading for all staff participating in the work effort. The FSP will be in the possession of the field teams at all times during its implementation.

1.3 REFERENCE DOCUMENTS

General guidelines followed in the preparation of this FSP are set out in the following documents:

- Data Quality Objectives Process for Hazardous Waste Site Investigations (U.S.

Environmental Protection Agency [EPA], June 1999); and

- Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA (U.S. EPA, October 1988).

Additional reference documents used in the preparation of this FSP included the following:

- TCEQ QAPP (FY 2010) for the PST Program
- TCEQ Standard Operating Procedures, PST/DCRP Section, Remediation Division;
- Guidance For Data Usability in Risk Assessment (Part A) Final (U.S. EPA, April 1992); and
- American Society of Testing and Materials (ASTM) Standard Guide for Monitoring in the Vadose Zone, Designation: D 5314-92 (reapproved 2006);
- United States Environmental Protection Agency, Office of Underground Storage Tanks, OSWER, Expedited Site Assessment Tools for Underground Storage Tank Sites, A Guide for Regulators, Chapter IV, Soil-Gas Surveys, March 1997;
- BEACON Environmental Services, Inc., BeSure Sample Collection Kit™ for Passive Soil-Gas Investigations.

1.4 DOCUMENT CONTROL

Controlled distribution of the FSP will be implemented to ensure that project personnel always use the final, approved version. A sequential numbering system will be used to identify controlled copies of the FSP. Controlled copies will be provided to all parties identified in the Approval Page and to representatives of the Hillcrest Community. A community comment period will be extended after every revision to allow for community input. Whenever revisions are made or addenda added to the FSP, a document control system will be put into place to ensure that:

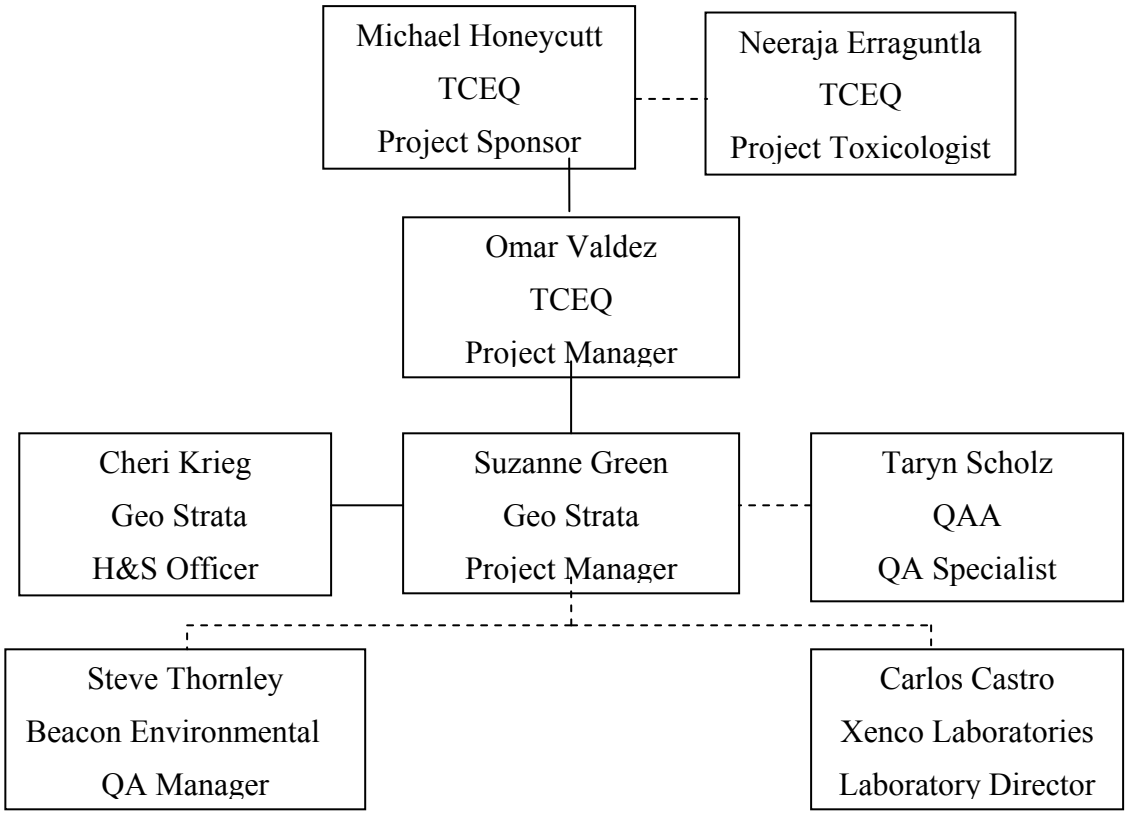
- All parties holding a controlled copy of the FSP receive any revisions or addenda; and
- Outdated material is removed from circulation.

The document control system does not preclude making and using copies of the FSP; however, the holders of controlled copies are responsible for distributing additional material to update any copies within their organizations. TCEQ will maintain the distribution list for controlled copies.

1.5 PROJECT TEAM AND RESPONSIBILITIES

The project team and task leaders and their responsibilities are listed in Table 1.

Table 1: Project Organization Chart



TCEQ Project Sponsor –Dr. Michael Honeycutt

The TCEQ Project Sponsor is Dr. Michael Honeycutt. Dr. Honeycutt has the primary role of defining the project objectives and establishing the project policies and procedures to address the specific needs of the project as a whole.

TCEQ Project Manager – Mr. Omar Valdez

The TCEQ PM for the project is Mr. Omar Valdez. He has oversight responsibility for all aspects of the project including direction of Geo Strata, technical review of work products, issues affecting data quality, and all contractual aspects of the project. Mr. Valdez will be the primary advisor of the Project Sponsor, advising him of technical progress, program needs, challenges, and recommended solutions.

TCEQ Project Toxicologist- Dr. Neeraja Erraguntla

The TCEQ Project Toxicologist is Dr. Neeraja Erraguntla. Dr. Erraguntla has responsibility for all aspects of performing health assessments on project data. She will also assist the Project Sponsor and the PM on defining the project objectives and on designing subsequent phases of the investigation, based on an evaluation of the Phase I results.

Geo Strata, Project Manager – Suzanne Green:

Suzanne Green of Geo Strata is the prime contractor's Project Manager (PM). Ms. Green has responsibility for the contractual aspects of the project as the prime contractor and for the quality of all project deliverables. Ms. Green has the primary responsibility for FSP implementation and communication with TCEQ. Geo Strata through Ms. Green will arrange, monitor, direct, and control staff and other resources needed to execute the FSP within budget and scheduled restraints and establish clear lines of communication with TCEQ. Ms. Green is responsible for ensuring that the technical activities have appropriate planning and oversight for assurance of overall quality in data collection and report production to meet or exceed project requirements.

Geo Strata, Field Team Leader/Lead Technician – Carrie Holderfield:

Ms. Holderfield of Geo Strata will also serve as the Field Manager and is responsible for the implementation of the FSP. As Field Manager, she will direct all fieldwork, communicate any difficulties encountered in the field to project management, and stop fieldwork if safety or data quality are significantly affected by site operations.

QAA, Quality Assurance Specialist – Taryn Scholz:

Ms. Scholz will have the overall responsibility to independently assure that the planning, implementation, and reporting fulfill the objectives for data use. This includes QAPP adherence and documentation of deviations from the QAPP. Ms. Scholz will also oversee the review and validation of all analytical data and will prepare a Data Usability Summary on all project data. The QA Specialist must have reporting responsibility outside of the project organization to assure independent evaluation of project data.

Analytical Laboratory, Beacon Environmental QA Manager – Steve Thornley:

Mr. Thornley will oversee all aspects of PSG sample analysis and have responsibility for implementing laboratory QA procedures. Mr. Thornley will assure that the laboratory data packages will be provided in a timely manner to satisfy the project objectives.

Analytical Laboratory, Xenco Laboratories, Laboratory Director – Carlos Castro:

Mr. Castro will oversee all aspects of the Equipment Rinsate Blank sample analysis and have responsibility for implementing laboratory QA procedures. Mr. Castro will assure

that the laboratory data packages will be provided in a timely manner to satisfy the project objectives.

2.0 SITE AND PROJECT SUMMARY

2.1 PROJECT SCOPE AND PURPOSE

Soil gas surveys are defined as the collection, analysis, and interpretation of soil gas data. A soil gas survey provides information on the soil atmosphere in the vadose zone that can aid in assessing the presence, composition, source, and distribution of contaminants. Soil gas surveys are generally used to screen for VOCs emanating from groundwater. There are two basic types of soil gas surveys. The first type is the active soil gas survey in which a volume of soil gas is pumped out of the vadose zone into a sample collection device for analysis. The second type is a passive soil gas survey in which a sorbent material is left in the ground so that contaminant vapors can be selectively adsorbed over time using ambient flow of soil gas. The primary goal of Phase I of the HCEI project is to perform a passive soil gas survey in the Hillcrest Community to screen for VOC impacts to groundwater and air in the Hillcrest Community.

2.2 SITE DESCRIPTION AND HISTORY

The Hillcrest Community is bounded by the refinery sector to the west and north. It is bounded by a mixed use light industrial sector to the south and east. Nueces Bay Street borders the community to the west, Broadway Street to the north, Port Road to the east, and Interstate 37 to the south. A Site Location Map is presented in Figure 1.

3.0 DATA QUALITY OBJECTIVES

3.1 GENERAL

Data Quality Objectives (DQOs) are qualitative and quantitative statements that translate non-technical project goals into technical project-specific decision goals. The seven-step DQO Process as described in Data Quality Objectives Process for Hazardous Waste Site Investigations (EPA, 1999) (G-4HW) was formally completed for this project. That is, outputs for each of the seven steps of the DQO Process were developed in the format suggested in G-4HW by the Project Team, in consultation with the Hillcrest community and other stakeholders, through communications and meetings. The results of the DQO Process are discussed in the sections below and in Section 4 concerning the design of the sampling plan.

Step 1: State the Problem

Potential impacts to groundwater and other environmental media in the Hillcrest Community from subsurface releases are unknown.

Step 2: Identify the Decision

The primary goal for Phase I of this project is to obtain passive soil gas data to screen the Hillcrest Community for VOC impacts to groundwater and use soil gas data to select the optimal locations for permanent monitor wells.

Step 3: Identify Inputs to the Decision

Historical information and data obtained from corrective actions in progress in the refinery sector adjacent to the Hillcrest Community and requests from the community to verify whether their groundwater is impacted have led to the decision to screen for VOC impacts to groundwater via passive soil-gas sampling and analysis.

Step 4: Define the Boundaries of the Study

Phase I of the HCEI will focus on the Hillcrest Community as it is bounded by Nueces Bay Street to the west, Broadway Street to the north, Port Road to the east, and Interstate 37 to the south. A finer sample grid will be established within the areas adjacent to the refinery sector to the west, north, and east. A coarser grid will be established in the interior of the Hillcrest community. The approximate sample locations selected are displayed in Figure 2. Soil gas samples will be analyzed by EPA SW-846 method 8260C to provide sufficient analytical sensitivity. Data reviews performed by Quality Assurance Associates (QAA), the selected Quality Assurance Specialist, will be conducted in accordance with TCEQ's *Review and Reporting of COC Concentration Data* (RG-366/TRRP-13, December 2002).

Step 5: Develop a Decision Rule

Permanent monitor well locations and other environmental assessment work will be selected in subsequent phases of the HCEI based on the masses of VOCs in the soil gas measured in Phase I.

Step 6: Specify Limits on Decision Errors

The analytical results obtained in the investigation will be reviewed to support the decision rule of the soil gas survey; therefore, the analytical data obtained must be of sufficient completeness and quality. Random and/or systematic errors may be introduced during sample collection, sample handling and storage, sample analysis, data reduction, and data reporting. The Quality Control (QC) measures specified in the PST QAPP and the procedures outlined in the FSP will be followed to aid in the establishment of analytical quality and to minimize these errors. Each member of the field team must follow the same procedures in order to minimize field errors. Appropriate EPA-approved analytical methods will be used to ensure sufficient analytical sensitivity. Field QC samples, including field duplicates, ambient field blanks, equipment rinsate blanks, and trip blanks, will be collected to monitor the precision of the field sampling event and the controlled conditions of the sampling and shipping environment. These QC samples are discussed in 4.4. The Quality Assurance Specialist will review all analytical data obtained by Geo Strata, Beacon and Xenco based on review criteria and limits presented in TRRP-13 to determine if the data meets project DQOs. Based on a comparison of analytical data to these criteria results may be qualified to indicate the limitations of the data. In cases where the data is deemed of insufficient quality to satisfy project DQOs, the data will be rejected and will not be used to support project decisions. Data validation is discussed further in 3.9.

Step 7: Optimize the Design

The number and location of soil gas samples collected and analyzed have been confined only to those necessary to satisfy project goals. A fine grid has been selected for the areas adjacent to the refinery sector where a higher likelihood of VOC impacts to groundwater exists. A coarser grid has been selected for areas in the interior of the Hillcrest Community.

3.2 COCS AND ANALYTES

Considering the site history, and previous sampling and analyses, samples will be analyzed for VOCs using EPA 8260C method. All VOCs in the laboratory's standard VOC list will be analyzed as "Target Analytes." The "Final COC list" will be determined from detected compounds after additional sampling and analysis in future phases of the HCEI.

3.3 TRRP ASSESSMENT LEVELS

The Assessment Level (AL) is the lowest of the applicable Protective Concentration Levels (PCLs) for a COC developed under the Texas Risk Reduction Rule (TRRP) Tier 1 Residential evaluation. The AL is used to determine the extent of contamination (or the "Affected Property" as this is termed in TRRP). However, the TCEQ does not typically evaluate soil gas, and the TRRP rule is not written to specifically address this exposure scenario. Additionally, passive soil gas sampling and analysis will not yield quantitative data (i.e., concentrations) that could be evaluated against TRRP risk-based exposure levels (RBELs). Therefore, the data generated from Phase I will not facilitate comparisons to any health based benchmarks.

3.4 ANALYTICAL METHODS

After a review of the available information regarding former site operations, COCs identified at the site, and field sampling methods, analytical method EPA Method 8260C for VOCs will be used.

Any site-specific exceptions, additions, or changes to the requirements of the QAPP are described in Section 8.0 of this FSP.

3.5 LABORATORY

Beacon Environmental Services, Inc. (Beacon) has been selected to provide PSG analytical services, and Steve Thornley is the laboratory contact. Xenco Laboratories (Xenco) has been selected to provide the equipment rinsate blank analytical services, and Carlos Castro is the laboratory contact. Beacon and Xenco have a quality assurance program, in place and implemented, which meets the requirement set forth by the EPA, National Environmental Laboratory Accreditation Conference (NELAC), or the International Organization for Standardization (ISO). Beacon and Xenco have documented precision, bias, and Method Detection Limit (MDL) information demonstrating each laboratories capabilities (as per NELAC) to meet the objectives specified by EPA. This information is on file and readily available upon request by the TCEQ or the Hillcrest Community. Additionally, Geo Strata will provide TCEQ and the Hillcrest Community with access to review the laboratory's procedures and activities that relate to this project, if requested.

Each of these analyses will be performed in accordance with the applicable published methods for extraction, cleanup, preparation, determination and will include all method-required and method-recommended quality control steps, including all QA/QC procedures specified in the laboratories quality assurance manual. The QC acceptance criteria specified by the laboratories will be utilized.

3.6 LEVEL OF REQUIRED PERFORMANCE AND METHOD QUANTITATION LIMITS

The Level of Required Performance (LORP) is a phrase used in TRRP to specify the lowest concentration of interest during chemical analyses. Since passive soil gas sampling and analysis will not yield quantitative data, the required performance emphasis shall be on the Method Quantitation Limit (MQL). In order to show that "clean" or "not detected" samples were adequately analyzed, the MQL shall serve as the baseline for establishing the presence of VOCs in the sample media.

Estimated concentrations that are below the MQL but exceed the method detection limit (MDL), and that meet the qualitative identification criteria of the method used, must be reported as detected results by the laboratory for the COC in the sample analyzed. As specified in the PST QAPP, non-detected results must be reported as less than the value of the SDL. The SDL is defined as the MDL adjusted to reflect sample-specific actions, such as dilution or use of smaller aliquot sizes than prescribed in the analytical method, and takes into account sample characteristics, sample preparation, and analytical adjustments. The SDL is that value below which the COC cannot be reliably detected. Additionally, the laboratory must routinely check the MDL for reasonableness to verify the laboratory's ability to reliably detect the COC at the MDL used for reporting detected results and for calculating non-detected results. This check can be demonstrated by analyzing a detectability check sample (DCS). A DCS is a reagent matrix spiked by the laboratory with the COC near, or within two to three times, the calculated MDL and carried through the sample preparation procedures for the analysis.

3.7 METHOD QUANTITATION LIMITS

Laboratory specified MQLs for each analyte will be provided by Beacon and Xenco.

3.8 DATA REVIEW AND REPORTING

Laboratory submittals shall meet the requirements of TRRP-13, which provides the procedures for review and reporting of COC concentration data, and thus submittals shall include the Reportable Data for each analysis and the Laboratory Review Checklist (LRC) and necessary Exception Reports (ERs). QAA will perform laboratory review on the submittal for each analysis in accordance with the requirements listed in TRRP-13.

3.9 INDEPENDENT DATA REVIEW

QAA will perform an independent data review (IDR) as specified in TRRP-13 on each analytical batch using the following recommended review criteria:

for organic analytes, percent recoveries between 60% and 140%, but not less than 10%, and relative percent differences within 40% are acceptable.

QAA will identify and report issues and concerns encountered during the IDR and will recommend corrective action as soon as possible. The results of analyses will be flagged with the final data review qualifiers and qualifier and bias codes in accordance with TRRP-13.

QAA will document the results of the IDR and data validation in the Data Usability Summary (DUS) prepared in accordance with the requirements specified in TRRP-13. The DUS will discuss what QC measures were reviewed, how these measures were reviewed, the evaluation criteria used in the review, all items identified as falling outside the evaluation criteria, the specific data potentially affected, and the potential effect on the quality of the associated data.

Upon completion of the laboratory review, IDR, data validation, and DUS, QAA will submit the DUS and a Laboratory Data Package consisting of: the Reportable Data; the LRCs; any applicable ERs; and the Laboratory Release Statement. The Laboratory Data Package shall be submitted for each analysis or group of analyses.

At the request of the TCEQ PM, the preliminary results of analyses or Certificate of Analyses will be communicated or conveyed to the TCEQ PM prior to the completion of the Laboratory Data Package or DUS.

3.10 BATCHING OF SAMPLES

Geo Strata will collect and deliver the samples to the laboratories in a manner that allows the laboratory to batch as many TCEQ project samples together as possible.

4.0 FIELD SAMPLING PLAN

4.1 GENERAL

This FSP provides the general requirements for implementation of the soil gas sample collection activities at the site. As discussed above, soil gas samples will be collected from locations in the Hillcrest Community as described below. Sample locations and sample location intervals are based on proximity of a focus area to known hydrocarbon sources. Samples are expected to be collected during the week of May 3rd, 2010.

4.2 SAMPLING DESIGN

The soil gas sample locations will be determined by TCEQ based on historical information, data obtained from corrective actions in progress in the refinery sector adjacent to the Hillcrest Community, and a desire to identify any previously unknown sources of VOCs in soil gas in the Hillcrest Community. The soil gas samples will be collected using sample collection kits from Beacon. Each PSG sampler will be analyzed for VOCs using EPA Method 8260C. A finer sample grid will be established within the areas adjacent to the refinery sector to the west, north, and east and referred to as focus areas AW, AN, and AE respectively. A coarser grid will be established in the interior of the Hillcrest community and referred to as focus area I. These approximate sample locations are displayed in Figure 2.

A sample grid based on 200 foot spacing will be established in focus areas AW, AN, and AE. A sample grid based on 300 foot spacing will be established in focus area I. Sampling locations will be located as close to the nodes of each grid cell as is possible depending on the field conditions. All sample locations will be recorded via GPS. Duplicate samples will be collected as described in Section 4.4.

Prior to implementation of this FSP, TCEQ will notify all the owners affected by the proposed sample locations by mail and obtain the access agreement from each owner, as appropriate. In situations where sampling at a particular location is not feasible, either due to physical limitations or an inability to obtain an access agreement, the sample location may be adjusted in the field, or legal staff may be consulted to determine the appropriate course of action.

4.3 LABELING OF SAMPLES

Each PSG sampler will receive a sample label that includes information required per TCEQ SOP No. 6.4 (Sample Handling and Control). Sample labels will include the following information:

- Unique sample identification number,
- Sample type,
- Analytical method,
- Sampler's initials,
- Date and time deployed and collected, and
- Preservation method used.

Sample labels will be marked with indelible black ink and affixed to the PSG samplers.

4.4 QA/QC SAMPLING

QA/QC samples will consist of field duplicates, ambient field blanks, equipment rinsate blanks, trip blanks, and matrix spike (MS) and matrix spike duplicates (MSD).

A field duplicate sample is a second sample collected at the same location as the original sample. Duplicate sample results are used to assess total precision, which includes variability associated with both the sample collection process and with laboratory analysis. Normally, two sample aliquots are collected in the field, but in this case the passive soil gas (PSG) samplers have two sets of absorbent cartridges in each sampler. By this approach, duplicate samples will be collected simultaneously or in immediate succession, using identical recovery techniques, and treated in an identical manner during storage, transportation, and analysis. The FSP will identify duplicate samples at a frequency of 10 percent in accordance with TCEQ SOP No. 6.5 (Collection of QA/QC Samples) and document as such in the field logbook and on the Chain of Custody (C-O-C) for analysis where both sets of absorbents will be analyzed. The precision of duplicate results are calculated by relative percent difference (RPD) using the following equation:

$$RPD = (X1-X2)/ ((X1+X2)/2))$$

The field team leader is responsible for ensuring that the frequency requirements for field duplicate samples are met. There is no corrective action for the failure to achieve this goal; however, the information will be used to evaluate data quality.

Two ambient field blanks will be collected from two separate locations within the sample grid, both during the deployment and retrieval of the PSG samplers. After deploying several PSG samplers, the average time to deploy each PSG sampler will be calculated. The ambient samples will then be collected by taking a PSG sampler and opening it for the average time calculated, exposing the absorbent cartridges to the air. The exact location of each ambient air sample location will be carefully noted. During the retrieval of the PSG samplers, the average time to retrieve each PSG sampler will be calculated,

and then both of the PSG samplers will be re-opened (in the same locations noted during the PSG deployment) for that period of time during the retrieval. The samplers will then be capped, labeled, and logged onto the C-O-C and sent to Beacon for analysis.

One equipment rinsate blank will be collected per work day by pouring laboratory grade volatile organic free water over the borehole drilling equipment and collecting the water for analysis. Rinsate blanks can be used to determine if the decontamination between boreholes is adequate to avoid cross contamination between samples.

When VOC analyses are conducted, trip blank samples will be collected according to SOP 6.5 (Collection of QA/QC Samples). Trip blanks consist of a sealed PSG sampler supplied by the laboratory, transported to the sampling site, handled like an environmental sample, and returned to the laboratory for analysis. Trip blanks are not opened in the field. Trip blanks are prepared only when VOC samples are taken and are analyzed only for VOC analytes. Trip blanks are used to assess the potential introduction of contaminants from sample containers or during the transportation and storage procedures. One trip blank shall accompany each shipment sent to the laboratory for analysis of VOCs. The trip blank will be identified as such on the C-O-C record.

MS/MSD samples will be collected in accordance with TCEQ SOP No. 6.5 (Collection of QA/QC Samples). The sampler will identify the sample for MS/MSD analysis on the C-O-C. The sampler will collect the MS/MSD samples as replicate samples but with three sets of samples (one original, one matrix spike sample, and one matrix spike duplicate). One set of MS/MSD samples will be collected for every 20 samples.

4.5 OVERSIGHT

Oversight activities will be performed to determine whether the QC measures identified in the FSP and the PST QAPP are implemented and documented as required. Fieldwork assessment and oversight functions and responsibilities will be shared by all members of the project team and will be extended to the community and other stakeholders upon request to monitor conformance to this FSP. Oversight checks may address the questions:

- Is the FSP being adhered to?
- Is non-conformance being identified, resolved, and documented?
- Are identified deficiencies being corrected?
- Are sampling operations being performed as stated in the FSP?
- Are the sample labels being filled out completely and accurately?

- Are the C-O-C records complete and accurate?

- Are the field notebooks being filled out completely and accurately?

- Are the samples collected being handled and preserved as described in the QAPP?

Identification and documentation of any deviation from this FSP or the QAPP can be made independently by any member of the project team, citizen, or other stakeholder. The appropriate corrective action for any deviation will be determined by the project team and implemented as soon as possible to ensure data quality and data integrity. Oversight activities may include surveillance, inspection, peer review, management system review, performance evaluation, and data quality assessment. Observations made during oversight activities may be reported to the TCEQ PM, who will be responsible for ensuring that the corrective action response is completed, verified, and documented.

5.0 SAMPLING METHODS

5.1 GENERAL

Since the soil gas sample collection method and procedure are not specified in the TCEQ SOPs or the PST QAPP, the collection method and procedure described in the FSP follow the EPA (1997) and ASTM (2006) guidance. This section describes the procedures or methods that will be used to collect the soil gas samples.

5.2 STANDARD OPERATING PROCEDURES

The SOPs developed by TCEQ for environmental investigations will be used as part of field sampling at the site. The applicable SOPs and sampling procedures will include, but not be limited to, the following:

Table 3: SOPs Utilized

SOP Used	SOP #	SOP Title
■	1.3	Site Restoration
■	1.4	Management of Investigative Derived Waste
■	1.5	Decontamination
■	6.1	Documentation
■	6.4	Sample Handling and Control
■	6.5	Collection of QA/QC Samples
■	17.1	GPS Data Collection and Submission

No TCEQ SOPs have been developed for passive soil gas surveys; therefore, the following guidance documents will be used in place of SOPs:

- ASTM Standard Guide for Soil Gas Monitoring in the Vadose Zone, Designation D 5314-92 (Reapproved 2006);
- United States Environmental Protection Agency, Office of Underground Storage Tanks, OSWER, Expedited Site Assessment Tools for Underground Storage Tank Sites, A Guide for Regulators, Chapter IV, Soil-Gas Surveys, March 1997; and
- BEACON Environmental Services, Inc., Field Kit Guide for Passive Soil-Gas Investigations.

5.3 FIELD MEASUREMENT PARAMETERS

Field measurement parameters will not be measured as they are not required for this sample collection methodology.

5.4 EQUIPMENT CALIBRATION AND QUALITY CONTROL

No equipment calibrations will be required as no field measurements will be required for this sample collection methodology.

5.5 SAMPLING PROCEDURES

Geo Strata personnel will follow the sampling procedures outlined in the instructional guidance document provided by Beacon for sampler deployment and sampler retrieval. A copy of this document titled "Field Kit Guide for Passive Soil-Gas Investigations" is provided in Appendix A.

5.6 SAMPLE VOLUMES, CONTAINER TYPES, AND PRESERVATION REQUIREMENTS

The PSG Samplers are manufactured by Beacon and are pre-packaged in laboratory supplied jars from their facility, with no preservatives. No special requirements for containers, preservation, or sample volumes, are required. The samples shall be analyzed within a maximum holding time of 14 days from retrieval.

5.7 SAMPLE HANDLING AND ANALYSIS

The field task leader will ensure that the lids on module jars are tight and that each individual sample container has a custody seal. The custody seal should not cover the barcode. Caution will be used when screwing down the lid on the sample jars. Any soil/debris on the jar and lid threads will be cleaned, and care will be taken to make sure no part of the module is pinched between the jar and lid. The seal will be tight but not overtightened as this may cause breakage. The modules will be placed back into their shipping box and into the supplied outer shipping container using appropriate packing materials to protect fragile contents. Styrofoam peanuts will not be used as packing material, bubble packing is acceptable. The boxes will be labeled to indicate fragile contents. There is no need to return the shipment in coolers with ice. The modules will be returned to Beacon along with the insertion rod and the chain-of-custody by overnight courier to:

Beacon Environmental Services, Attention: Sample Receiving
323 Williams Street, Suite D, Bel Air, MD 21014
Phone: (800) 878-5510
Attn: NOTIFY LAB IMMEDIATELY UPON DELIVERY!!

The equipment rinsate blanks will be shipped on a daily basis by overnight courier to:

Xenco Laboratories
4143 Greenbriar Drive, Stafford, TX 77477
Phone: (281) 240-4200
Attn: NOTIFY LAB IMMEDIATELY UPON DELIVERY!!

IMPORTANT: Samples should not be shipped for weekend or holiday delivery without prior arrangement with the laboratories.

Strict C-O-C procedures will be followed during this project to track all samples collected and data transmitted, in accordance with TCEQ SOP No. 6.4 (Sample Handling and Control). Sample possession must be traceable from the time of collection until the results are verified and final disposition of the sample. The sample custody procedures provide a mechanism for documentation of all information related to sample collection and handling to achieve this objective.

The field task leader will be responsible for ensuring that proper custody and documentation procedures are followed. Preformatted C-O-C records will be used as the primary documentation mechanism to ensure that information pertaining to each sample is recorded. In addition, field notebooks and a master sample log will be maintained for all samples collected. Copies of the C-O-C records and the field logs will be retained in the project file.

5.8 EQUIPMENT DECONTAMINATION

All equipment potentially coming into contact with contaminated media, will be decontaminated according to SOP No. 1.5 (Decontamination). A centralized decontamination area will be provided for the equipment. The decontamination area will be lined with heavy gauge plastic sheeting, and designed with a collection system to capture decontamination waters. IDW generated by decontamination procedures will be accumulated in 55-gallon drums for disposal. Smaller decontamination areas for personnel and portable equipment will be provided as necessary in accordance with the Health and Safety Plan (HASP). Decontamination areas will include basins to capture decontamination waters, which will be transferred to 55 gallon drums as necessary.

All disposable Personal Protective Equipment (PPE) will be decontaminated such that it can be disposed as Class 3 waste.

5.9 CHAIN-OF-CUSTODY

All offsite sample shipments will be accompanied by the C-O-C record, which identifies

the contents of the shipment. The original C-O-C record plus copies will accompany the shipment with one copy retained in the project file. Another copy will be returned to the project team with the analytical results.

Geo Strata will collect the samples and turn them over for subsequent shipping and analyses. Geo Strata will relinquish the samples to a representative of the analytical laboratories who will sign the C-O-C to acknowledge receipt of the samples. Alternatively, the samples will be shipped to the laboratory via carrier service (e.g. Federal Express, United Parcel Service).

Preformatted C-O-C records will be used as the primary documentation mechanism to ensure that information pertaining to each sample is recorded. In addition, field notebooks and a master sample log will be maintained for all samples collected. Copies of the C-O-C records and the field logs will be retained in the project file.

6.0 FIELD SURVEY AND MEASUREMENTS

6.1 PROPERTY ACCESS

Access agreements between landowners and TCEQ will be obtained prior to initiation of sample collection activities. Form TCEQ-10452 will be used to obtain written access agreements between landowners and TCEQ. In the event the TCEQ is unable to secure a written access agreement from a property owner, verbal agreement of granted access will be documented in the project field notes. If the property is abandoned or the owner cannot be reached, TCEQ Legal Division will determine the appropriate course of action to document access. Copies of the access agreements will be placed in the project file.

6.2 GPS INFORMATION

Geo Strata or TCEQ PM will record GPS locations of all sampling locations and other pertinent site features. The contractor will submit all GPS information to the TCEQ as specified in the work order. The GPS data shall be collected pursuant to SOP 17.1 (GPS Data Collection and Submission).

7.0 ADDITIONAL FIELD ACTIVITIES

7.1 SAMPLE IDENTIFICATION AND DOCUMENTATION OF SAMPLING ACTIVITIES

Information regarding sample collection will be entered into the field logbook pursuant to SOP 6.1 (Field Activity Documentation and Reporting). The following information will be recorded in the TCEQ field logbook:

Date and time of sample deployment and retrieval;

Environmental matrix and sample type;

Sample collection method;

Name of the person who collected the sample;

Sample identification number and depth measured from surface of the environmental medium sampled;

GPS file number;

Photograph number;

Date and time of photograph with a description of the purpose of the photograph, e.g. "This photo documents the sample collected at location X of material released to soil from the corroded and leaking drums in the drum storage area observed and documented in photos 2 & 3.";

Name of the person who took the photograph and direction the person was facing when the photograph was taken;

Relevant observations such as soil color, obvious staining, and weather conditions; and

Deviations from the QAPP, FSP, or SOP.

Samples will be adequately marked for identification from the time of collection and packaging through shipping and storage. The sample identification scheme will include:

Field sample ID;

Project name and number;

Sampling date and time;

Name of the sample collector;

Method of sample preservation; and

Laboratory analyses required.

Sample identification will be as follows:

Soil Gas Samples: Soil gas samples will be identified using the prefix "SG" followed by the focus area identification and the grid cell number (ex.: "SG-AW-1);

Field Duplicate Samples: Each PSG sampler has two sets of absorbent cartridges, and thus duplicate samples will be collected at every location. This is done in case a problem is encountered during analysis, in which case the second set is analyzed. To facilitate field duplicates, both sets of absorbents will require analysis at a frequency of 10 percent. For every 10 samples, one sample will be selected as the field duplicate and documented as such in the field logbook and on the Chain of Custody (C-O-C). Field duplicate samples will be identified using the prefix "SGD" followed by the focus area identification and the grid cell number (ex.: "SGD-AW-1).

Ambient Field Blanks: For quality assurance purposes, these samples will be shown as soil gas (SG) samples on the C-O-C form and documented as blanks in the field logbook;

Equipment Rinsate Blanks: These samples will be recorded as equipment rinsate blanks on a separate COC each day and shipped to Xenco Laboratories in Houston for analysis;

Trip Blanks: Trip blanks will be identified using the prefix "TB" followed by a sequential number.

At each sampling location, the collection of the sample will be documented by photographing the sample collection point and by recording the location with certified GPS equipment operated by GPS certified TCEQ staff or contractor personnel. If certified GPS equipment is not available, the sample locations will be identified and method of identification and site sketch will be included in the field logbook.

7.2 INVESTIGATION-DERIVED WASTE

All investigative-derived waste (IDW) will be handled in accordance with SOP 1.4 (Management of Investigation Derived Waste). The contractor will be responsible for collection, containerization, and disposal of all IDW.

Soil cuttings from the sample bore holes will be managed according to guidance provided in SOP No. 1.4 (Management of Investigation Derived Waste) and "Management of Investigation-Derived Wastes During Site Inspections", EPA/540/G-91/009, May 1991. The preference is to leave both RCRA hazardous and non-hazardous investigation-

derived wastes on site whenever it complies with regulations and does not pose any immediate threat to human health and the environment.

7.3 SITE RESTORATION

The work site or sampling location will be restored to its original condition in accordance with SOP 1.3 (Site Restoration). Efforts will be made to minimize impacts to work sites and sampling locations, particularly residential properties and those properties in or near sensitive environments.

7.4 HEALTH AND SAFETY

The contractor will develop a site-specific HASP to meet the project objectives. During all sampling activities, contractor's personnel will adhere to the HASP to ensure that all sample collection and decontamination are done in a safe manner. The purpose of this HASP is to assign responsibilities, establish personnel protection standards, specify safe operating procedures, and provide for contingencies that may arise while conducting this investigation. TCEQ personnel will adhere to the HASP while on site.

Prior to commencement of field activities, the contractor's designated health and safety officer will conduct a safety briefing to inform all personnel of the possible chemical and physical hazards. All personnel will be required to read and sign the HASP, and it will be readily available in the field at all times. The contractor will conduct a daily safety meeting prior to initiating field work each day to advise workers of ongoing and new health and safety concerns. During the daily safety meeting, the contractor will identify all potential health and safety risks present at the site. The contractor will record the subjects covered during each daily safety briefing, as well as personnel in attendance. These records will become part of the project files. The contractor will verify all field personnel have completed "OSHA Hazardous Waste Operations and Emergency Response Standard (29 CFR 1910.120)" training before beginning fieldwork and will verify at least one on-site worker has training in first aid and CPR.

While on site during field activities, no personnel will eat, drink, or smoke, and all personnel will minimize hand to mouth contact.

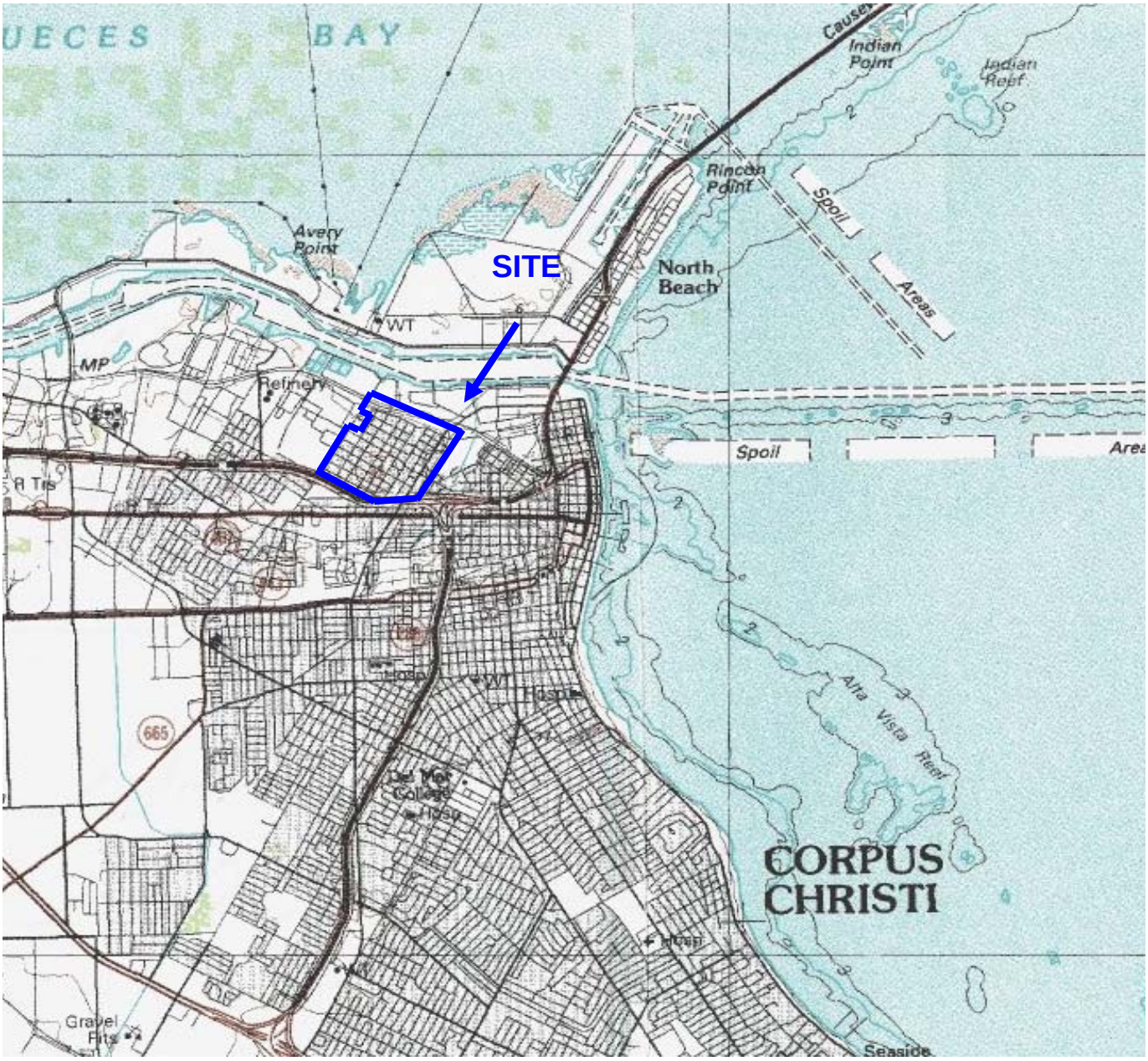
8.0 EXCEPTIONS, ADDITIONS, AND CHANGES TO THE TCEQ PST QAPP

Deviations from the PST QAPP as it pertains to laboratory accreditation for the analytical methods and analytes specified in the QAPP. Beacon is not NELAC accredited under the Texas Laboratory Accreditation Program for VOCs in soil gas by method 8260C because the TCEQ does not offer accreditation for VOCs in soil gas by method 8260C. The laboratory does have a quality assurance program, in place and implemented, which meets the requirement set forth by the EPA, NELAC, or the ISO, as described in Section 3.5 of this FSP.

Deviations from S.O.P. 6.5 *Collection of QA/QC Samples* exist as it pertains to Field Duplicates. Deviations from the QAPP are described in Section 4.4 of this FSP.

FIGURES

N



Geo Strata	Site Location Map Hillcrest Community Environmental Investigation Corpus Christi, Texas	Figure 1

Geo Strata	**Sample Location Map** Hillcrest Community Environmental Investigation Corpus Christi, TX	**Figure 2**

APPENDIX A

Beacon Environmental Services, Inc: Field Kit Guide for Passive Soil-Gas Investigations

FIELD KIT GUIDE
FOR
PASSIVE SOIL-GAS INVESTIGATIONS

[PLEASE READ ENTIRE GUIDE BEFORE STARTING SURVEY]

I. General Information

A. BEACON is furnishing this kit to **Geo Strata Environmental Consultants** (GEOSTRATA) specifically for use on the **Hillcrest Community Environmental Investigation site in Corpus Christi, TX.** Field installation of passive soil gas samplers is scheduled for **ASAP;** retrieval is scheduled for **14 days after installation**. If schedule changes occur, please contact BEACON at 800-878-5510.

B. It is also essential that, prior to returning the Kit to BEACON, GEOSTRATA verify that the caps are tight and clean [free of dirt] on the Passive Soil-Gas (PSG) Samplers and that the Samplers are sealed individually in the small Sampler Bags and also in the larger Return Shipment Bag, with an adsorbent pak.

C. ***Before going to the field*** please inventory the contents of the Kit, checking them against the enclosed list to verify item counts and to become familiar with all components. (Because the components are thoroughly cleaned prior to shipment, the inventory should be conducted without opening the plastic bags.) Note that Trip Blanks are to remain sealed throughout the Survey.

D. Upon receipt of the Field Kit, BEACON requests that GEOSTRATA sign and date the enclosed Chain-of-Custody Form to document receipt of the Kit **[NOTE the condition of the CUSTODY SEAL]**. The Field Deployment Report is to be completed during the course of the survey.

E. Following completion of the survey, fill out the Chain-of-Custody Form with the following information: (i) Field Sample IDs, (ii) the name and contact phone number of the person submitting the samples, (iii) the unique number of the custody seal that will be used, and (iv) signature and date of person relinquishing samples. The Chain-of-Custody Form and Field Deployment Report are to be returned with the Field Kit to BEACON. If possible, retain photocopies for your record. Next, pack the Samplers, tools, containers, sampling caps, and requisite documentation in the Field Kit.

Note: Place the Return Shipment Bag, which contains the individually bagged PSG Samplers, in the upper tray and place the tools in the lower compartment of the Kit so they do not damage the Samplers. One trip blank should be included with each Return Shipment Bag.

Affix the tug-tight custody seal to the latch on the Field Kit, pack it in its original cardboard shipping container, and send the shipment via overnight courier (FedEx, UPS, DHL) to:

Beacon Environmental Services, Inc.
Attn: Sample Receiving
323 Williams Street, Suite D
Bel Air, MD 21014
410-838-8780

NOTE: DO NOT PACK IN THE KIT OR SHIPPING BOX STYRENE PEANUTS, NEWSPAPER, OR OTHER MATERIALS THAT COULD CONTAMINATE THE SAMPLES. PLEASE AVOID SMOKING WHILE HANDLING SAMPLERS.

II. Contents

A. This Field Kit contains the components needed for a **216**-point soil-gas survey, plus sufficient additional cartridges for **7** trip blanks (vials labeled **Trip-1 through Trip-7**, not to be opened), and **5** extra Samplers for use in the event of breakage or accidental contamination. In addition, **5** extra transport vials are provided in case a Sampler Vial breaks during retrieval. Assuming that instructions are followed, due care is exercised in QA/QC procedures, and timing schedules are observed, the Kit provides users with an extremely accurate and reliable soil-gas system. **Do not open bags until deployment.**

Code/Item		Quantity
(1)	PASSIVE SOIL-GAS SAMPLERS	**228**
(2)	EXTRA TRANSPORT VIALS	**5**
(3)	SAMPLING CAPS (in container)	**230**
(4)	CAP STORAGE CONTAINERS	**3**
(5)	TAPPING DOWELS	**1**
(6)	12″ LENGTHS OF METAL PIPE	**227**
(7)	WIRE CUTTERS	**1**
(8)	GAUZE CLOTHS	**250**
(9)	PIPE CUTTER	**1**
(10)	SCRATCH AWL	**1**
(11)	VISE GRIPS	**1**
(12)	3” x 4” PLASTIC SAMPLER BAGS (for return shipment of samples)	**250**
(13)	12” x 12” PLASTIC RETURN SHIPMENT BAG	**7**

B. In addition to the materials found in the kit, field teams will need:

- NITRILE GLOVES
- CLEAN TOWEL
- HAMMER
- ELECTRIC ROTARY HAMMER DRILL WITH 1¼” to 1½” DIAMETER BIT WITH AT LEAST 12 INCHES OF CUTTING LENGTH
- BALL-POINT PEN and CLIPBOARD
- PIN FLAGS, WOODEN STAKES, or OTHER LOCATION MARKERS
- FLAGGING TAPE
- BOX OF ALUMINUM FOIL

C. Additional materials necessary only for deployment through asphalt or concrete:

- DRY CONCRETE MORTAR MIX and ASSOCIATED EQUIPMENT (for temporary patching of the sample holes) including:
  SMALL PAIL, WATER, SMALL PLASTIC PUTTY KNIFE
- CHISEL or SCREWDRIVER (to remove the temporary patch)
- ASPHALT COLD PATCH or CEMENT (for final repair of the sample holes)

III. Instructions

A. GENERAL:

Deployment and retrieval of Samplers requires only one person. Separate step-by-step procedures are detailed below for sampling through vegetation or bare soils and for sampling in areas covered by asphalt, concrete, or gravel. **Keep exposure of sample cartridges to ambient air to a minimum.**

Note: Do not deploy Samplers within 10 feet of a monitoring well or other intrusive sampling apparatus that potentially creates a preferential pathway for gases.

REMEMBER: TRIP BLANKS ARE NOT TO BE OPENED.

B. SAMPLER DEPLOYMENT:

Note: Each Sampler contains two sets of adsorbent cartridges. BEACON will analyze one set per Sampler; however, the second set in each Sampler can be analyzed as a field sample duplicate. GEOSTRATA will note at which locations, if any, duplicates are to be analyzed by writing separate entries corresponding to the sample location followed by the letter "D" (*i.e,* 3, 3-D, 4, 4-D) on the Chain-of-Custody Form. It is not necessary to alter the deployment pattern to have the duplicate samples analyzed. There is an additional per sample charge for analysis of any duplicates.

Sample/Matrix Spike/Matrix Spike Duplicate (MS/MSD)

Eleven (11) locations are designated for sample/MS/MSD for this investigation. The samplers to be used for these locations are marked with orange stickers and are bagged independently of the main field samples.

Only these samples are to be used at the sample locations where MS/MSD samples are to be collected.

BEACON requests that GEOSTRATA denote these locations on the Field Deployment Report.

Properly label the cap and 3" x 4" plastic Sampler Bag during retrieval and package them separately for return shipment to BEACON in their own return shipment bag.

Vegetation or Bare Soils:

1. At each survey point, clear vegetation as necessary and drill a 1¼"- to 1½"-diameter hole, using a rotary hammer drill, to a depth of 12 inches. **Note**: In areas of very organic topsoil or landscaped areas (ie, mulched areas, gardens, etc.) it is important to get beneath the organic soil layer to the underlying soil below.

2. When the hole has been completed, take a 12-inch length of 1"-diameter metal pipe and lower it into the sample hole, being careful not to touch the inside of the pipe. Any portion of the pipe above grade is cut flush with the ground surface, using the pipe cutter. With the tapping dowel and a hammer, push or tap the pipe one inch into the base of the drilled hole (see **attached figure**).

3. Remove one of the PSG Samplers (a glass vial containing four ***hydrophobic*** adsorbent cartridges) and unwind the retrieval wire wrapped around it. Holding the capped end of the vial in one hand, pull the wire tight (to straighten it) with the other hand. Remove the solid cap on the Sampler Vial and replace it with a Sampling Cap (a one-hole cap with a screen meshing insert). Place the solid cap in the Field Kit.

Note: At each sampling location, verify that the (black) sampling cap is on the vial before installing the Sampler.

4. Lower the Sampler, open-end down, into the metal pipe approximately four inches so that the retrieval wire sticks out of the hole. Cover the open end of the pipe with a balled up **wad** of aluminum foil, pressing it tightly on top of the pipe with the tapping dowel. Next, cover the hole to grade with local soils or sand, leaving the end of the wire exposed above the surface of the ground. Using the hammer, collapse the soils above the Sampler. **Coil the wire and lay it flat on the ground surface**. Place the solid cap in the Cap Storage Container. Clearly mark the sample location with a pin flag or wooden stake.

5. Close the Field Kit, and on the Field Deployment Report record: (a) sample-point number; (b) date and time of emplacement (to nearest minute); and (c) other relevant information (*e.g.*, soil type, vegetation, proximity to potential source areas). Be sure to mark the sample location and take detailed notes (*i.e.*, compass bearings and distances from fixed reference points).

6. Move to next location.

Concrete, Asphalt, or Gravel Covered Areas:

1. At each survey point, drill a 1¼"- to 1½"-diameter hole through the asphalt/concrete/gravel to bare soil using a rotary hammer drill or comparable equipment. This hole should be approximately 12 inches deep. **Note**: When one person is performing fieldwork, it is often more efficient to drill all holes before beginning Sampler deployment.

2. When the hole through concrete/asphalt/gravel has been completed, take a 12-inch length of 1"-diameter metal pipe and lower it into the sample hole, being careful not to touch the inside of the pipe. Any pipe above grade is cut flush with the ground surface, using the pipe cutter. With the tapping dowel and a hammer, push or tap the pipe one inch into the base of the drilled hole (see **attached figure**).

3. Remove one of the PSG Samplers (a glass vial containing four ***hydrophobic*** adsorbent cartridges) and unwind the retrieval wire wrapped around it. Holding the capped end of the vial in one hand, pull the wire tight (to straighten it) with the other hand. Remove the solid cap on the Sampler Vial and replace it with a Sampling Cap (a one-hole cap with a screen meshing insert). Place the solid cap in the Field Kit.

Note: At each sampling location, verify that the (black) sampling cap is on the vial.

4. Lower the Sampler, open-end down, into the metal pipe approximately four inches.

   If sampling through asphalt or concrete, bend the end of the wire over the top of the pipe so that the coil of wire hangs over the top and outside of the pipe. Next, plug the top of the hole with a wad of aluminum foil. Using the tapping dowel, push down the aluminum foil so it forms a seal on the metal pipe and rests ¼" below the surfacing. Cover the hole to grade with a **¼" thick** concrete patch. [**Note**: A ¼" thick patch is all that is required. If it is thicker it will be difficult to remove during retrieval.] Next, place the solid cap in the Cap Storage Container.

   If sampling through gravel, extend the retrieval wire out of the pipe and plug the pipe with a wad of aluminum foil. Using the tapping dowel, push down the aluminum foil so it forms a seal on the metal pipe. Bend the wire over the aluminum foil plug and while the wire is extended out of the hole, cover the aluminum foil with local soil or sand. **Coil the wire and lay it flat on the ground surface.** Next, place the solid cap in the Cap Storage Container.

   If a hole deeper than 12 inches is created, it will be necessary to use more than one wad of aluminum foil. In these situations, extend the wire out of the pipe. While holding onto the wire, plug the top of the pipe and hole loosely with as many wads as needed. Before inserting the last wad of foil, bend the wire so it rests below the uppermost wad of foil. This will make it easy to retrieve the Sampler during retrieval.

5. Close the Field Kit, and on the Field Deployment Report record: (a) sample-point number; (b) date and time of emplacement (to nearest minute); (c) type of surfacing and approximate thickness; and (d) other relevant information (*e.g.*, surfacing material, proximity to potential source areas). Be sure to mark the sample location and take detailed notes (*i.e.*, compass bearings and distances from fixed reference points).

6. Move to next location.

C. AMBIENT AIR SAMPLE COLLECTION:

1. Ambient air control samples are to be collected at **two (2)** pre-determined sample point locations in this Survey to measure the representative ambient air contamination.
   Note: Expose the samples to ambient air twice at the pre-determined sample locations: once during deployment and once during retrieval.

2. After the standard PSG Sampler has been deployed at the selected sample location, take an Ambient Air Control Sample from the holder in the bag.
   Note: Ambient Air Control Samples are marked AA-1 and AA-2.

3. Remove Control-Sample Vial cap and gently wave the open Vial around for 10 seconds (the approximate time field samples are exposed to ambient-air.)

4. Replace the solid cap on the vial (screwing cap on firmly), and replace it in holder.

5. Close Field Kit, and on the Field Deployment Report record: (a) the control sample letter; (b) date and time of collection; (c) location of collection (adjacent sample point); and (d) other information deemed relevant.

6. Repeat above steps 2 through 5 during retrieval of the same Sampler.

D. SAMPLER RETRIEVAL:

Prior to retrieving samples, seal each Trip Blank in a 3"x4" Sampler Bag, and place the bagged Trip Blank in a separate larger bag marked "Return Shipment Bag." One trip blank should be included with each Return Shipment Bag. Stow the sampler blocks, with the Transport vials and extra samplers, in the lower compartment of the kit. The sampler blocks are to be returned to BEACON's lab along with the samples.

Note: Each Sampler contains two sets of adsorbent cartridges. BEACON will analyze one set per Sampler; however, the second set in each Sampler can be analyzed as a field sample duplicate. GEOSTRATA will note at which locations, if any, duplicates are to be analyzed by writing separate entries corresponding to the sample location followed by the letter "D" (*i.e*, 3, 3-D, 4, 4-D) on the Chain-of-Custody Form. It is not necessary to alter the deployment pattern to have the duplicate samples analyzed. There is an additional per sample charge for analysis of any duplicates.

Vegetation or Bare Soils:

1. At each sample location open the Field Kit and place it and the wire cutters within easy reach. Remove a square of gauze cloth and place it and a clean towel on the open Kit. Remove a solid cap from the Cap Storage Container and place it on the Kit, also.

2. Remove the aluminum foil plug, using vise grips and the scratch awl, if necessary, and retrieve the Sampler from the hole.

3. Holding the Sampler upright, clean the sides of the vial with the clean towel (especially close to the Sampling Cap). Remove the Sampling Cap, cut the wire from the vial with the wire cutters, and clean the vial threads completely with the gauze cloth.
   [**Note**: **Completely remove the wire to ensure the cap fits tight on the vial and no soil is returned in the field kit**.]

4. Firmly screw the solid cap on the Sampler Vial and clean the vial completely with the gauze cloth. With a **ballpoint pen** record the sample number, corresponding to the sample location, on the cap's label. [**Note**: Do not use a Sharpie marker.]

5. Return the sampling cap to the Sampling Cap container. Place the sealed and labeled Sampler Vial in the smaller 3" x 4" plastic Sampler Bag. Then place the individually bagged and labeled sampler into the larger bag labeled "Return Shipment Bag."

   Note: Each sampler must be individually bagged and placed in a Return Shipment Bag, with approximately 30 samplers and one trip blank per Return Shipment Bag.

6. On the Field Deployment Report, record: (a) date and time of retrieval (to nearest minute); and (b) any other relevant information.

7. After all samples have been retrieved, verify that the caps on each Sampler are sealed tightly and that the seals on the Sampler Bags are closed. Verify that all Samplers are stored in the Return Shipment Bag, which contains an adsorbent pak. Seal the Return Shipment Bag and place it in the upper tray of the Field Kit, and place the provided tools and materials in the lower compartment of the Field Kit.

Note: Please do not return the sampling caps, pipe, or the wire with the Field Kit as they could bias the samplers. Return *all* the other materials and equipment (blocks, extra samplers, tools, containers, *etc.*).

Asphalt, Concrete, or Gravel:

1. At each sample point covered by gravel, clear away the soil or sand to expose the aluminum-foil plug. For those locations covered by asphalt or concrete, use a small chisel and hammer to remove the concrete patch to expose the aluminum foil.

2. Next, open the Field Kit and place it and the wire cutters within easy reach. Remove a square of gauze cloth and place it and a clean towel on the open Kit. Remove a solid cap from the Cap Storage Container and place it on the Kit, also.

3. While securely holding onto the retrieval wire, remove the aluminum-foil plug, using the scratch awl, as necessary. Holding the Sampler upright, clean the sides of the vial with the clean towel (especially close to the Sampling Cap). Remove the Sampling Cap, cut all the wire from the vial with the wire cutters, and clean the vial threads completely with gauze cloth.

   [**Note**: **Completely remove the wire to ensure the cap fits tight on the vial and no soil is returned in the field kit**.]

4. Firmly screw the solid cap on the Sampler Vial and clean the vial completely with the gauze cloth. With a **ballpoint pen** record the sample number, corresponding to the sample location, on the cap's label. [**Note**: Do not use a Sharpie marker.]

5. Return the sampling cap to the Sampling Cap container. Place the sealed and labeled Sampler Vial in the smaller 3" x 4" plastic Sampler Bag. Then place the individually bagged and labeled sampler into the larger bag labeled "Return Shipment Bag."

   Note: Each sampler must be individually bagged and placed in a Return Shipment Bag, with approximately 30 samplers and one trip blank per Return Shipment Bag.

6. On the Field Deployment Report, record: (a) date and time of retrieval (to nearest minute); and (b) any other relevant information. Return the sampling cap to the Sampling Cap container.

7. After all samples have been retrieved, verify that the caps on each Sampler are sealed tightly and that the seals on the Sampler Bags are closed. Verify that all Samplers are stored in the Return Shipment Bag, which contains an adsorbent pak. Seal the Return Shipment Bag and place it in the upper tray of the Field Kit, and place the provided tools and materials in the lower compartment of the Field Kit.

Note: Please do not return the sampling caps, pipe, or the wire with the Field Kit as they could bias the samplers. Return *all* the other materials and equipment (blocks, extra samplers, tools, containers, *etc.*).

8. Fill sampling holes to grade with an asphalt cold patch or cement.

IV. Forms

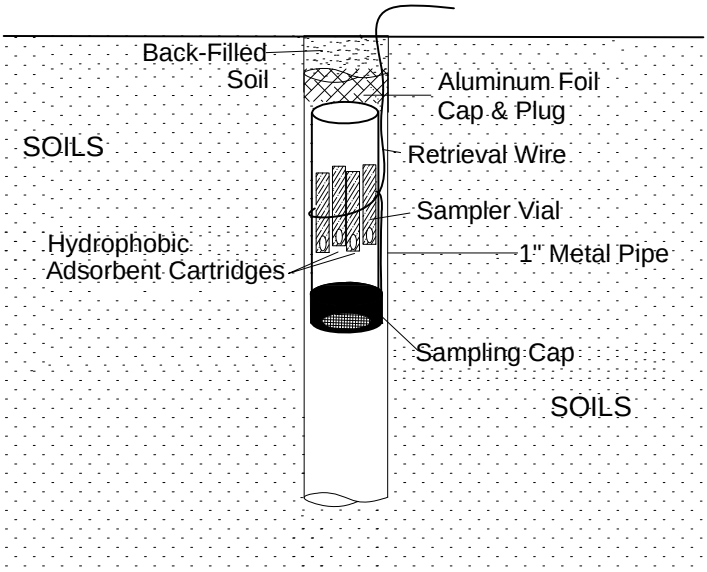
The Field Kit also contains a **Chain-of-Custody Form** and a **Field Deployment Report**.

A. The Chain-of-Custody Form is to be completed in accordance with **Section I**.

B. The Field Deployment Report is to be filled out during the Survey as indicated in **Section III**.

BEACON PASSIVE SAMPLER

DEPLOYMENT THROUGH SOILS



DEPLOYMENT THROUGH AN ASPHALT/CONCRETE CAP