Field Sampling Plan

East Hampton Hortonsphere Site

East Hampton, New York
AOC Index No. A1-0595-08-07
Site #:

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November 2007

072710-2-1101

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Abbreviations and Acronyms

ASTM	American Society for Testing and Materials
COC	Chain Of Custody
DNAPL	Dense Non-Aqueous Phase Liquid
EPA	Environmental Protection Agency
FID	Flame Ionization Detector
FSP	Field Sampling Plan
GEI	GEI Consultants, Inc.
HASP	Health and Safety Plan
HDPE	High Density Polyethylene
ID	Identification
LEL	Lower Explosive Limit
LNAPL	Light Non-Aqueous Phase Liquid
MGP	Manufactured Gas Plant
MS	Matrix Spike
MSD	Matrix Spike Duplicate
NAPL	Non-Aqueous Phase Liquid
NYSDEC	New York State Department of Environmental Conservation
PDA	Personal Data Assistant
PID	Photo Ionization Detector
PM	Project Manager
PPE	Personal Protection Equipment
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
QC	Quality Control
SOP	Standard Operating Procedures
VOC	Volatile Organic Compound

1. Purpose

1.1 Introduction

GEI Consultants, Inc. (GEI) has prepared this Draft Field Sampling Plan (FSP) to address the Site Characterization of the East Hampton Hortonsphere Site located in East Hampton, New York. The FSP is a companion document to the *East Hampton Hortonsphere Site Characterization Work Plan* dated May 2007 (Work Plan) that was prepared by KeySpan Corporation (KeySpan). The project location is shown on Figure 1 of the Work Plan. Proposed sample locations are summarized in Figure 2 of the Work Plan. The FSP was prepared to provide the applicable procedures for collecting, transporting, and logging analytical samples during the East Hampton Hortonsphere Site Characterization.

A quality assurance project plan (QAPP) dated May 2007 has been prepared under a separate cover. The QAPP details the project data objectives and quality assurance/quality control (QA/QC) measures that will be implemented during the implementation of the Work Plan.

2. General Field Procedures

2.1 Utility Clearance Procedure

Underground utilities, including electric, telephone, cable television, sewers, water, natural gas, etc., will be identified by owners/operators prior to any intrusive activity. KeySpan will provide underground utility locations on KeySpan property, if necessary. The drilling/ sediment coring contractor will place a call to the New York City/ Long Island One Call Center (1-800-272-4480) at least two, but not more than 10 days, prior to the commencement of work activities. The New York City and Long Island One Call Center is open 24 hours a day, 7 days a week. The drilling and excavation contractors will make note of ticket reference numbers and names of the utility operators that the notice will be transmitted to. Public and privately owned utilities will be located by responsible agencies at least 48 hours prior to field activities. The contractor will check that each notified operator has either marked the work site or given an "all clear" prior to commencing work. Other potential on-site hazards such as sharp objects, known subsurface structures, overhead power lines, and building hazards will be identified during the site reconnaissance visit.

If intrusive activity occurs on private property, then a private mark out company will be contracted to identify any subsurface utilities, or obstructions prior to sample collection. As a precaution, the first 5 feet or 1 foot below the nearest identified utility of the boring location will be cleared utilizing hand tools, vacuum excavation, or non-intrusive methods.

References:

1. Field Sampling Plan For Site Investigations At Manufactured Gas Plants, KeySpan Corporation, March 2004.
2. New York City One Call Center & Long Island internet web page online http://www.nycli1calldsi.com accessed on March 5, 2007.

2.2 Field Notebook Procedure

Objective

The field notebook is intended to serve as a record of significant field activities performed or observed during the project. The field notebook will serve as a factual basis for preparing field observation reports, if required, and reports to clients and regulatory agencies.

Procedure

1. Use a separate all-weather bound notebook for each site/location/project number.
2. Write neatly using black or blue waterproof pen (or note if field conditions [i.e., cold or wet weather] require use of pencil).
3. Write the project name, project number, and book number (i.e., 1 of 3) on the front cover. On the inside cover, identify the project name, project number, and "Return Book To:" the office address of the project manager.
4. Number all of the pages of the field book starting with the first entry.
5. Record activities as they occur.
6. Neatly cross out mistakes using a single line and initial them. Erasures are not permitted. If an error is made on an accountable document assigned to one individual, that individual will make all corrections. The person who made the entry will correct any subsequent error discovered on an accountable document. All subsequent corrections will be initialed and dated.
7. Sign or initial and date the bottom of every page with an entry. Cross out unused portions of a page.
8. Record the following information upon each arrival at the site:
    a. Date/time/weather/project number
    b. GEI personnel
    c. Purpose of visit/daily objectives
9. Record conversations with: [Recommendation - If possible, record telephone numbers of individual contacts for the site in the field notebook.]
    a. Contractors
    b. Clients
    c. Visitors (include complete names, titles, and affiliations whenever possible).
    d. GEI office staff
    e. Landowners (site or abutters)
    f. Note time of arrival and departure of individuals visiting the site.
10. Examples of the field information to be recorded include time of occurrences.
    a. General site work activities
    b. Subcontractor progress
    c. Type and quantity of monitoring well construction materials used
    d. Use of field data sheets or electronic logging equipment (i.e., boring logs, monitoring well sampling logs, etc.)
    e. Ambient air monitoring data
    f. Locations and descriptions of sampling points
    g. Sample media (soil, sediment, groundwater, etc.)
    h. Sample collection method
    i. Number and volume of sample(s) collected and sample bottle preservatives used

   j. Sample identification number (s) and date and time of sample collection
   k. Approximate volume of groundwater removed before sampling
   l. Field observations
   m. Any field observations made such as pH, temperature, turbidity, conductivity, water level, etc.
   n. References for all maps and photographs of the sampling site(s)
   o. Information pertaining to sample documentation such as: bottle lot numbers/ dates and method of sample shipments/chain-of custody record numbers and overnight shipping air bill numbers.
   p. Surveying data (including sketches with north arrows)
   q. Changes in weather
   r. Rationale for critical field decisions
   s. Recommendations made to the client representative and GEI Project Manager

11. Record the following information upon departure.
   a. Include a site sketch or representative site photograph of conditions at the end of the day, if required.
   b. Time
   c. Summarize work completed/work remaining
   d. Place a diagonal line though and sign portions of pages not used or skipped.

Precautions

- Only record facts.
- Do not fail to record an observation because it does not appear to be relevant at that time.
- Identify conditions or events that could affect/impede your ability to observe conditions.
- Do not use spiral notebooks because pages can be easily removed.

References

1. *ASFE Model Daily Field Report* (1991), ASFE, Inc.
2. GEI Consultants, Inc. Standard Operating Procedure (SOP) No. RE-001 [Field Note Book] February 6, 1995
3. Field Sampling Plan For Site Investigations At Manufactured Gas Plants, KeySpan Corporation, March 2004.

2.3 Daily Activity Report Procedure

Objective

A daily activity report will be generated from the field database or field notebook to summarize the activities, observations, and decisions made during the day’s fieldwork.

Procedure

At the completion of the day's fieldwork, all pertinent field observations will be recorded in the site database, computer electronic form, or on a hard copy paper form. If the electronic database is used, the database will generate the daily activity report that includes all samples collected and submitted to the laboratory for analysis. A daily activity report form is located in Appendix A. This report must be completed at the end of the workday. The daily activity report will be forwarded to the project manager (PM) and site manager once completed. Field reports will be maintained at the site electronically and/or in hard copy form.

Contents of the report should include, at a minimum, the following information:

1. Date, project name, project number/phase/task, and site location.
2. A record of person(s) present at the site during the workday.
3. A brief description of the daily activities performed (e.g., drilled five borings in the overburden).
4. A summary of any significant field observations to include:
    a. A summary of deviation(s) from the work plan or objectives.
    b. A summary of field decision(s) made, who made it/them, and the basis for such decision(s).
    c. Any recommendations that may result from field observations and any actions that resulted from those recommendations.
5. A summary of specific field work completed (e.g. RSMW-01, drilled depth 20 feet).
6. A summary of samples submitted for laboratory analysis.

Precautions:

The daily activity report should be based solely upon factual information. Any speculation should be clearly noted in the report as such.
The daily activity report should never be released to anyone other than the PM, or client unless explicitly authorized by the PM or client.

References

1. GEI Consultants, Inc. Standard Operating Procedure (SOP) No. RE-002 [Field Observation Report] February 6, 1995

2.4 Field Boring Data Logging

Objective

To prepare and record a succinct, accurate representation of subsurface conditions, drilling and soil sampling activities, monitoring well installation details, and borehole abandonment procedures. A completed boring log should contain sufficient information to facilitate the preparation of geologic cross sections, to identify possible contaminant sources or pathways observed, and to offer readers a thorough account of drilling and borehole abandonment procedures.

Procedures

1. All borings will be recorded in a field notebook and/or electronically on a personal data assistant (PDA) in utilizing pLog™ or similar soil logging program. Prior to beginning drilling activities, generic project header information, project staff, subcontractors, and anticipated geologic formations should be entered into the pLog™ database and downloaded to the PDA. If a field notebook is used, then logging will be completed in accordance with procedures described above in subsection 2.2.
2. Complete the log concurrently with drilling procedures (i.e., do not let the driller work faster than your ability to accurately represent the subsurface conditions).
3. If applicable, record the conventional geotechnical parameters during Standard Penetration Testing as per American Society for Testing and Materials (ASTM)-D1586, including blow counts of the hammer per 6-inch increment, total penetration of the split-spoon sampler, and length of the entire sample recovered. Record the weight of the hammer, size of the split-spoon sampler, and distance of the hammer fall.
4. Record the depth at which casing, augers, or drilling equipment are seated and the sizes of the equipment. Be certain to include sizes and seating depths of telescoped casing (if used).
5. Record the time at which each sample is retrieved from the borehole.
6. Record the results of any headspace tests performed on samples collected from discrete depths and also the type of field equipment used.
7. Provide soil descriptions in accordance with soil description procedures located below in Section 6.
8. Use the field book to record any relevant drilling observations that cannot be recorded on the PDA such as advance rate, water levels, drilling difficulties, changes in drilling method or equipment, amounts and types of any drilling fluids, running sands, and borehole stability.
9. Record the procedures and material used to abandon or seal each borehole upon completion.
10. At the completion of the day’s activities, download the PDA to the database and generate, review, and edit (if necessary) the completed boring log. If a field notebook is used, make photocopies of the field notebook at the end of each day.

Precautions

- Electronic files should be backed up daily to prevent loss of data. A hardcopy of the boring logs for work performed each day should be generated as a backup. Hardcopy documents should be backed up also.
- Keep boring logs and rock core logs focused on actual observations. Record only factual information on the logs.

3. Subsurface Soil Sample Collection Procedure

The following subsurface soil sample collection procedure is applicable to the collection of representative subsurface soil using direct push Geoprobe® drilling methods. Conventional hollow-stem auger, or resonant sonic drilling technologies may also be used if drilling conditions warrant. Alternative methods may be used at the GEI field representative's discretion with the authorization of KeySpan and New York State Department of Environmental Conservation NYSDEC.

3.1 Sampling Methods

Location, equipment, and sampling situations will dictate the applicable method of sample collection for each boring location. Borings will generally be accomplished through the use of one of the following samplers or techniques:

Geoprobe® Drilling Techniques
Conventional Hollow-Stem Auger Drilling Methods
Resonant Sonic Drilling Methods

These samplers and sampling techniques will result in the collection of representative samples.

3.2 Sample Interferences

Proper sampling procedures will be used to collect samples in accordance with this SOP to prevent cross contamination and improper sample collection. Common causes of sample interferences are listed below to ensure that the samplers can avoid potential sample collection problems.

1. Cross Contamination: Eliminated or minimized through the use of dedicated or disposable sampling equipment where appropriate. Where the use of dedicated or disposable sampling equipment is not possible or practical, the equipment will be decontaminated in accordance with the SOP for Decontamination of Field Sampling Equipment is located in Section 7.

2. Improper Sample Collection: Typical improper sample collection techniques include:

    - Improper decontamination of sampling equipment
    - Use of sampling equipment or sample containers that are not compatible with the contaminants of concern or the laboratory analytical method.
    - Sample collection in an obviously disturbed or non-representative area.

3.3 Equipment/Apparatus

Equipment needed for collection of sediment samples may include (depending on technique chosen):

- Geoprobe® Sampling Apparatus
- Rotary Hollow-Stem Auger Sampling Apparatus
- Rotosonic Sampling Apparatus
- Stainless Steel Sampling Tools
- Laboratory Provided Sample bottles
- Resealable plastic bags
- Ice
- Coolers, packing material
- Chain of Custody records, custody seals
- Decontamination equipment/supplies
- Maps/plot plan
- Safety equipment
- Tape measure
- Digital Camera
- Field data sheets/Logbook/waterproof pen
- Permanent markers
- Sample bottle labels
- Paper towels
- Personal protection equipment (PPE)

3.4 Subsurface Soil Sample Procedure

Subsurface sampling will be conducted in accordance with the following general procedures and specific guidance for the methods discussed below.

3.4.1 General Procedures

Prior to sampling, New York City and Long Island One Call will be contacted and an accurate utility mark out will be established as described in subsection 2.1. If drilling on private property, then a private mark out company may be contracted to identify any subsurface utilities or obstructions prior to sample collection.

At each location, plastic sheet, plywood sheet, or other suitable cover will be placed around the augers during conventional hollow stem auger drilling rig to contain soil cuttings.

Procedures for geologic logging, sample collection, and field classification are presented in Section 4.

If a boring exhibits the presence of non-aqueous phase liquid (NAPL), drilling will proceed until signs of the free and residual product are no longer visible in accordance with the work plan and the limitations of the drilling equipment. Any deep drilling through nearby impacted zones will ensure that there is no vertical communication caused by the drilling. Specifically, the upper impacted units may be cased and grouted into a lower, more confining unit; if encountered.

All the borings will be backfilled using a tremie pipe from the bottom to the top of the borehole with cement/bentonite grout in accordance with NYSDEC guidelines for standard grout mixtures:

One 94-pound bag Type I Portland cement
3.9 pounds powdered bentonite
7.8 gallons potable water

The boring will be grouted to the surface and allowed to cure overnight. If excessive settling is observed in the borehole due to seepage of the grout into the formation, then additional grout may be applied. The surface conditions including any asphalt/concrete surface will then be restored to its original condition.

Investigation derived wastes will be handled as specified in investigation-derived waste handling procedure located in Section 9.

3.4.2 Direct Push Geoprobe® Procedures

For direct push Geoprobe® methods, discrete soil samples will be collected from each boring using a 4-foot or 5-foot close piston Macro-Core® sampler configuration. Macro-Core® will be advanced to the beginning of the intended sample interval, the piston will be released and the Marco-Cores® will be driven to the end the intended sample interval. This method will ensure that sampling of "slough" does not occur. The Macro-Core® will then be retrieved and the collected soil core will be extruded from the sampler along with the liner. After decontamination, the Macro-Core® sampler will be re-assembled using a new liner. The Macro-Core®, rods and other sample collection equipment will be decontaminated as indicated below in subsection 7.2.2. Direct push Geoprobe® methods have been selected for site characterization activities.

3.4.3 Rotary Hollow Stem Auger Procedures

For rotary hollow-stem auger methods, split-spoon sampling will be conducted in accordance with ASTM Specification D-1586-84 for standard penetration test and split barrel sampling. Soil samples will be collected continuously through split-spoon sampling methods at the boring location. Split spoon samples will be collected ahead of the lead auger flight.

Upon collection of each split spoon sample, the lead auger will be advanced over the sampled interval prior to collection of the next split spoon sample. This method will ensure that "double-spooning" ahead of the augers does not occur. In addition, while the augers are being advanced a temporary auger plug will be placed at the bottom of the lead auger to minimize or eliminate the potential for formation materials to run up into the augers. The use of an auger plug will help assure that split spoon samples are representative of in-situ formation materials. Split-spoons will be decontaminated after each sample is collected as indicated below in subsection 7.2.2.

3.4.4 Rotosonic Procedures

For rotosonic methods, soil samples will be collected utilizing a stainless steel core barrel that is advanced utilizing resonant sonic energy. A larger diameter casing is then advanced over the core barrel. The core barrel is retrieved to the surface for sample extrusion. Core samples will be taken directly from the core barrel by extruding it into a plastic baggie-like sleeve, stainless steel tray, or retained in a clear plastic liner. The core barrel will be cleaned with tap water following each use. The field geologist will classify and sample the soil located within the liner. Upon completion, the excess soil will be placed into a 55-gallon drum for disposal and the inner liner properly disposed as indicated in Section 9. The core barrel will then be advanced within the isolation casing on the same borehole to collect the next soil core interval. The core barrel, casing, and other sample collection equipment will be decontaminated as indicated below in subsection 7.2.2.

References

New York State Department of Environmental Conservation, Division of Environmental Remediation, 2003. *Groundwater Monitoring Well Decommissioning Procedures*. NYSDEC, April, 2003.

ASTM, 1997. *D1586-84 (1992) Standard Test Method for Penetration Test and Split-Barrel Sampling of Soils.* ASTM, West Conshohocken, PA. 1997.

4. Soil Description Procedure

The following soil description procedure is applicable for use in describing surface and subsurface soils. This procedure may be varied or changed as required, dependent upon site conditions and equipment limitations. Any deviation from this standard will be documented in the field sampling book and in the final report.

4.1 Description Method

All soils will be described using the Unified Soil Classification System/ASTM D2488. The use of one standard will allow continuity of sampling descriptions between sample locations and personnel.

4.2 Sample Interferences

Proper handling of cores while recording descriptions will be used to ensure that handling does not effect sample collection, or cause cross contamination within the core sample.

Cross Contamination: Eliminated or minimized with dedicated or disposable sampling equipment where appropriate. Where the use of dedicated or disposable sampling equipment is not possible or practical, the equipment will be decontaminated in accordance with the procedure for the decontamination of field sampling equipment located below in Section 7.

4.3 Equipment/Apparatus

Equipment needed for description of soil and sediment samples may include:

- Stainless steel sampling tools
- Decontamination equipment/supplies
- Safety equipment
- Tape measure
- Camera
- Field data sheets/field notebook/waterproof pen
- Permanent marker
- Personal protection equipment (PPE)

4.4 Soil Sample Description Procedure

The sampling procedure is as follows:

All soils are to be logged using ASTM D2488 *Standard Practice for Description and Identification of Soils*. The description of each sample interval should be prepared as follows:

1. The specific intervals for description should be noted for each sample. The description should not necessarily be for the entire subsurface soil interval. Geologic horizons, small-scale units, or other changes in soil conditions within the subsurface soil sample should be identified and described separately.
2. Soil description should include particular notes if the field representative believes that there is a possibility the soil sample being described is not representative of the interval sampled.
3. The following data will be recorded on the sample collection method, if applicable:
   a. Method of collection, hollow stem auger, rotosonic, Geoprobe®, etc.
   b. Interval sampled vs. amount recovered.
   c. Blow counts, weight of hammer, and hammer free fall distance for split spoon samplers, if used.
4. For course grained soils with less than 50% fines:
   a. GROUP NAME (SYMBOL), Structure, % Gravel Sand and Fines in order of predominance, % Cobbles and/or boulders (by Volume), Maximum Particle Size, Other (moisture, depositional descriptions, representativeness), Color, Local or Geologic Name, environmental/geologic descriptions.
5. For fine grained soils with greater than or equal to 50% fines:
   a. GROUP NAME (SYMBOL), Structure, Plasticity, Plasticity characteristics (if performed), % Gravel Sand and size ranges, Other (moisture, depositional descriptions, representative nature), Color, Local or Geologic Name, Field Soil Strength measurements (if performed), environmental/geologic descriptions.
6. Specific descriptions of each of the above description categories are described in Appendix B or below.
7. Soil moisture will be described as Dry, Moist, or Wet.
8. Soil color will be described using the color chart in Appendix B. Colors may be combined: e.g., red-brown. Color terms should be used to describe the "natural color" of the sample as opposed to staining caused by contamination.
9. The representative nature of the sample interval should be noted if there is a possibility the soil sample being described is not representative of the interval sampled.
10. Visual evidence of contamination should be described in the sample log with the specific depths or depth intervals where the contamination was noted. Descriptions of visual, olfactory, and product observed should conform to the following standards.

a. **Sheen** - iridescent petroleum-like sheen. Not to be used to describe a "bacterial sheen", which can be distinguished by its tendency to break up on the water surface at angles, whereas petroleum sheen will be continuous and will not break up. A field test for sheen is to put a soil sample in a jar of water and shake the sample (jar shake test), then observe the presence/absence of sheen on the surface of the water in the jar.
b. **Stained** - used w/color (i.e., black or brown stained) to indicate that the soil matrix is stained a color other than the natural (non-impacted) color of the soil.
c. **Coated** - soil grains are coated with tar/free product – there is not sufficient free-phase material present to saturate the pore spaces.
d. **Blebs** - observed discrete sphericals of tar/free product - but for the most part the soil matrix was not visibly contaminated or saturated. Typically, this is residual product.
e. **Saturated** - the entirety of the pore space for a sample is saturated with the tar/free product. Care should be taken to ensure that you are not observing water saturating the pore spaces if you use this term. Depending on viscosity, tar/free-phase saturated materials may freely drain from a soil sample.
f. **Oil**. Used to characterize free and/or residual product that exhibits a distinct fuel oil or diesel fuel like odor; distinctly different from Manufactured Gas Plant (MGP)-related odors/impacts.
g. **Tar**. Used to describe free and/or residual product that exhibits a distinct "coal tar" type odor (e.g., naphthalene-like odor). Colors of product can be brown, black, reddish-brown, or gold.
h. **Solid Tar**. Used to describe product that is solid or semi-solid phase. The magnitude of the observed solid tar should be described (e.g. discrete granules or a solid layer).
i. **Purifier Material**. Purifier material is commonly brown/rust or blue/green wood chips or granular material. It is typically associated with a distinctive sulfur-like odor. Other colors may be present.
j. **Olfactory Descriptors.** Use terms such as " tar-like odor" or "naphthalene-like odor" or "fuel oil-like odor" that provide a qualitative description (opinion) as to the possible source of the odor. Use modifiers such as strong, moderate, or faint to indicate intensity of the observed odor.
k. **Dense Non-Aqueous Phase Liquid (DNAPL)/Light Non-Aqueous Phase Liquid (LNAPL).** A jar shake test should be performed to identify and determine whether observed tar/free-phase product is either denser or lighter than water. In addition, MGP residues can include both light and dense phases - this test can help determine if both light and dense phase materials are present at a particular location.

l. **Viscosity of Free-Phase Product –** If free-phase product/tar is present, a qualitative description of viscosity should be made. Descriptors such as:

   Highly viscous (e.g. taffy-like)
   Viscous (e.g. No. 6 fuel oil or bunker crude like)
   Low viscosity (e.g. No. 2 fuel oil like)

11. A Photoionization detector or flame ionization detector (PID/FID) will be used to screen all soil samples at the core location at 6 to 12-inch intervals. This screening data may be used to aid in selection of specific analytical sampling intervals. In addition, the PID or FID will be used to screen samples using the jar headspace method described below in subsection 6.5. The maximum readings from the jar headspace screening will be recorded and included on the logs. PID/FID will be calibrated daily at a minimum.

4.5 Soil Screening Procedure

The objective of field screening of soils is to measure the relative concentrations of volatile organic compounds (VOCs) present in soil at the project site. This information can be used to: 1) segregate soil based upon the degree of impacts, 2) to identify samples for laboratory analysis of VOCs, and 3) as a qualitative method to evaluate the presence or absence of VOCs in soils. A PID or FID may be used.

Procedure

1. Prior to sampling event, the instrument must be calibrated to the appropriate standard and have the appropriate detector for the contaminants expected to be encountered at the site. The type of standard and detector to be used is indicated in the Draft QAPP.
2. Record background readings of atmospheric conditions in the work area while walking across the work area. The highest meter response should be recorded in the field notebook.
3. Fill a clean, glass jar approximately half way with soil. Use a clean stainless steel sampling implement. Quickly cover the top of the jar with a sheet of aluminum foil and affix the lid to the jar. Each jar should be labeled to indicate the sample location and depth from which the sample was collected.
4. Allow the soil to volatilize for at least 10 minutes. Shake vigorously at the beginning and at the end of the headspace development period. If ambient temperatures are below 50 °F, headspace development should occur, if possible, with a heated area.
5. After headspace development, gently remove the screw cap and expose the foil seal. Quickly puncture the foil seal with the instruments tip to approximately ½ of the headspace depth.

6. Following the probe insertion through the foil seal, record the highest meter response as the jar headspace concentration. Maximum response should occur within 3 to 5 seconds after probe insertion.

Precautions:

- Follow safety procedures defined within the Rutledge Street Health and Safety Plan.
- The various instruments may work poorly in rain, high humidity, or in cold temperatures. In these instances, headspace readings will be completed in dry or warm areas.
- Care must be taken to prevent water or soil particulates from entering the tip of the instrument. If this occurs, the probe tip should be cleaned before further use.
- While establishing background conditions and performing jar headspace screening, care should be taken to avoid extraneous VOC sources such as vehicle emissions or other organic vapor sources.

Reference:

1. GEI Consultants, Inc. Standard Operating Procedure (SOP) No. TE-001 [VOC Field Screening] February 6, 1995

4.6 Air Monitoring Procedure

Air monitoring will be conducted as specified in the Work Plan and the Health and Safety Plan (HASP) dated November 2007 that is provided as part of the Site Characterization Work Plan. Air monitoring will be conducted utilizing a PID during all intrusive subsurface soil sampling activities. A multiple gas meter will be used to monitor for total VOCs, hydrogen cyanide, hydrogen sulfide, lower explosive limit (LEL), percent oxygen during intrusive subsurface soil sampling activities. During subsurface soil sampling, particulate monitoring will be conducted with a mini-ram digital particulate meter up wind and downwind of the work zone. All monitoring equipment will be calibrated at the beginning of the day and more frequently, if needed, with manufacturer specified calibration gas.

4.7 Quality Assurance/Quality Control

There are no specific QA activities that apply to the implementation of these procedures. However, the following general QA procedures apply:

- All data must be documented on field data sheets or within site logbooks.
- All instrumentation must be operated in accordance with operating instructions as supplied by the manufacturer, unless otherwise specified in the work plan.

Equipment checkout and calibration activities must occur prior to sampling/operation and they must be documented.

4.8 Sample Labeling Procedure

All samples collected will be labeled in accordance with the table listed below.

PRIMARY SAMPLES TYPES	QA/QC SAMPLE TYPES
SOIL SAMPLES	**FIELD BLANKS**
Surface Soil-ID (SAMPLE DEPTH-FEET)	SAMPLE-ID – [DATE]
EHS-SS-01 (0-0.2)	EHS-SS-FB-033107
Boring -ID (SAMPLE DEPTH-FEET)	EHS-GP-FB-033107
EHS-GP-01 (10-15)	EHS-MW-FB-033107
GROUNDWATER SAMPLES	EHS-GW-FB-033107
Monitoring Well-ID	**MATRIX SPIKE/DUP**
EHS-MW-01	SAMPLE [ID] [DEPTH] [EITHER MS OR MSD]
Temporary Groundwater Monitoring Point-ID	EHS-SS-01 (10-15) MS/MSD
(SAMPLE DEPTH-FEET)	EHS-GP-01 (10-15) MS/MSD
EHS-GW-01 (10-14)	EHS-MW-01 (10-15) MS/MSD
SOIL VAPOR SAMPLES	EHS-GW-01 (10-15) MS/MSD
Soil Vapor-ID	**TRIP BLANKS**
EHS-SV-01	SAMPLE- ID [DATE]
	EHS-TB-063007
	BLIND DUPLICATES
	SAMPLE -ID[XX][DATE]
	EHS-SS-XX-063007
	EHS-GP-XX-063007
	EHS-MW-XX-063007
	EHS-GW-XX-063007

In addition to the information listed above, each sample will be labeled with the date and time the sample was collected, laboratory analysis requested, initials of the sampler (s), and the project number. Sample handling procedures are located in the Draft QAPP.

References

ASTM *D 2488, Standard Practice for Description and Identification of Soils (Visual-Manual Procedure).* ASTM International, West Conshohocken, PA.

ASTM *D 2487, Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System).* ASTM International, West Conshohocken, PA.

5. Monitoring Well Installation and Development

Permanent monitoring wells are not proposed as part of the site characterization at this time. However, if field conditions warrant the installation of permanent monitoring wells then the monitoring wells will be installed at the completion of the soil boring installation, all permanent wells will be developed prior to the collection of groundwater samples. The following procedures will be used to install and develop all permanent monitoring wells.

5.1 Monitoring Well Specifications

Monitoring wells installed in unconsolidated deposits that do not penetrate a presumed confining layer will be constructed according to the following specifications:

1. Install polyvinyl chloride (PVC) 1.5-inch diameter, threaded, flush-joint casing and Pre-packed 2.5-inch outer diameter, 1.5-inch inner diameter screens.
2. Wells will be screened in the unconsolidated deposits. Screens will be 10 feet in length, and slot openings will be 0.010 inch. Alternatives may be used at the discretion of the field geologist, based on site-specific geologic conditions.
3. If appropriate, a sump, at least 2 feet in length, may be attached to the bottom of the screen to collect dense nonaqueous phase liquids (DNAPLs).
4. Where appropriate, the annulus around the screens will be backfilled with clean silica sand (based on Site-specific geologic conditions and screen slot size) to a minimum height of 1 to 2 feet above the top of the screen.
5. A bentonite pellet seal or a bentonite slurry will be placed above the sand pack. If a pellet seal is used, it will be allowed to hydrate for at least 30 minutes before placement of grout above the seal. Where possible, the bentonite pellet seal will be a minimum of 24-inches in depth, except in those instances where the top of the well screen is in close proximity to the ground surface. In these instances, the well will be completed in accordance with specifications provided by the field geologist who will incorporate an adequate surface seal into the well design.
6. The remainder of the annular space will be filled with a cement grout up to the ground surface. The grout will be pumped from the bottom up. The grout will be mixed in the following relative proportions: One 94-pound bag Type I Portland cement, 3.9 pounds powdered bentonite, and 7.8 gallons potable water. The grout will be allowed to set for a minimum of 48 hours before wells are developed.
7. The top of the casing will be finished using flush-mount casings with keyed-alike locks.
8. A concrete surface pad will be sloped to channel water away from the well casing.
9. A weep hole will be drilled at the base of the protective standpipe casing to allow any water between the inner and outer casing to drain.

10. The top of the PVC well casing will be marked and surveyed to 0.01 foot, and elevations will be determined relative to a fixed benchmark or datum. The measuring point on all wells will be on the innermost PVC casing.
11. Characteristics of each newly installed well will be recorded in the field notebook.

References:

1. Field Sampling Plan For Site Investigations At Manufactured Gas Plants, KeySpan Corporation, March 2004.

5.2 Monitoring Well Development

After a minimum of 48 hours after completion of permanent monitoring wells, one, or a combination of the following techniques will be used in the monitoring well development:

1. Surging;
2. Bailing;
3. Using a centrifugal pump and dedicated polyethylene tubing; and/or
4. Positive displacement pumps and dedicated polyethylene tubing.

Development water will initially be monitored for organic vapors with a PID. In addition, the development water will be observed for the presence of non-aqueous phase liquids (NAPLs) or sheens. The development water will be contained in a tank and/or 55-gallon steel drums on-site. The purge water will be disposed of in accordance with NYSDEC requirements. The wells will be developed until the water in the well is reasonably free of visible sediment (<50 NTU if possible). Well development will not exceed 10 well volumes. Following development, wells will be allowed to recover for at least two weeks before groundwater is purged and sampled. All monitoring well development will be overseen by a field representative and recorded in the field logbook.

References:

1. Field Sampling Plan For Site Investigations At Manufactured Gas Plants, KeySpan Corporation, March 2004.

6. Groundwater Sampling Procedure

The following is a step-by-step sampling procedure to be used to collect groundwater samples from the monitoring wells and temporary groundwater monitoring points. Well sampling procedures will be recorded in the field notebook. Sample management is detailed in the QAPP.

1. Groundwater samples will not be collected until at minimum, two weeks following well development of permanent wells.
2. Prior to sampling, a round of groundwater elevation measurements will be collected. The measurements will be made from the surveyed well elevation mark on the top of the inner PVC casing with a decontaminated electric water/product level probe. The measurements will be made in as short a time frame as practical to minimize temporal fluctuations in hydraulic conditions. The time, date, and measurement to nearest 0.01 foot will be recorded in the field logbook.
3. Place a plastic sheet on the ground to prevent contamination of the bailer rope and/or the tubing associated with the purging (pump) equipment.
4. Each monitoring well will be purged with a centrifugal, submersible, peristaltic, or whale pump and dedicated polyethylene tubing, or other methods at the discretion of the field geologist, and with the prior approval of KeySpan and NYSDEC.
5. Monitoring wells will be purged at a rate to minimize drawdown within the well to the extent practicable.
6. The water quality parameters of temperature, pH, conductivity, oxygen reduction potential, turbidity, and DO will be measured and recorded, at 3 to 5 minute intervals with a multi-parameter water quality probe. At least, one well volume of water will be removed prior to sampling. When the parameters stabilize over three consecutive readings, sampling may commence. Stability is achieved when pH is within 0.1 standard unit, temperature is within 0.5ºC, Eh is within 10% and specific conductivity is within 10% for three consecutive readings. Record results in the field logbook prior to sample collection.
7. Collect VOC samples with a dedicated polyethylene bailer lowered by a dedicated polypropylene rope, or other methods as indicated. Other parameters may be collected with a submersible, or peristaltic pump using the low-flow sampling technique. The pump should be capable of throttling to a low flow rate suitable for sampling.
8. If the well goes dry before the required volumes are removed, the well may be sampled when it recovers sufficiently.

9. After all samples are collected, the water level in the monitoring well will be gauged and the locking cap will be re-installed.
10. Investigation derived water and PPE will be disposed of dedicated disposable sampling equipment in garbage bags or stored in temporary 5-gallon containers.

References:

1. Field Sampling Plan For Site Investigations At Manufactured Gas Plants, KeySpan Corporation, March 2004.
2. *Low Stress (low flow) Purging and Sampling Procedure for the Collection of Ground Water Samples From Monitoring Wells,* published July 30, 1996 by the United States Environmental Protection Agency (EPA).

7. Soil Vapor Sampling Procedure

7.1 Soil Vapor Sample Collection

The following is a step-by-step sampling procedure to be used to collect soil vapor samples from the temporary soil vapor probes.

7.1.1 Documentation of Field Conditions

Pertinent field conditions will be documented prior to the installation of any probe locations.

- Weather information will be recorded (precipitation, temperature, barometric pressure, relative humidity, wind speed, and wind direction) at the beginning of the sampling event. Substantial changes to these conditions that may occur during the course of sampling will be recorded. The information may be measured with on-site equipment or obtained from a reliable source of local measurements (e.g., a local airport). Data will be obtained for the past 24 to 48 hours.
- A checklist will be filled out to assess the uses of volatile chemicals during normal operations of the nearby structures.
- Outdoor plot sketches will be drawn that include the site, area streets, neighboring commercial or industrial facilities (with estimated distance to the site), outdoor air sampling locations (if applicable), and compass orientation (north).
- Any pertinent observations will be recorded, such as odors and readings from field instrumentation.

7.1.2 Soil Vapor Point Installation

The installation of the temporary soil vapor points will be in general accordance with Section 2.7.1 of the New York State Department of Health (NYSDOH) *Final Guidance for Evaluating Soil Vapor Intrusion in the State of New York*, dated October 2006 (herein referred to as the NYSDOH guidance document). Each soil vapor point will be constructed as follows:

- Six-inch stainless steel Geoprobe® AT86 series Permanent Implants (soil vapor screens) threaded to an (expendable) stainless steel anchor point.
- The implants will be fitted with inert Teflon or stainless steel tubing of laboratory or food grade quality.
- The annular space surrounding the vapor screen interval and a minimum of 6-inches above the top of the screen will be filled with a porous backfill material (e.g., glass beads or coarse silica sand) to create a sampling zone 1 foot in length.

- A hydrated bentonite surface seal will be created at the surface to minimize infiltration.

7.1.3 Soil Vapor Sample Collection

Soil vapor samples will be collected in accordance with the NYSDOH guidance document. Specifically, samples from the points will be collected as follows:

- Temporary points will be purged and sampled immediately following installation.
- Document pertinent field conditions prior to sampling as described above.
- A suction pump will be used to remove a minimum of three implant volumes from the soil vapor points prior to sampling.
- The purge rate shall not exceed 0.2 liters per minute.
- Samples will be collected in an individually laboratory certified clean 1-liter SUMMA® canister (or equivalent) using a certified flow controller calibrated for the anticipated sample duration (4 minutes). The regulator flow rate will not exceed 0.2 liters per minute.
- A helium tracer gas will be used to identify any potential migration or short circuiting of ambient air during sampling as described below.
- The identification numbers for the canister and flow controller will be recorded.
- The initial canister pressure on the vacuum gauge will be recorded. These numbers and values will be recorded on the chain-of-custody form for each sample.
- The tubing from the soil vapor probe to the flow controller will be connected.
- Open the valve on the canister. The time that the valve was opened (beginning of sampling) and the canister pressure on the vacuum gauge will be recorded.
- The canister and the area surrounding the canister will be photographed.
- The vacuum pressure in the canister will be monitored routinely during sampling.
- Sample collection will be stopped when the canister still has a minimum amount of vacuum remaining. (Check with the laboratory supplying the canister and flow controller for the ideal final vacuum pressure.) Typically, the minimum vacuum is between 2 and 5 inches of mercury, but not zero. If there is no vacuum remaining, the sample will be rejected and collected again in a new canister.
- The final vacuum pressure will be recorded and the canister valve closed. The date and time that sample collection was stopped will be recorded.
- The flow controller will be removed from the canister and the protective brass plug replaced.
- The labels/tags (sample name, time/date of sampling, etc.) will be attached to the canister as directed by the laboratory.

- The canister and other laboratory-supplied equipment will be placed in the packaging provided by the laboratory.
- The information required for each sample will be entered on the chain-of-custody form, including the identification numbers for the canister and flow controller, and the initial and final canister pressures on the vacuum gauge.
- Samples will be analyzed for VOCs and naphthalene via modified USEPA modified Method TO-15 and helium via ASTM D-1945, if necessary, by a New York State Environmental Laboratory Approval Program (ELAP) certified laboratory.
- The required copies of the chain-of-custody form will be included in the shipping packaging, as directed by the laboratory. A copy of the chain-of-custody will be maintained for the project file.
- The samples will be delivered or shipped to the laboratory as soon as practical.

All laboratory analytical data will be validated by a data validation professional in accordance with the USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review, January 2005 and the USEPA Region II Standard Operating Procedure (SOP) for the Validation of Organic Data modified to accommodate the USEPA Method TO-15 and natural gas analysis by ASTM D-1945.

7.1.4 Tracer Gas Evaluation

The tracer gas evaluation provides a means to evaluate the integrity of the soil vapor probe seal and assess the potential for introduction of ambient air into the soil vapor sample.

A tracer gas evaluation will be conducted on the each temporary soil vapor probe to be sampled in the sampling event.

The following tracer gas evaluation procedure will be utilized:

- Retain the tracer gas around the sample probe by filling an air-tight chamber (such as a plastic bucket) positioned over the sample location.
- Make sure the chamber is suitably sealed to the ground surface.
- Introduce the tracer gas into the chamber. The chamber will have tubing at the top of the chamber to introduce the tracer gas into the chamber and a valved fitting at the bottom to let the ambient air out while introducing tracer gas. Close the valve after the chamber has been enriched with tracer gas at concentrations >10%.
- The chamber will have a gas-tight fitting or sealable penetration to allow the soil vapor sample probe tubing to pass through and exit the chamber.

- After the chamber has been filled with tracer gas, attach the sample probe tubing to a pump that will be pre-calibrated to extract soil vapor at a rate of no more than 0.2 liters per minute. Purge the tubing using the pump. Calculate the volume of air in the tubing and probe and purge one to three tubing/probe volumes prior to collecting an analytical sample or using a portable device to measuring the tracer gas concentration.
- Samples collected from vapor points during a tracer gas evaluation will be analyzed for VOCs and naphthalene via modified USEPA modified Method TO-15 and helium via ASTM D-1945 by a New York State Environmental Laboratory Approval Program (ELAP) certified laboratory.
- The concentrations of the tracer gas detected during analysis or direct measurement, will determine whether additional gas tracer evaluations are necessary:

If the evaluation on a probe indicates a high concentration of tracer gas in the sample (>10% of the concentration of the tracer gas in the chamber), then the surface seal is not sufficient and requires improvement via repair or replacement prior to commencement subsequent to sample collection.

A non-detectable level of tracer gas is preferred; however, if the evaluation on a probe indicates a low potential for introduction of ambient air into the sample (<10% of the concentration of the tracer gas in the chamber), then we will proceed with the soil vapor sampling. While lower concentrations of tracer gas are acceptable, the impact of the detectable leak on sample results will be evaluated in the sampling report.

8. Equipment Decontamination Procedure

The following equipment decontamination procedure is applicable for use in decontaminating sampling tools used in collection of analytical samples from surface soils, subsurface soils, and groundwater. Equipment decontamination will prevent cross-contamination and maintain analytical sample integrity. This procedure may be varied or changed as required, dependent upon site conditions and equipment limitations. Any deviation from this standard should be documented in the field-sampling book and in the final report.

8.1 Equipment/Apparatus

Equipment needed for decontamination of sampling equipment may include:

- Alconox or non-phosphate soap
- Simple Green
- Methanol
- 10% Nitric acid solution
- De-ionized water
- Decontamination buckets
- Secondary containment vessels
- Plastic sheeting
- Scrub brushes
- Personal protection equipment (PPE)

8.2 Equipment Decontamination Procedure

Equipment will be decontaminated in accordance with procedures specified in the Work Plan as summarized below. Equipment decontamination procedures are also detailed within the Draft QAPP.

8.2.1 Sampling Equipment and Tools

Prior to sampling, all non-dedicated equipment (i.e., bowls, spoons, bailers, and soil sampling apparatus (i.e. Macro-Core Shoe and split spoon equipment) will be decontaminated as follows.

- Decontamination of sampling equipment and hand tools may take place at the sampling location as long as all liquids are contained in pails, buckets, etc.
- All sampling equipment will be washed with water and a non-phosphate detergent (Alconox, Simple Green, etc.) to remove gross contamination.

- All sampling equipment will then be rinsed with de-ionized water.
- All equipment used to collect samples for VOCs and semivolatile organic compounds (SVOC) analysis will then receive a methanol rinse followed by a de-ionized water rinse.
- All equipment used to collect samples for metals analysis will then receive a 10% nitric acid solution rinse followed by a de-ionized water rinse.
- At no time will decontaminated equipment be placed directly on the ground.
- Equipment will be wrapped in polyethylene plastic or aluminum foil for storage or transportation from the designated decontamination area to the sampling location, where appropriate.

8.2.2 Drill Rig Decontamination

For site characterization activities, the Geoprobe® rig drilling implements will be decontaminated with water and a non-phosphate detergent and water rinse. Decontamination will be completed in close proximity to the proposed borings and will be completed over a temporary decontamination pad or plastic containers because of site constraints. The macro-core sampling shoe will be decontaminated in accordance with subsection 7.2.1.

In the event that conventional hollow stem auger drilling or resonant sonic drilling is used, then a temporary decontamination pad, or tubs will be used. All augers, rods, and tools will be decontaminated between each drilling location according by steam cleaning. Decontamination water will be containerized an stored in temporary 5-gallon buckets for off-site disposal.

8.3 Quality Assurance/Quality Control

There are no specific quality assurance (QA) activities that apply to the implementation of these procedures. However, the following general QA procedures apply:

- All data must be documented on field data sheets or within site field notebooks.
- All instrumentation must be operated in accordance with operating instructions as supplied by the manufacturer, unless otherwise specified in the work plan. Equipment checkout and calibration activities must occur prior to sampling/operation and they must be documented.

References

1. ASTM *E 1391-94, Standard Guide for Collection, Storage, Characterization, and Manipulation of Sediments for Toxicological Testing.* 2000 ASTM Standards on Environmental Sampling, Vol 11.05, West Conshohocken, PA.
2. Puget Sound Estuary Program, 1997. *Recommended Guidelines for Sampling Marine Sediment, Water Column, and Tissue in Puget Sound.* U.S. Environmental Protection Agency, Region 10, Seattle, WA and Puget Water Quality Authority, Olympia, WA.
3. U.S. Environmental Protection Agency, 1993. U.S. EPA Contract Laboratory Program – Statement of Work for Organic Analysis, Multi-Media, Multi-Concentration. Document ILMO1.0-ILO-1.9, 1993. U.S. Environmental Protection Agency, Washington, DC.
4. GEI Consultants, Inc. Standard Operating Procedure (SOP) No. SA-007 [Equipment Decontamination]
5. Field Sampling Plan For Site Investigations At Manufactured Gas Plants, KeySpan Corporation, March 2004.

9. Analytical Sample Handling and Transport

Subsurface soils collected will be handled and submitted for laboratory analysis according to the following procedure. The QAPP provides a detail description of sample handling and transport.

1. Samples will be transferred from the sample equipment into suitable, labeled sample containers specific for the laboratory analyses to be performed. Use laboratory-provided, pre-preserved sample bottles for specific analyses. Do not overfill bottles if they are pre-preserved.
2. Secure the sample container with the appropriate cap, place the sample container in a resealable plastic bag or bubble wrap, and place it inside of a sample cooler provided by the laboratory. Use ice to cool the sample cooler to 4 degrees Celsius.
3. Record all pertinent sample identification data in the site database and/or field notebook.
4. Print the completed the Chain-of-Custody (COC) record from the database, sign, and photocopy. If necessary, a hard copy COC may be used in the place of the electronic database. A chain of custody is attached in Appendix C. Place the original COC in a resealable plastic bag and affix it to the inside of the top of the cooler/or will transmitted to the laboratory courier upon a sample pick-up.
5. Attach a custody seal to the outside of the cooler prior to shipment/pickup.

10. Investigation-Derived Waste Handling Procedure

10.1 General Waste Handling Procedures

The following procedure provides guidelines for the management of investigation derived wastes. Wastes anticipated to be generated as part of the Rutledge Street Site Characterization include the following materials: subsurface soils, groundwater, decontamination fluids, PPE, and miscellaneous investigation-derived field supplies. All wastes will be segregated into soil, fluids and PPE/miscellaneous investigation-derived materials will be stored in temporary 5–gallon storage containers or garbage bags. Investigation derived wastes will be picked at the end of the work day by a licensed KeySpan waste hauler or will be placed in United States Department of Transportation (USDOT)-approved 55-gallon drums at a temporary storage facility. Each waste vessel will labeled with a “Non-Hazardous Waste Label” designated with “Pending Characterization.”

Information on the label should include:

Generator: KeySpan Corporation
Address: 1 MetroTech Center Brooklyn, NY 11201

At the end of each day, each waste container should be secured with temporary 5-gallon containers and trash bags until it is either picked up by a private waste carrier at the end of each work day, or staged at a temporary waste storage facility. GEI field representative will document the number and type of investigation derived wastes. Investigation -derived wastes will be documented on the waste tracking sheet and provided to the KeySpan Project Manager. A waste tracking sheet is attached in Appendix D.

10.2 Investigation Derived Waste Sample Collection Procedure

If required, the GEI field representative will obtain a waste profile sample of soil and fluid investigation derived wastes. A sample will be collected from each of the investigation-derived wastes that require analysis for disposal. Soil wastes will be collected by using shovels, hand auger or other equipment, composited and then placed into laboratory provided sample jars. The waste profile parameters will be provided to the GEI field representative prior to collection of the waste profile sample. Samples will be collected into laboratory-preserved bottles, chilled with ice and submitted to the laboratory under chain of custody as described in above Section 8.

References

1. GEI Consultants, Inc. Standard Operating Procedure (SOP) No. RE-006 [Investigation Derived Waste Management]
2. Field Sampling Plan For Site Investigations At Manufactured Gas Plants, KeySpan Corporation, March 2004.

Appendix A

Daily Activity Report

DAILY ACTIVITY REPORT

DATE:	**GEI Personnel:**	
PROJECT: Clifton Former MGP Site	**KeySpan Personnel:**	
GEI PROJECT NO.: 98248	**Other Personnel:**	
SITE LOCATION: 25 and 40 Willow Ave, Clifton (Staten Island), NY	**NYSDEC Personnel:**	
	Site Visitors:	

Description of Activities and Summary of Significant Field Observations (Indicate Times as Appropriate)

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Drilling Summary

Completed Boring ID	Completed Well ID	Total Depth of Soil Sampling	Well Screen Bottom Depth	Well Screen Top Depth	Isolation Casing Depths	Other

Summary of Soil Samples Submitted for Laboratory Analyses

Soil Sample ID	Boring ID	Depth Interval	Time Collected	Analyses Requested	Duplicate Sample ID	MS/MSD (yes/no)

Summary of Groundwater Samples Submitted for Laboratory Analyses

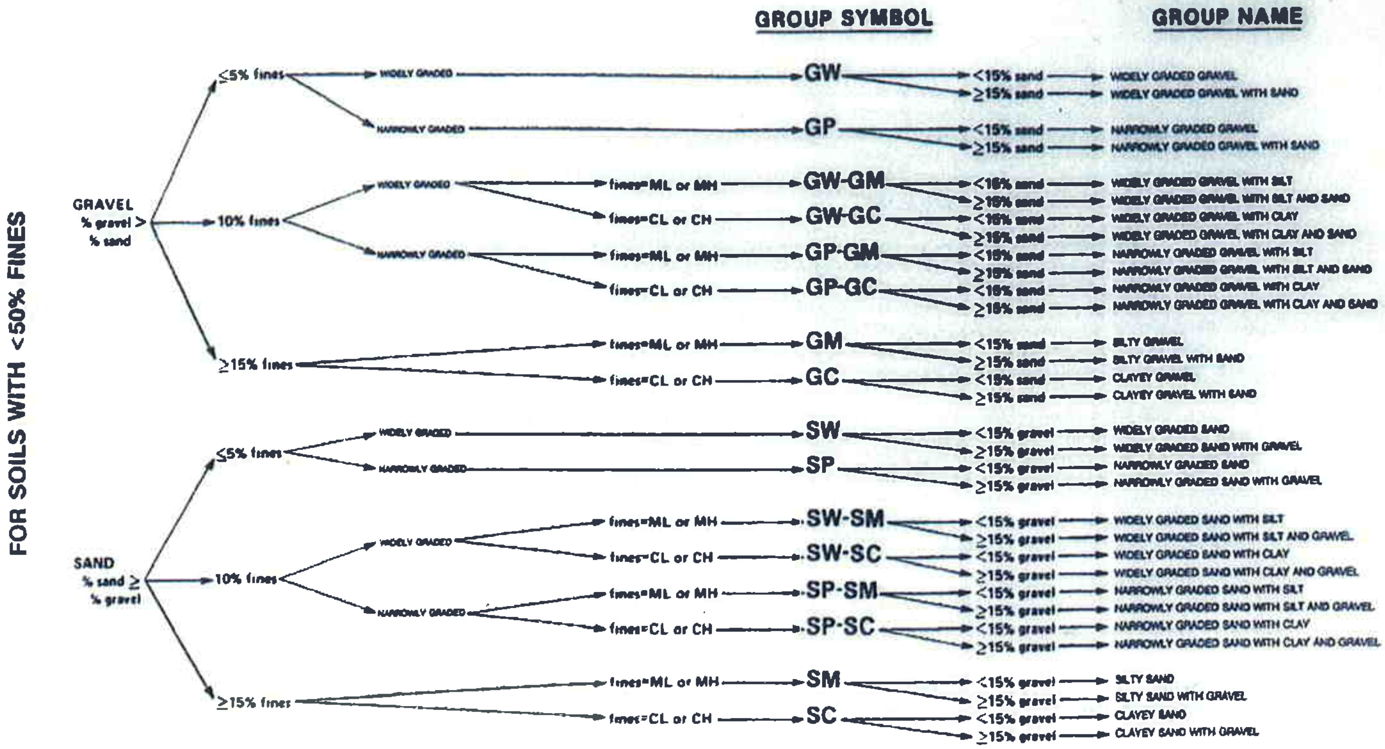
Groundwater Sample ID	Well ID	Time Collected	Analyses Requested	Sample Tube Intake Depth	Purge/Sample Flow Rate	Duplicate Sample ID

Appendix B

Visual-Manual Description Standards

COARSE GRAINED SOILS

VISUAL-MANUAL DESCRIPTIONS

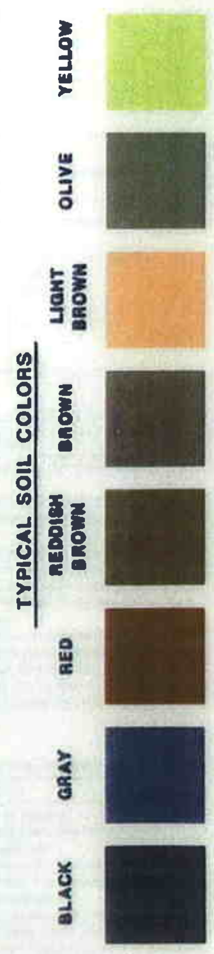


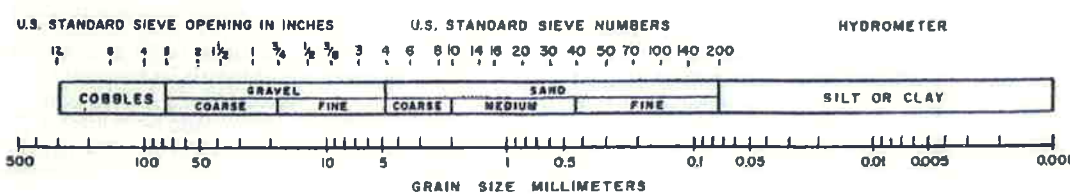
SOIL DESCRIPTION FORMAT

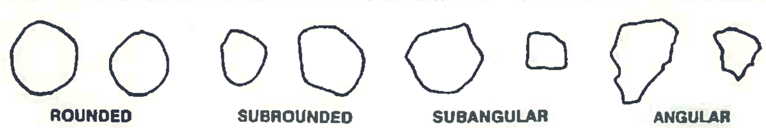
1. GROUP NAME and SYMBOL
2. Structure: stratified, laminated (layers <6 mm thick), lensed, homogeneous
3. Percent gravel, sand, fines (by dry weight), in order of predominance:
   - gravel - fine, coarse, and angularity
   - sand - fine, medium, coarse, and angularity
   - fines - plasticity characteristics
4. Percent cobbles and/or boulders (by volume)
5. Maximum particle size
6. Other - if appropriate - odor, roots, cementation, reaction with HCl, particle shape, moisture condition
7. Color
8. Local or geologic name

EXAMPLES

1. NARROWLY GRADED SAND (SP); mostly fine sand; <5% fines; brown.
2. SILTY SAND WITH GRAVEL (SM); ~60% fine to coarse, subangular sand; ~20% silty fines with low plasticity; ~20% fine, subangular gravel, max. size 10 mm; sample contained ~5% (by volume) subrounded cobbles to 200 mm; gray, Basal Glacial Till.
3. CLAYEY SAND (SC) and WIDELY GRADED SAND (SW); stratified layers ranging from ~6 to 20 mm thick; SC layers consist of fine sand with low plasticity clayey fines ranging from ~20 to 40%; SW layers consist of fine to coarse subrounded sand with <5% fines; SC layers are olive-gray, SW layers are brown; Hydraulic Fill.



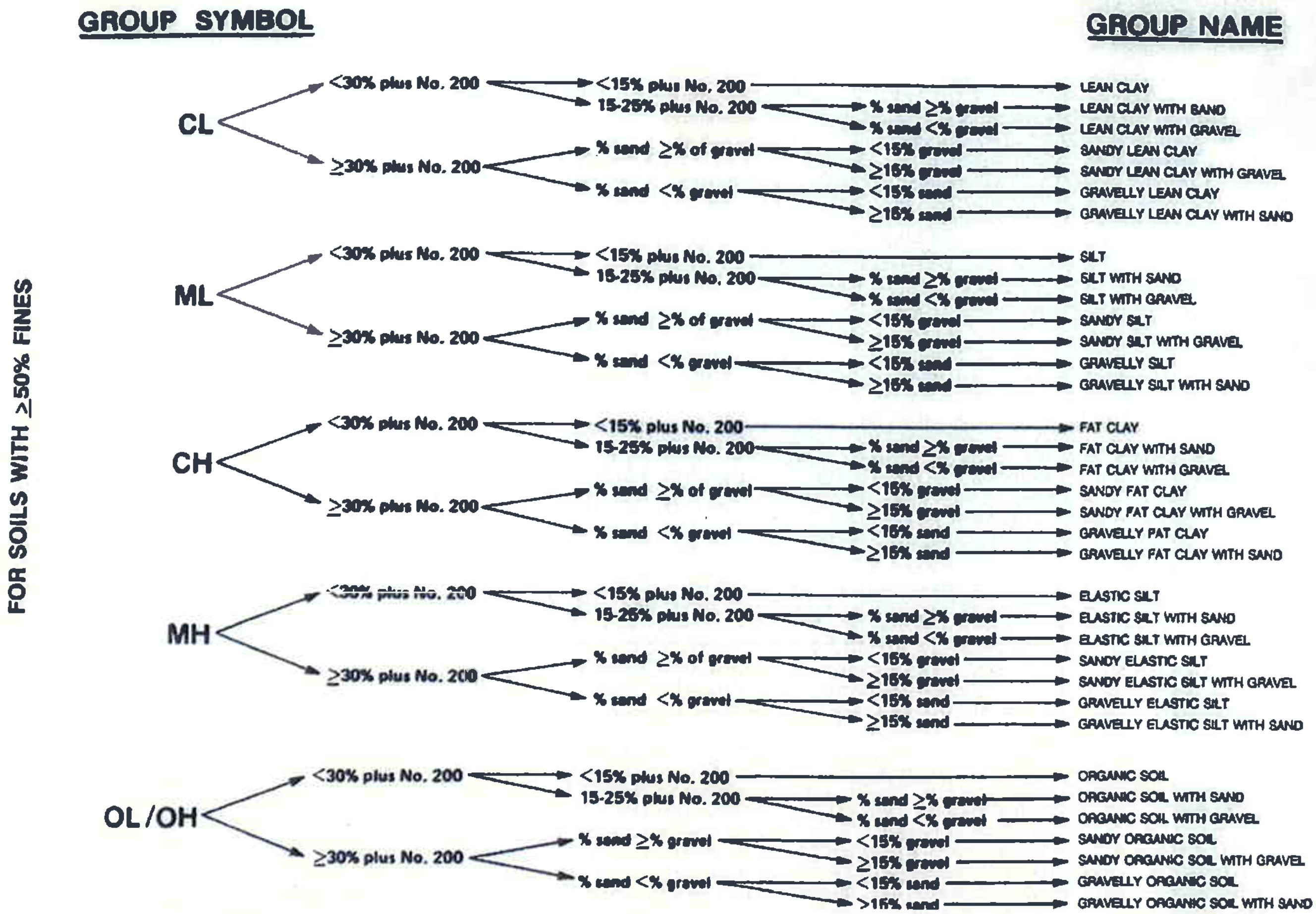




GEI Consultants

FINE GRAINED SOILS

VISUAL-MANUAL DESCRIPTIONS



SOIL DESCRIPTION FORMAT

1. GROUP NAME and SYMBOL
2. Structure; stratified, laminated, fissured, slickensided, blocky, lensed, homogeneous
3. Plasticity
4. Plasticity characteristics (if performed) - dilatancy, dry strength, toughness at PL
5. Percent gravel, sand; size ranges
6. Other - if appropriate - odor, roots, cementation, reaction with HCl, particle shape, moisture condition
7. Color
8. Local or geologic name
9. Field soil strength measurements:
   Q_p = unconfined compressive strength from pocket penetrometer
   S_v = undrained shear strength from torvane

EXAMPLES

1. LEAN CLAY (CL); homogeneous, medium plasticity, occasional small shell fragments, gray, Boston Blue Clay.
2. SANDY SILT (ML); hetergeneous till structure, nonplastic, ~30% fine to coarse, subangular sand; ~10% angular to subangular fine gravel, max. size 88 mm; brown, Glacial Till.
3. ELASTIC SILT WITH GRAVEL (MH); homogeneous, medium plasticity, medium dry strength, no dilantancy, low toughness; ~20% fine gravel, max. size 10 mm; brown, Q_p = 0.70, 0.75 tsf; S_v = 0.35, 0.40, tsf

TABLE 12 Identification of Inorganic Fine-Grained Soils from Manual Tests

Soil Symbol	Dry Strength	Dilatancy	Toughness
ML	None to low	Slow to rapid	Low or thread cannot be formed
CL	Medium to high	None to slow	Medium
MH	Low to medium	None to slow	Low to medium
CH	High to very high	None	High

TABLE 11 Criteria for Describing Plasticity

Description	Criteria
Nonplastic	A ⅛-in. (3-mm) thread cannot be rolled at any water content
Low	The thread can barely be rolled and the lump cannot be formed when drier than the plastic limit
Medium	The thread is easy to roll and not much time is required to reach the plastic limit. The thread cannot be rerolled after reaching the plastic limit. The lump crumbles when drier than the plastic limit
High	It takes considerable time rolling and kneading to reach the plastic limit. The thread can be rerolled several times after reaching the plastic limit. The lump can be formed without crumbling when drier than the plastic limit

TABLE 9 Criteria for Describing Dilatancy

Description	Criteria
None	No visible change in the specimen
Slow	Water appears slowly on the surface of the specimen during shaking and does not disappear or disappears slowly upon squeezing
Rapid	Water appears quickly on the surface of the specimen during shaking and disappears quickly upon squeezing

TABLE 8 Criteria for Describing Dry Strength

Description	Criteria
None	The dry specimen crumbles into powder with mere pressure of handling
Low	The dry specimen crumbles into powder with some finger pressure
Medium	The dry specimen breaks into pieces or crumbles with considerable finger pressure
High	The dry specimen cannot be broken with finger pressure. Specimen will break into pieces between thumb and a hard surface
Very high	The dry specimen cannot be broken between the thumb and a hard surface

TABLE 10 Criteria for Describing Toughness

Description	Criteria
Low	Only slight pressure is required to roll the thread near the plastic limit. The thread and the lump are weak and soft
Medium	Medium pressure is required to roll the thread to near the plastic limit. The thread and the lump have medium stiffness
High	Considerable pressure is required to roll the thread to near the plastic limit. The thread and the lump have very high stiffness

Appendix C

Chain-of-Custody

Chain of Custody Record

STL Connecticut
128 Long Hill Cross Road
Shelton, CT 06484
Tel: 203-929-8140

SEVERN TRENT STL
Severn Trent Laboratories, Inc.

STL-4124 (0901)

Client	Project Manager	Date	Chain of Custody Number 00732
Address	Telephone Number (Area Code)/Fax Number	Lab Number	Page ____ of ____
City / State / Zip Code	Site Contact / Lab Contact	Analysis (Attach list if more space is needed)	Special Instructions/ Conditions of Receipt
Project Name and Location (State)	Carrier/Waybill Number		
Contract/Purchase Order/Quote No.	Matrix / Containers & Preservatives		

Sample I.D. No. and Description (Containers for each sample may be combined on one line)	Date	Time	Air	Aqueous	Sed.	Soil		Unpres.	H2SO4	HNO3	HCl	NaOH	ZnAc/ NaOH														Special Instructions/ Conditions of Receipt

Possible Hazard Identification
☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown

Sample Disposal
☐ Return To Client ☐ Disposal By Lab ☐ Archive For ______ Months (A fee may be assessed if samples are retained longer than 1 month)

Turn Around Time Required
☐ 24 Hours ☐ 48 Hours ☐ 7 Days ☐ 14 Days ☐ 21 Days ☐ Other______

QC Requirements (Specify)

	Date	Time		Date	Time
1. Relinquished By			1. Received By		
2. Relinquished By			2. Received By		
3. Relinquished By			3. Received By		

Comments

DISTRIBUTION: WHITE - Returned to Client with Report; CANARY - Stays with the Sample; PINK - Field Copy

Appendix D

Waste Tracking Form

Monthly Tracking Inventory of Former MGP Site Investigation Derived Waste:

Site Name	Address	Project Start Date(dd/mm/yy)	Project Completion Date(dd/mm/yy)	Profile samples collected(Y/N)	Description of Waste On-site			
					55-gal. Drums	Roll-Offs	Frac Tank	Miscellaneous