Site Characterization Work Plan

Oyster Bay Hortonsphere Site

21 Willow Place
Oyster Bay, New York
ACO Index No. A1-0595-08-07
Site ID: 130183

Submitted to:
KeySpan Corporation
175 East Old Country Road
Hicksville, NY 11801

Submitted by:
GEI Consultants, Inc.
455 Winding Brook Drive
Glastonbury, CT 06033
860-368-5300

December 2007

072710-10-1901

Table of Contents

Abbreviations and Acronyms iii

1. Introduction 1

2. Site Background 3
2.1 Site Location and Description 3
2.2 Site History 3
2.2.1 Hortonsphere Facility History 3
2.2.2 Current Site Conditions 4

3. Summary of Records Search 5
3.1 Records Search 5
3.2 Records of Materials Handling, Storage Processes, and Waste Generation 5
3.3 Possible Subsurface Structures 6

4. Site Geology 7
4.1 Surficial Geology 7

5. Scope of Work 8
5.1 Preliminary Site Visit 8
5.1.1 Utility Clearance 9
5.2 Field Investigation Preparation and Mobilization Activities 9
5.2.1 Site Access 9
5.2.2 Decontamination and Investigation Derived Wastes 9
5.3 Field Investigation Sampling and Analysis 10
5.3.1 Soil Borings 10
5.3.2 Soil Vapor Sampling 11
5.3.3 Surface Soil Sampling 12
5.3.4 Groundwater Monitoring Points 12
5.3.5 Air Monitoring 13
5.3.6 Waste Disposal Sampling 13
5.3.7 Groundwater Sampling 13
5.4 Qualitative Human Health Risk Assessment 14
5.5 Survey and Sample Point Location 14
5.6 Quality Assurance/Quality Control and Data Validation 14

6. SC Report Preparation 16

7. Schedule 17

Tables

1 Summary of the Potential Area Sources of Impact
2 Sample Descriptions, Rationale and Analysis

Figures

1 Site Location Map
2 Proposed Sampling Locations
3 Nearby Land Use

Appendices

A Historical Documents (electronic only)
B Community Air Monitoring Plan
C Field Sampling Plan (electronic only)
D Health and Safety Plan (electronic only)
E Quality Assurance Project Plan (electronic only)

H:\WPROC\Project\KEYSPAN\11 Site Characterizations\OysterBay8-1-07\OysterBay12.21.07revised\SCWP\Oyster Bay_Hortonsphere_SCWP (Revised 12-21-07).doc

Abbreviations and Acronyms

ACGIH	American Conference of Government Industrial Hygienists
ACO	Administrative Order on Consent
BTEX	Benzene, Toluene, Ethylbenzene, Xylene
CAMP	Community Air-Monitoring Plan
CHSS	Corporate Health and Safety Specialist
DER	Division of Environmental Remediation
DNAPL	Dense Non-Aqueous Phase Liquid
EDR	Environmental Data Resources
ELAP	New York State Environmental Laboratory Approval Program
EPA	United States Environmental Protection Agency
FOIL	Freedom of Information Law
FSP	Field Sampling Plan
FWRIA	Fish and Wildlife Resources Impacts Analysis
GEI	GEI Consultants, Inc.
HASP	Health and Safety Plan
IDW	Investigation-derived waste
KeySpan	KeySpan Corporation
LILCO	Long Island Lighting Company
LIPA	Long Island Power Authority
MGP	Manufactured Gas Plant
MS/MSD	Matrix Spike/ Matrix Spike Duplicate
NAPL	Non-aqueous Phase Liquids
NYSASP	New York State Analytical Services Protocols
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
OSHA	Occupational Health & Safety Administration
PID	Photoionization Detector
PAH	Polycyclic Aromatic Hydrocarbons
PCB	Polychlorinated Biphenyl
PM-10	Respiable Particulates
ppm	Parts Per Million
PPE	Personal protective equipment
PRP	Potential responsible party
QAPP	Quality Assurance Project Plan
QA/QC	Quality Assurance/Quality Control
RCRA	Resource Conservation and Recovery Act
RSCOs	Recommended Soil Cleanup Objectives
Sanborn	Sanborn Fire Insurance Map

SC	Site Characterization
SSO	Site Safety Officer
SVOC	Semivolatile Organic Compound
TAL	Target Analyte List
USDOT	United States Department of Transportation
VOC	Volatile Organic Compound

1. Introduction

On behalf of KeySpan Corporation (KeySpan), GEI Consultants, Inc. (GEI) has prepared this Site Characterization (SC) Work Plan for the Oyster Bay Hortonsphere site located at 21 Willow Place in Oyster Bay, Nassau County, New York. Figure 1 shows the location of the Oyster Bay Hortonsphere site.

KeySpan is conducting the site characterization because a predecessor company, the Long Island Lighting Company (LILCO), operated the Hortonsphere to store manufactured and natural gas for use in the surrounding community. The Hortonsphere was dismantled in approximately 1979. Approximately 0.25 percent of the subject property is currently occupied by an electrical substation. The portion of the subject property where the former Hortonsphere was located is currently grass covered vacant land. The former storage of the gas at this facility may have generated waste products including certain volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), metals, and polychlorinated biphenyls (PCBs); which if present, could impact the environment.

KeySpan and the New York State Department of Environmental Conservation (NYSDEC) have entered into an administrative order on consent (ACO) and administrative settlement # A1-0595-08-07 to evaluate environmental conditions at a number of sites in New York City and Long Island.

The site characterization scope of work described in this work plan is intended to collect sufficient data to evaluate the presence, or absence of chemical compounds within soils, soil vapor and groundwater that may be associated with the former Oyster Bay Hortonsphere which was in operation from approximately 1930 to 1979. The SC will also assess whether potential pathways exist through which people, flora, or fauna could be exposed to the contaminants. The work plan has been prepared in accordance with the *NYSDEC Draft Division of Environmental Remediation (DER)-10 Technical Guidance for Site Characterization and Remedial Investigation* dated December 25, 2002.

The purpose of this work plan is to describe the methods and procedures to be implemented in performing a SC of the Oyster Bay Hortonsphere property. This work plan includes a brief site description and brief site history and a proposed scope of work for the site characterization. The SC scope of work includes the following tasks:

- Records Review and Preliminary Site Visit
- Sensitive Receptor Summary
- Preparation of a Field Sampling Plan (FSP), Quality Assurance Project Plan (QAPP) and Site-Specific Health and Safety Plan (HASP)

- Field Investigation Preparation and Mobilization Activities
- Field Investigation Sampling and Analysis
- Quality Assurance/Quality Control (QA/QC) and Data Validation
- SC Report Preparation

Detailed descriptions of each proposed work activity are provided in Section 4 of this Work Plan.

The appendices contain the historical documents (Appendix A), a Community Air Monitoring Plan (CAMP) (Appendix B), a Field Sampling Plan (FSP) (Appendix C), a Health and Safety Plan (HASP) (Appendix D), and a Quality Assurance Project Plan (QAPP) (Appendix E).

2. Site Background

2.1 Site Location and Description

The Oyster Bay Hortonsphere site is located at the east end of Willow Place in Oyster Bay, New York. The site is bounded by privately owned properties, fronting on Willow Place and Walnut Place to the east and West Main Street to the southwest. The former Hortonsphere facility encompassed a small portion of an approximately 2 acre parcel. A portion of the 2 acres is occupied by an electrical substation and vacant property. The site location is depicted on Figure 1. The current site conditions are shown on Figure 2.

2.2 Site History

The site history of the Oyster Bay Hortonsphere site and surrounding area was developed through the review of available Sanborn Fire Insurance (Sanborn) maps, aerial photographs and topographic maps. The Oyster Bay Hortonsphere site contains an electrical substation in the northeast portion of the site and vacant grass covered and wooded land that occupies a significant portion of the subject property. A brief history of the Oyster Bay Hortonsphere facility is provided below. The Sanborn Maps, aerial photographs and topographic maps are included in Appendix A.

2.2.1 Hortonsphere Facility History

The Oyster Bay Hortonsphere was constructed in 1930 and dismantled in 1979, according to historic records. Historically, the Long Island Lighting Company operated a "Transformer Station" on the south central portion of the subject property. Prior to this, the Nassau Power and Light Company operated the hydroelectric DC plant at the same location. In the 1928 Sanborn map, the northeast portion of the site is occupied by the John Titus Machine & Auto Repair Shop and the area east of the location of the Hortonsphere was occupied by a building labeled "Pipe Shop". On the 1922 Sanborn map the area near the location of the Hortonsphere was occupied by a building labeled "Carpenter Shop". In the 1909 and 1915 Sanborn Maps the location of the Hortonsphere portion of the site is occupied by a building labeled "Automobile Repairing". In the 1902 Sanborn map the Hortonsphere portion of the site was occupied by a building labeled Oyster Bay Gas Engine Company. A building located just east of the Hortonsphere location was labeled "Machine Shop". No gas production facilities were present at the site according to Sanborn Map information.

2.2.2 Current Site Conditions

GEI visited the Oyster Bay Hortonsphere site on May 22, 2007. The current site conditions and the surrounding area are shown on Figure 2. The Oyster Bay Hortonsphere site property includes an electrical substation and vacant land. The Oyster Bay Hortonsphere property is partially secured with a chain-link fence. The site is bordered to the south by residential property, West Main Street and then the Mill Pond; to the east by residential property; to the north by Long Island Railroad property; and to the west by residential property. The site is currently owned by the Long Island Power Authority (LIPA).

3. Summary of Records Search

GEI completed a search of environmental records for the Oyster Bay Hortonsphere property as part of the preparation of the SC Work Plan. The purpose of the review was to determine:

- Environmental data and information currently available
- History and description of site including nature of operations
- Types, quantities, physical state, locations, methods and dates of hazardous waste disposal
- Current site security
- Identity of other potential responsible parties (PRPs) for releases of hazardous waste

The records search review was prepared in general accordance with requirements established within the ACO.

3.1 Records Search

The record search for the Oyster Bay Hortonsphere site included the review or evaluation of the following:

- For potential releases on site, GEI reviewed the NYSDEC's on-line Spills Incidents Database Search and the Environmental Remediation Database Search (http://www.dec.ny.gov/chemical/8437.html).
- For environmental data, potential hazardous waste storage, and PRPs, GEI relied upon information from Environmental Data Resources (EDR), a commercially available environmental database search dated April 9, 2007 and available Sanborn maps dating from 1897 until 1964.

The site history, current site conditions and site security are discussed above within Section 2.

3.2 Records of Materials Handling, Storage Processes, and Waste Generation

A search of the NYSDEC spill incidents and environmental site remediation databases was conducted on June 19, 2007. No releases were noted on the subject property. The Oyster Bay Hortonsphere site was not listed in the NYSDEC environmental site remediation database.

No additional environmental records were encountered for the Oyster Bay Hortonsphere site in the Environmental Data Resources (EDR) report.

A number of adjacent and nearby properties with current/historic activities of potential environmental concern were identified within the EDR report and on Sanborn maps. A summary of adjacent and nearby environmental records is provided on Table 1.

GEI will issue a Freedom of Information Law (FOIL) request letter to the NYSDEC to obtain information for the subject property and abutting properties prior to the completion of the site characterization report.

A Holzmacher, McLendon & Murrell, P.C. (H2M) report titled "Environmental Site Assessment" dated November 13, 2002 was reviewed. In addition, an IT Corporation report titled "Environmental Site Assessment Phase I Report" dated March 13, 2000 was discovered, but not reviewed prior to the issuance of this document.

3.3 Possible Subsurface Structures

The former Oyster Bay Hortonsphere was an aboveground, steel, spherical gas storage tank. The Hortonsphere was located on concrete support foundations. The dimensions of the support foundations have not been determined and no evidence of these support foundations was observed during the site inspection in May 2007. No evidence of other storage tanks was discovered on any of the historic maps or photographs or was observed during the site inspection.

No records of possible subsurface structures were identified for the subject property.

4. Site Geology

The site geology has been compiled from existing published information. The site hydrogeology was determined based upon a review of topographic map information. No subsurface investigation has yet been completed; therefore, the following information has not yet been field-verified by GEI personnel.

4.1 Surficial Geology

According to the 1989 *Surficial Geologic Map of New York, Lower Hudson Street*, the subject property is underlain by till. These deposits have variable texture (e.g. clay, silt-clay, boulder clay) and are usually poorly sorted. They are relatively impermeable and have variable clast content, ranging from abundant well-rounded diverse lithologies in valley tills to relatively angular, more limited lithologies in upland tills. These deposits tend to be sandy in areas underlain by gneiss or sandstone and have variable thickness.

4.2 Hydrogeology

Mill Pond is located to the south of the site and Mill Race is abuts the site to the west. Based upon the surrounding topography, groundwater is anticipated to flow to the northwest towards Mill Race.

5. Scope of Work

This scope of work addresses field investigation tasks that will provide a better understanding of potential soil, soil vapor, and groundwater impacts related to the operation of the Oyster Bay Hortonsphere. The type, number and depth of samples were developed based on a preliminary review of historic sources of information such as Sanborn maps, topographic maps, and aerial photograph information. Accordingly, the proposed sampling program includes sampling of subsurface soils, surface soils and groundwater.

Six soil vapor samples have also been included in this scope of work. If during the course of conducting the SC, GEI encounters VOCs or naphthalene, then the potential for vapor intrusion would be assessed. The location, depth, magnitude and possible extent of the impacts relative to overlying or nearby buildings would be used to assess if soil vapor is of concern. If soil vapor is determined to be of potential concern, then GEI, in consultation with KeySpan and the NYSDEC, would take a step-wise approach to assessing the potential for soil vapor intrusion.

If during the course of conducting the SC, GEI encounters impacts to the soils and groundwater the need for a Fish and Wildlife Resources Impact Analyses (FWRIA) would also be evaluated.

The scope of work includes the following tasks.

- Preliminary Site Visit
- Field Investigation Preparation and Mobilization Activities
- Site Utility Survey
- Field Investigation Sampling and Analysis
- Survey and Sample Point Location
- Quality Assurance (QA)/Quality Control (QC) and Data Validation
- SC Report Preparation

Descriptions of each proposed work activity are provided separately below.

5.1 Preliminary Site Visit

GEI has participated in a preliminary site visit to evaluate on-site conditions and evaluate the SC logistics at the Oyster Bay Hortonsphere site. Soil borings will be used to assess the possible presence of subsurface impacts within the area of the former Hortonsphere. The approximate locations of the proposed sampling locations were identified during the preliminary site visit to facilitate the public utility clearance activities. These locations are shown on Figure 2.

5.1.1 Utility Clearance

Proposed sample locations were identified during the preliminary site visit. Once access is secured, each boring will be marked with stakes and/or white paint. The drilling subcontractor will provide the boring locations to the utility clearance organization (New York City and Long Island One Call) to identify potential utility conflicts at the site and with the street right of ways adjacent to the site. Prior to installation, each proposed soil boring and temporary groundwater well location and soil vapor point location will be cleared by a private utility mark-out company or by KeySpan Survey as necessary based upon GEI/KeySpan consultation. Available drawings will be obtained from KeySpan/LIPA to evaluate subsurface facilities prior to commencing the field program.

All sample locations will be cleared by manual means, with air vacuum, or by air knife to a depth of 5 feet, or 1 foot below the estimated depth of any nearby known utility.

5.2 Field Investigation Preparation and Mobilization Activities

Upon receipt of authorization from KeySpan, and receipt of any required private property access agreements as provided by KeySpan, GEI will mobilize to the site to implement the sampling program. The initial field mobilization will include the following items to be completed prior to the commencement of the field SC activities:

- Establish a temporary decontamination area.
- Establish a temporary waste storage area and make arrangements with KeySpan for the removal of investigation-derived wastes (IDW).
- Identify underground utilities.

5.2.1 Site Access

An access agreement was negotiated between KeySpan and LIPA on October 12, 2007.

5.2.2 Decontamination and Investigation Derived Wastes

Drilling equipment will be decontaminated in the vicinity of the sampling rig between each sample in accordance with the FSP in Appendix C. All decontamination equipment will be removed from the site each night. Wastewaters produced during decontamination will be collected and contained within 55-gallon United States Department of Transportation (USDOT) drums. KeySpan will arrange for the disposal of the investigation derived wastes after they have been characterized at the completion of the field program. If requested, GEI will collect a waste characterization sample and have it analyzed for the selected waste disposal facility parameters.

Sampling equipment used for sample collection (e.g., stainless steel split spoons, sample spoons, and hand trowels) will be decontaminated prior to use and reuse or disposable sampling equipment will be used.

Soil cuttings will be minimized through the use of direct-push drilling equipment. Groundwater purged from the groundwater points will be minimized through the use of low-flow purge and sampling techniques. Soil cuttings and purged groundwater will be contained in 55-gallon USDOT drums and will be disposed of by KeySpan.

5.3 Field Investigation Sampling and Analysis

This section discusses the proposed soil boring and temporary groundwater point sampling and analysis activities. Table 2 presents the general rationale and proposed sampling and analysis for the borings and temporary groundwater points. The proposed sample locations are shown on Figure 2. In addition, air monitoring and groundwater sampling procedures to be implemented are discussed. Sampling procedures and methods are detailed within the FSP in Appendix C.

The proposed analyses, analytical methods, and QA/QC samples are discussed under each of the following subsections for soil borings and temporary monitoring point sampling procedures and are also provided within the QAPP in Appendix E. Subsection 4.6 discusses laboratory data deliverables and data validation procedures. If NAPL is encountered during the SC activities, the source of the NAPL will be evaluated and a well will be installed with a 2-foot-deep sump for NAPL collection. If NAPL is encountered, then GEI/KeySpan will notify NYSDEC of the conditions encountered. If NAPL is found, a sample may be submitted for forensics analysis. KeySpan, in consultation with the NYSDEC, will determine if a remedial investigation is required at the property.

5.3.1 Soil Borings

GEI will install the soil borings shown on Figure 2. Table 1 provides sample description, rationale, and analysis. A minimum of four borings, OHS-GP-01 through OHS-GP-04, will be drilled with direct push Geoprobe® drilling methods as described below.

Each soil boring location will be manually cleared to a depth of 5 feet, or 1 foot below the estimated depth of any nearby known utility.

Soil samples will be collected continuously from each boring using 4-foot or 5-foot long MacroCore® samplers equipped with a discrete sampler device (closed-piston sampler). Drilling equipment (rods and macro-core sampler) will be decontaminated in the vicinity of the sampling rig between each sample location. Soil cuttings and decontamination fluids will be collected in 55-gallon USDOT drum and will be disposed of by KeySpan.

Two soil samples will be selected for chemical analysis from each boring. The first sample will be collected from the depth interval indicating the greatest degree of contamination from 0 to approximately 5 feet below grade using a hand auger during utility clearance activities to evaluate subsurface soil conditions for determination of potential exposure pathways at the site. A sample will be collected at the depth interval indicating the greatest degree of contamination to evaluate the magnitude of the observed impacts at each boring. The greatest degree of contamination will be identified by field screening of the borings with a Photoionization Detector (PID), and by visual and olfactory observations. If impacts are observed 10 feet below the groundwater table, the boring will be advanced approximately 10 feet beyond observed visual impacts for the purpose of vertical delineation to a maximum depth of 40 feet. If Dense Non-Aqueous Phase Liquid (DNAPL) is encountered during drilling and well installation activities, a well will be installed with a 2-foot-deep sump for NAPL collection. If no impacts are observed at a particular on-site boring location, the boring will terminate at approximately 10 feet below the observed groundwater table and a soil sample will be obtained for analysis at the apparent groundwater table.

Each sample will be analyzed for VOCs by EPA Method 8260, SVOCs by EPA Method 8270C, target analyte list (TAL) metals by United States Environmental Protection Agency (EPA) 6000/ 7000 series, PCBs and pesticides by EPA Method 8082 and for Herbicides by EPA Method 8151A. Following the collection of subsurface soil samples, each subsurface soil boring will be abandoned by tremmie-grouting, the boring from the bottom of the boring to the top.

Each sampling implement will be decontaminated in accordance with decontamination procedures described in the FSP. QA/QC procedures are detailed within the QAPP located in Appendix E. QA/QC samples will include blind duplicate soil samples, Matrix Spike/Matrix Spike Duplicate (MS/MSD) samples, and equipment rinsate blank samples. The quality control samples will be completed on a frequency of 1/20. An approved New York State Environmental Laboratory Approval Program (ELAP) registered laboratory will perform the analyses. One trip blank will be included per shipment of samples to the laboratory.

5.3.2 Soil Vapor Sampling

Six temporary soil vapor sample points, OHS-SV-01 through OHS-SV-06, will be advanced approximately 5 feet below grade at locations chosen during the preliminary site visit. The sampling tube will be sealed with a 2-inch layer of bentonite paste. To ensure that the sampling tube is sealed from the ambient air aboveground, GEI will utilize helium as a tracer gas as described in the State of New York Department of Health Soil Vapor Intrusion Guidance document. The samples will be collected in SUMMA canisters and shipped to an approved New York State ELAP registered laboratory for analyses. The sample will be analyzed for VOCs and naphthalene by the modified EPA Method TO-15 (including naphthalene).

5.3.3 Surface Soil Sampling

Surface soil samples will be collected at locations shown on Figure 2. Table 1 provides sample description, rationale, and analysis. A minimum of six surface soil samples, OHS-SS-01 through OHS-SS-06, will be collected with a stainless steel trowel from 0 to 2 inches below grade. In grass covered areas, the sod will be removed prior to sampling and replaced upon completion of sampling activities.

Sampling equipment (stainless steel trowel or spoon) will be decontaminated in the vicinity of the sample location.

Each of the six surface soil samples will be analyzed for VOCs by EPA Method 8260, SVOCs by EPA Method 8270C, TAL metals by EPA 6000/ 7000 series, PCBs and pesticides by EPA Method 8082 and for herbicides by EPA Method 8151A.

Each sampling implement will be decontaminated in accordance with decontamination procedures described in the FSP. QA/QC procedures are detailed within the QAPP located in Appendix E. QA/QC samples will include blind duplicate soil samples, MS/MSD samples, and equipment rinsate blank samples. The quality control samples will be completed on a frequency of 1/20. An approved New York State ELAP registered laboratory will perform the analyses. One equipment blank will be included per shipment of samples to the laboratory.

5.3.4 Groundwater Monitoring Points

Four temporary Geoprobe ® groundwater monitoring points, OHS-GW-01through OHS-GW-04, will be installed in OHSW-GP-01 through OHS-GP-04 respectively. Each monitoring point will be installed in general accordance with procedures described below and within the FSP (Appendix C).

Each temporary monitoring well will be installed into apparent groundwater table. Each well will consist of a small diameter polyvinyl chloride (PVC) 0.010″ slotted screen and PVC riser to the ground surface. The wells will be installed, and the sand pack and bentonite seal emplaced through 3-inch diameter casing. A groundwater sample will be collected from the water table.

If impacts are encountered at the water table, then one additional groundwater probe sample will be collected to evaluate site-related impacts below the water table. At the temporary groundwater sampling point location, the groundwater will be collected utilizing a Geoprobe® groundwater sampler with stainless steel screen. The groundwater sampler will be driven to the targeted groundwater depth based upon observations within adjacent borings. Once at the desired depth a groundwater sample will be collected.

The temporary sampling point will be surveyed for location and elevation.

5.3.5 Air Monitoring

A CAMP will be implemented at the site during each phase of the intrusive field activities. The objective of the CAMP is to ensure through monitoring that unacceptable levels of VOCs or dust potentially generated as part of the investigation do not migrate beyond the work zone. Air will be monitored upwind and downwind of each intrusive work area (i.e., boring locations). VOCs and respirable particulates (PM-10) will be monitored upwind and downwind on a continuous basis. Wind direction will be determined using a wind sock(s) and/or flagging poles installed on site. In addition, VOCs, particulates, and cyanide will be monitored in the work zone using hand held equipment. For interior drilling, CAMP units will be set up immediately adjacent to the work zone.

VOC vapors will be monitored using a PID. Particulate dust will be monitored using a Mini-ram particulate meter. In addition, work zone air monitoring will be completed in accordance with the HASP. The monitoring equipment for health and safety monitoring are described in the QAPP in Appendix E. The equipment will be calibrated at least daily or in accordance with manufacturers' recommendations. The proposed CAMP is presented in Appendix B, and additional monitoring details are included in the HASP in Appendix D.

5.3.6 Waste Disposal Sampling

KeySpan will arrange for the disposal of the investigation derived wastes at the completion of the field program.

KeySpan/GEI will obtain a waste profile sample of soil and fluid investigation derived wastes to characterize the wastes to determine the appropriate disposal options available. A sample will be collected from each of the investigation-derived wastes that require analysis for disposal. Samples will be collected into laboratory-preserved bottles, chilled with ice and submitted to the laboratory under chain of custody as described in the FSP and QAPP. Each disposal sample media will be sampled for parameters to meet the requirements of the approved disposal facilities. A list of potential disposal parameters is provided in the QAPP.

5.3.7 Groundwater Sampling

Groundwater samples will be collected from the four temporary monitoring points, OHS-GW-01 through OHS-GW-04 (Figure 2). GEI will utilize the EPA approved low flow method to sample the groundwater. Groundwater samples will be collected and analyzed for VOCs, SVOCs, TAL metals, PCBs, pesticides and herbicides. Upon completion of the groundwater sampling, the temporary wells will be properly abandoned. The PVC will be removed from the borehole and the borehole tremmie grouted to grade.

QA/QC procedures are detailed within the QAPP located in Appendix E. QA/QC samples will include one blind duplicate groundwater sample, a MS/MSD sample, and an equipment rinsate

blank sample. An approved New York State ELAP laboratory will perform the analyses. One trip blank will be included per shipment of samples to the laboratory.

5.4 Qualitative Human Health Risk Assessment

In accordance with direction provided by NYSDEC, a qualitative human health risk assessment will be prepared. This assessment will generally follow the guidelines provided in the *New York State Department of Health Qualitative Human Health Exposure Assessment* (Appendix 3B to NYSDEC's December 2002 *Draft DER-10 Technical Guidance for Site Investigation and Remediation*). In general, the assessment will identify the exposure setting, identify exposure pathways, and will evaluate the fate and transport of the contaminants. The assessment will include text discussions, tables, and graphics depicting the potential exposure pathways. The characterization will include all environmental data gathered pertaining to the SC. The qualitative assessment will identify potential risks for specific potential receptors based on complete pathways of exposure to contaminant levels exceeding default "screening criteria," such as the NYSDEC-recommended soil cleanup objectives (RSCOs) and drinking water standards. The assessment will be used to render an opinion as to whether potential complete exposure pathway(s) and/or risk exist for potential receptors.

5.5 Survey and Sample Point Location

Following completion of the planned field work, soil borings, temporary groundwater points, and soil vapor points will be surveyed by a New York State Licensed Land Surveyor. The elevation of each temporary groundwater point will be determined to ±0.01 foot and will be tied into the site benchmark. All locations and elevations will be tied to the New York State Plane Coordinate System.

5.6 Quality Assurance/Quality Control and Data Validation

An approved New York State ELAP laboratory will provide New York State Category B data deliverables. The data will be validated in accordance with New York State Analytical Service Protocols (NYSASP) protocols. The data validator will prepare a data usability report summarizing the adequacy of the analytical data obtained from the laboratory and discussing any pertinent data excursions or limitations on the use of the data. The data usability report will be used in preparing the SC report, and will be submitted as part of the SC report. The QAPP is located in Appendix E.

Through the use of standardized sample collection and decontamination procedures, the quality of the samples during field collection can be assured. The data validation process will ensure that the data collected and reported by the laboratory are of sufficient quality that management decisions regarding the degree and extent of potential impacts can be reliably made. The data validation will evaluate whether the required quantification limit has been achieved for each

sample analyzed, and will evaluate the precision, accuracy, and completeness of the data. The data validator will use the duplicate samples, the MS/MSD samples, the trip blanks, and the equipment rinsate blank samples, as well as laboratory calibration blanks, spikes, and other standards to assess the quality of the data obtained. Any deviations from the required level of sample quality will be called out in the data usability reports prepared by the data validator and these deviations will be taken into consideration when using the data to explain site conditions.

6. SC Report Preparation

GEI will prepare a SC report for submittal to NYSDEC and New York State Department of Health (NYSDOH) for the Oyster Bay Hortonsphere site. The report will present the findings of the SC. The report will identify specific contaminant concentrations throughout each media (e.g., soil, groundwater, soil vapor, etc.), which is necessary to assess whether any media require remediation or further evaluation. The reports will also incorporate the findings of the Qualitative Human Health Risk Assessment.

Key components of the SC report will include:

- An executive summary
- Description of SC activities
- Discussion of site geology
- Summary of analytical compounds in soil, soil vapor, and groundwater
- Identification of NAPL, if any
- Identification of historic structures and any associated waste source areas
- Comparison of site soil, soil vapor and groundwater analytical data to NYSDEC standards and NYSDOH guidelines
- Identification of areas that exceed the soil, soil vapor and groundwater standards
- Conceptual site model
- Boring logs and monitoring well construction details
- Site photographs
- Conclusions and recommendations

7. Schedule

It is anticipated that, pending vendor availability and property access, the Oyster Bay Hortonsphere field program can commence upon authorization by KeySpan and receipt of all access agreements necessary to implement the work scope. KeySpan anticipates that the sampling program can be completed in approximately two to three days of fieldwork, depending on weather, approval of this work plan, and property access. A detailed schedule will be established prior to commencing SC activities. KeySpan will notify NYSDEC five working days prior to the anticipated start date of the site characterization program.

Tables

Table 1
Oyster Bay Hortonsphere Site
Oyster Bay, New York

Parcel I.D. No.	Company Name [Location]	Facility Operations (years)	Environmental Records Information
On Site			
1	Oyster Bay Gas Engine Company	Manufacturing (1902)	None
2	Automobile Repairing	Automobile repair (1909-1915)	None
2	John Titus Moulding Mill, Machine Shop, Auto Repair Shop	Manufacturing, automobile repair (1902-1928)	None
Abutting Properties			
3	Nassau Steam Laundry/ Modern Laundry	Commercial, chemical use (1922-1928)	None
Properties within One Block			
4	Commander Terminal	Fuel Terminal	**NYSDEC Spill #0306342: 15 gallons gasoline released from a truck to a concrete pad.**
4	Commender Oil Corporation	Fuel Terminal	**NYSDEC Spill #9710179: 20 gallon No. 2 fuel oil over fill from a truck to the concrete pad. LTank, SQG, NY Manifests.**
5	Jacobson Shipyard Inc.	Ship Yard	**SQG, LTanks, NY Manifests.** **NYSDEC Spill #9312943: 1,000-gallon tank removal. Oil floating on the water in the tank grave.** **NYSDEC Spill #9925395: An unknown green liquid spilled from a crushed drum.** **NYSDEC Spill #9200501: Gasolin UST removal revealed impacted soil and groundwater.**
6	Barbera Residence	Residential Property	**NYSDEC Spill #9510400: No. 2 fuel oil release from a loose oil line fitting.**

Notes:
LTANK - Leaking storage tank.
UST - Underground storage tank.

Table 2
Sample Descriptions, Rationale and Analysis
Oyster Bay Hortonsphere Facility
Oyster Bay, New York

Sample I.D.	Sample Location	Sample Rationale	Sample Depth	Number of Samples			VOCs (EPA 8260B)	SVOCs (EPA 8270C)	TAL Metals (6000/7000)	Sulfide (EPA 376.1)	Sulfate (EPA 300)	Herbicides (EPA 8151A)	PCBs/ Pesticides (EPA 8082)	VOCs (Expanded) (Modified TO-15)
				Soil	Soil Vapor	Groundwater								
Subsurface Soil Borings and Temporary Groundwater Monitoring Point														
OHS-GP-01/ OHS-GW-01	Western central portion of the property (west of the former location of Hortonsphere)	Soil boring and temporary groundwater sample to provide soil and groundwater information in the area west of the former Hortonsphere.	Between 0&5' and depth at greatest suspected impact	2	0	1	X	X	X	X	X	X	X	
OHS-GP-02/ OHS-GW-02	Western central portion of the property (eastern portion of the former Hortonsphere)	Soil boring and temporary groundwater sample to provide soil and groundwater information in the eastern portion of the former Hortonsphere.	Between 0&5' and depth at greatest suspected impact	2	0	1	X	X	X	X	X	X	X	
OHS-GP-03/ OHS-GW-03	Southeastern central portion of the property	Soil boring and temporary groundwater sampling point to provide soil and groundwater information between the former Hortonsphere and nearest residences.	Between 0&5' and depth at greatest suspected impact	2	0	1	X	X	X	X	X	X	X	
OHS-GP-04/ OHS-GW-04	Eastern central portion of the property	Soil boring and temporary groundwater sampling point to provide soil and groundwater information between the former Hortonsphere and nearest residences.	Between 0&5' and depth at greatest suspected impact	2	0	1	X	X	X	X	X	X	X	
Surface Soil Sample Locations														
OHS-SS-01	Located within a grassed area at the west central portion of the property	Soil sample to evaluate surface soil conditions where the Hortonsphere was located.	0-2"	1	0	0	X	X	X	X	X	X	X	
OHS-SS-02	Located within a grassed area at the west central portion of the property	Soil sample to evaluate surface soil conditions where the Hortonsphere was located.	0-2"	1	0	0	X	X	X	X	X	X	X	
OHS-SS-03	Located within a grassed area at the location of the former Hortonsphere out building.	Soil sample to evaluate surface soil conditions at the location of the former Hortonsphere out building.	0-2"	1	0	0	X	X	X	X	X	X	X	

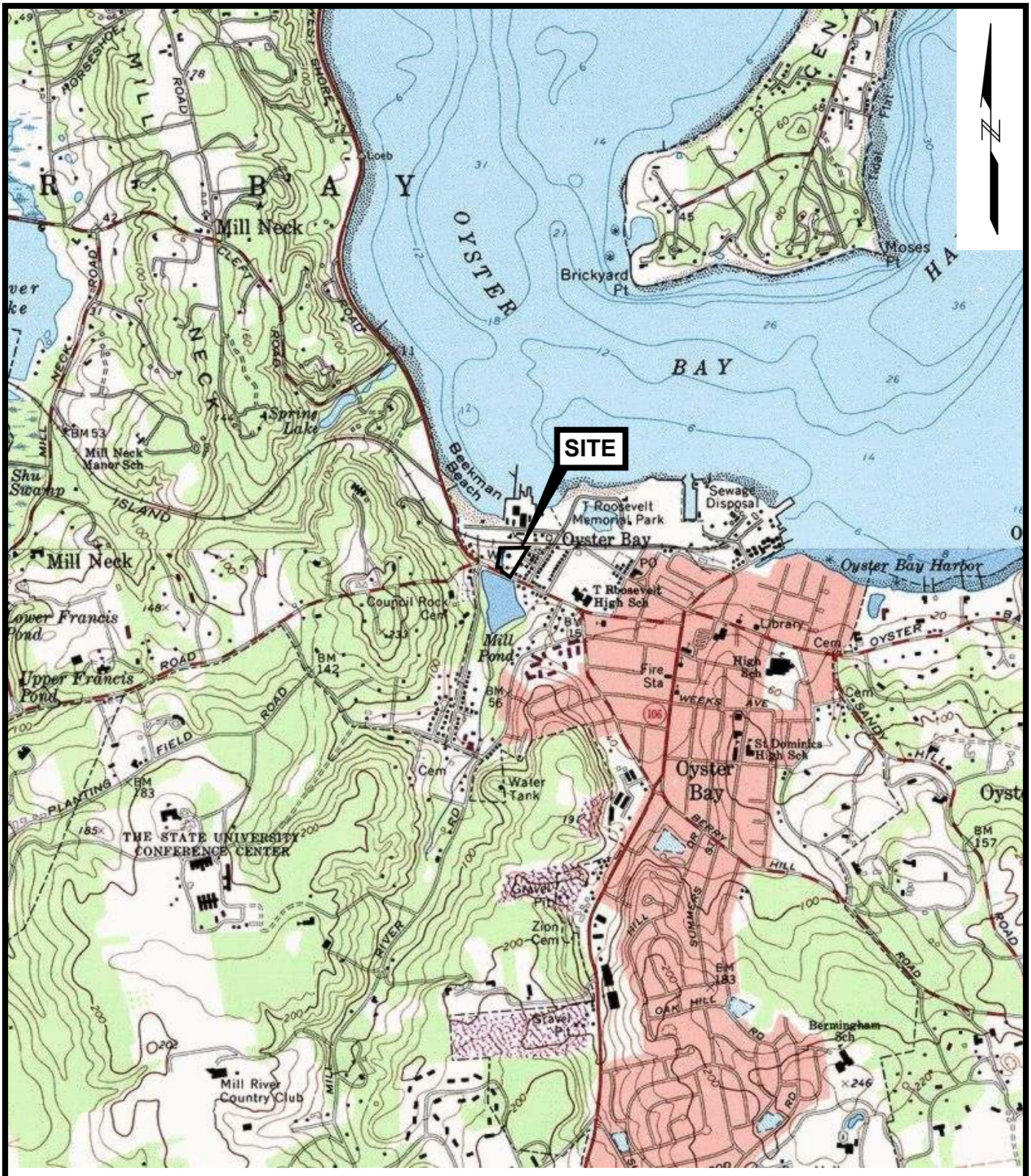
Table 2
Sample Descriptions, Rationale and Analysis
Oyster Bay Hortonsphere Facility
Oyster Bay, New York

Sample I.D.	Sample Location	Sample Rationale	Sample Depth	Number of Samples			VOCs (EPA 8260B)	SVOCs (EPA 8270C)	TAL Metals (6000/7000)	Sulfide (EPA 376.1)	Sulfate (EPA 300)	Herbicides (EPA 8151A)	PCBs/ Pesticides (EPA 8082)	VOCs (Expanded) (Modified TO-15)
				Soil	Soil Vapor	Groundwater								
OHS-SS-04	Southeastern property boundary adjacent to the neighboring residence	Surface soil sample to evaluate surface soil conditions adjacent to the neighboring residence	0-2"	1	0	0	X	X	X	X	X	X	X	
OHS-SS-05	Eastern property boundary adjacent to the neighboring residence	Surface soil sample to evaluate surface soil conditions adjacent to the neighboring residence	0-2"	1	0	0	X	X	X	X	X	X	X	
OHS-SS-06	South central portion of the boundary in the area of the former transformer yard.	Surface soil sample to evaluate surface soil conditions adjacent to neighboring residence	0-2"	1	0	0	X	X	X	X	X	X	X	
Soil Vapor Sample Locations														
OHS-SV-01	Western central portion of the property	Soil vapor sample to screen the soil conditions at the location of the former Hortonsphere.	Approximately 5 feet below grade	0	1	0								X
OHS-SV-02	Western central portion of the property	Soil vapor sample to screen the soil conditions at the location of the former Hortonsphere out building.	Approximately 5 feet below grade	0	1	0								X
OHS-SV-03	Eastern boundary of the property	Soil vapor sample to screen the soil conditions adjacent to the abutting residence.	Approximately 5 feet below grade	0	1	0								X
OHS-SV-04	Eastern boundary of the property	Soil vapor sample to screen the soil conditions adjacent to the abutting residence.	Approximately 5 feet below grade	0	1	0								X
OHS-SV-05	Southeastern boundary of the property	Soil vapor sample to screen the soil conditions adjacent to the abutting residence.	Approximately 5 feet below grade	0	1	0								X
OHS-SV-06	Northeastern boundary of the property	Soil vapor sample to screen the soil conditions adjacent to the abutting residence.	Approximately 5 feet below grade	0	1	0								X

Notes:
Chemical analysis test methods specified are from U.S. EPA SW-846 test methods
EPA TO-15 analysis will include VOCs and naphthalene
EPA stands for the Environmental Protection Agency
VOC stands for volatile organic compounds
SVOC stands for semi-volatile organic compounds
RCRA stands for Resource Conservation Recovery Act
PCBs stands for Polychlorinated Biphenyls

Prepared by: LEW

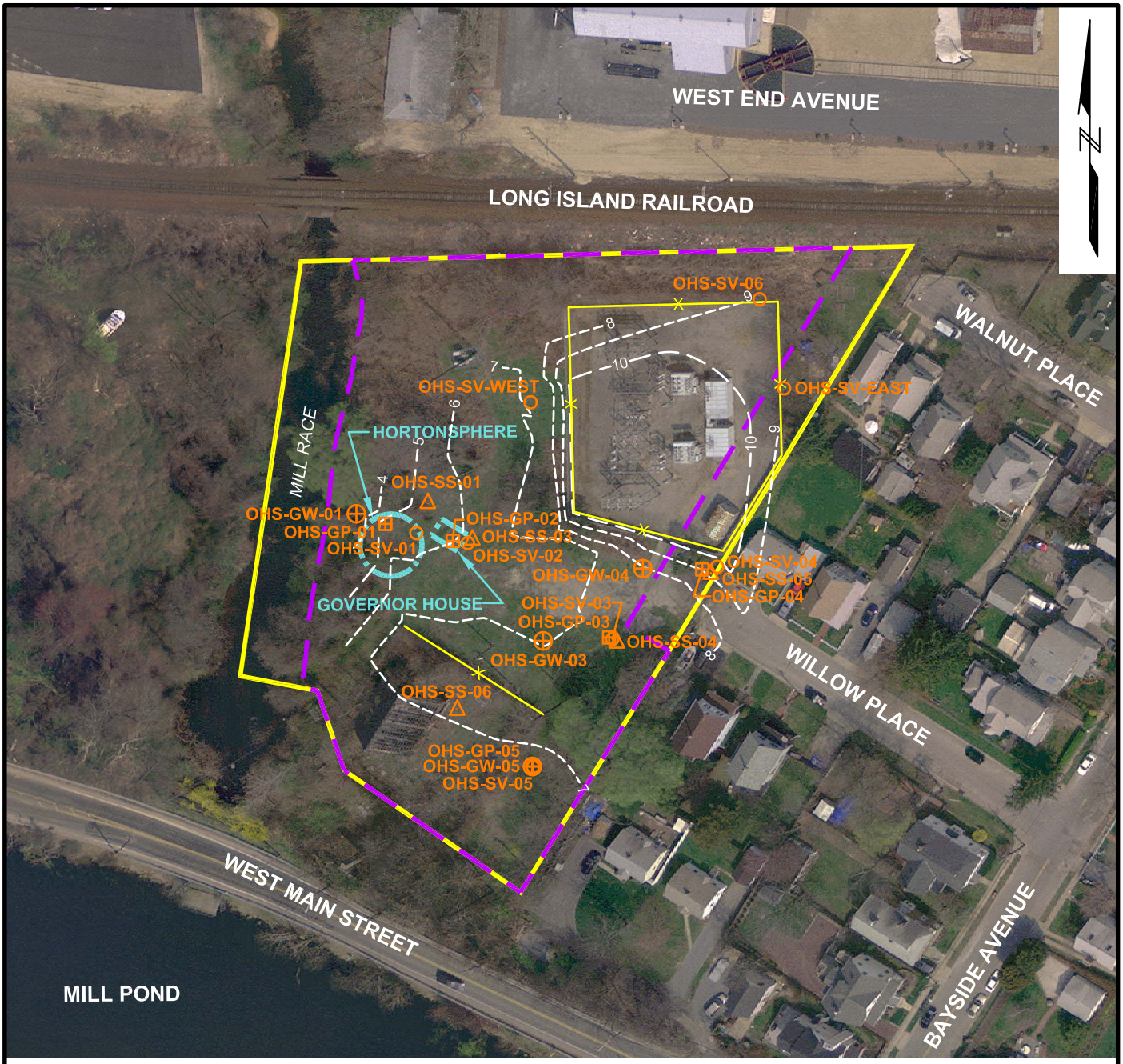
Figures



SOURCE: Map created with TOPO! ® ©2001 National Geographic (www.nationalgeographic.com/topo)

SITE CHARACTERIZATION WORK PLAN OYSTER BAY FORMER HORTONSPHERE SITE OYSTER BAY, NEW YORK	GEI Consultants	**SITE LOCATION MAP**
KEYSPAN CORPORATION	Project 072710-10-1901	December 2007 Figure 1

KEYSPAN\SITE CHARACTERIZATIONS\OYSTER BAY-LOCATION MAP.CDR



LEGEND:

PROPERTY BOUNDARY (APPROXIMATE)

HISTORIC PROPERTY BOUNDARY

HISTORIC STRUCTURE LOCATION

OHS-GP-01 ⊞ GEOPROBE® BORING LOCATION LOCATION

OHS-GW-01 ⊕ TEMPORARY GROUNDWATER SAMPLING LOCATION

OHS-SV-01 ○ SOIL VAPOR SAMPLE LOCATION

OHS-SS-01 △ SURFACE SOIL SAMPLE LOCATION

SOURCE:

1. Aerial photograph obtained from: New York state interactive mapping gateway, http://www1.nysgis.state.ny.us/, accessed on December 12, 2007.
2. *Land and Tax Map, Sec. 27, Blk. 29,* Nassau County Department of Assessment, Sheet 1 of 1, Revised date: February 11, 2003, Scale: 1" = 50', map obtained from: http://www.nassaucountyny.gov.
3. 1941 Sanborn Fire Insurance Map.

0 100 200

APPROXIMATE SCALE, FEET

SITE CHARACTERIZATION WORK PLAN
OYSTER BAY FORMER HORTONSPHERE SITE
OYSTER BAY, NEW YORK

KEYSPAN CORPORATION

GEI Consultants

Project 072710-10-1901

PROPOSED SAMPLE LOCATIONS

December 2007 Figure 2

I:\GEI\KEYSPAN\Oyster Bay Hortonsphere\ OysterBay-Surveyed Samples.dwg \Dec 17, 2007

LEGEND

- APPROXIMATE FORMER SITE BOUNDARY
- APPROXIMATE CURRENT PROPERTY BOUNDARY

RECENT REGULATORY RECORDS

- RCRA (TSDF, CORRACTS), CERCLIS, VCP, LANDFILL, DISPOSAL SITE
- RCRA (LQG, SQG)
- MAJOR OIL OR CHEMICAL STORAGE
- MINOR OIL STORAGE
- SPILLS, TRIS

HISTORIC LAND USE

- COAL YARD/LUMBER YARD
- ASPHALT PLANT/COAL TAR PRODUCT CO.
- MANUFACTURING AND COMMERCIAL
- OIL/PETROCHEMICAL
- CHEMICAL/PAINT/FERTILIZER/PLASTIC
- MULTIPLE

NOTE:
SEE TABLE 1 FOR INFORMATION ABOUT THESE SITES.

SOURCE:

NOTE: NOT TO SCALE

SITE CHARACTERIZATION WORK PLAN
OYSTER BAY FORMER HORTONSPHERE SITE
OYSTER BAY, NEW YORK

KEYSPAN CORPORATION

GEI Consultants

Project 072710-10-1901

NEARBY LAND USE

November 2007 Figure 3

Appendix A

Historical Documents (electronic only)

Appendix B

Community Air Monitoring Plan

Modified Community Air Monitoring Plan
Oyster Bay Hortonsphere

In accordance with NYSDEC and NYSDOH requirements for a CAMP, a perimeter air-monitoring plan will be implemented at the site during each phase of the field activities. The objective of the perimeter air-monitoring plan is to provide a measure of protection for the downwind community (i.e., off-site receptors, including residences and businesses and on-site workers not involved with the site field activities) from potential airborne contaminant releases as a direct result of field activities. The perimeter air-monitoring plan is a stand-alone document and will be available on site. The VOC Monitoring, Response Levels, and Actions are presented as follows.

Air Monitoring Response Levels and Actions

VOCs	
Response Level	**Actions**
>5 parts per million (ppm) above background for 15-minute average	▪ Temporarily halt work activities ▪ Continue monitoring ▪ If VOC levels decrease (per instantaneous readings) below 5 ppm over background, work activities can resume
Persistent levels >5 ppm over background <25 ppm	▪ Halt work activities ▪ Identify source of vapors ▪ Corrective action to abate emissions ▪ Continue monitoring ▪ Resume work activities if VOC levels 200 feet downwind of the property boundary or half the distance to the nearest potential receptor is <5 ppm for a 15-minute average ▪ If VOC levels are >25 ppm at the perimeter of the work area, activities must be shutdown
	Particulate
>100 mcg/m3 above background for 15-minute average or visual dust observed leaving the site	▪ Apply dust suppression ▪ Continue monitoring ▪ Continue work if downwind PM-10 particulate levels are <150 mcg/m3 above upwind levels and no visual dust leaving site
>150 mcg/m3 above background for 15-minute average	▪ Stop work ▪ Re-evaluate activities ▪ Continue monitoring ▪ Continue work if downwind PM-10 particulate levels are <150 mcg/m3 above upwind levels and no visual dust leaving site

Sources:
New York State Department of Health Community Air Monitoring Plan, June 20, 2000.
New York State Department of Environmental Conservation Division Technical and Administrative Guidance Memorandum - Fugitive Dust Suppression and Particulate Monitoring Program at Inactive Hazardous Waste Sites, October 27, 1989.

During drilling and materials handling operations, the air in work areas will also be sampled periodically for the presence of contaminants. A PID will be utilized to periodically monitor the

levels of organic vapors in the ambient air and a Mini RAM™ PM-10 (or equivalent) particle detector will be used to count inhalable particles (0.1-10 micrometer range) of dust during the fieldwork. PID and Mini RAM readings will be taken hourly during excavation or more frequently if air quality measurements approach action levels as defined herein. Measurements will be monitored from the breathing zone (4 to 5 feet above ground level) at worker locations to determine working conditions (and whether there is a need to change levels of worker protection).

In addition to VOCs and particulates, cyanide will be monitored in the work zone and at the perimeter of the work area. The cyanide monitoring methods will be determined prior to mobilization, but at a minimum, will include Draeger® tube sampling.

In order to make a conservative assessment of when different levels of respiratory protection are needed during the fieldwork, it will be assumed that the organic vapors detected by the air monitoring instruments consist of the most toxic volatile compounds expected to be found on the site. Preliminary evaluation of the risks expected at the site indicates that the most toxic volatiles that are probably present are VOCs (particularly Benzene, Toluene, Ethylbenzene, Xylene BTEX). Based on data published by the Occupational Safety and Health Administration (OSHA) and the American Conference of Government Industrial Hygienists (ACGIH), and GEI's experience with Manufactured Gas Plant (MGP) wastes, the following personal protective equipment (PPE) will be employed when the given concentrations of organic vapor are detected in the breathing zone.

Compound of Concern	Level D	Level C	Level B
Chemical Name	M<X	X<M<Y	M>Y
BTEX and other photoionizable VOCs	M <5 ppm	5 ppm <M <50 ppm	M >50 ppm
Where: M = concentration of organic vapor measured in the field X,Y = concentrations at which different levels of respiratory protection are necessary.			

The PPE requirements may be modified based on compound-specific monitoring results information, with the written approval of the Corporate Health and Safety Specialist (CHSS).

Respiratory protection from dusts will be required when inhalable particulate concentrations from potentially contaminated sources exceed 150 $\mu g/m^3$.

Odors or dusts derived from site contaminants may cause nausea in some site workers, even though the contaminants are at levels well below the safety limits as defined above. Workers may use dust masks or respirators to mitigate nuisance odors with the approval of the Site Safety Officer (SSO). Whenever practical, work areas should be positioned upwind of organic vapor and dust sources to reduce the potential for worker exposure.

Appendix C

Field Sampling Plan (electronic only)

Appendix D

Health and Safety Plan (electronic only)

Appendix E

Quality Assurance Project Plan (electronic only)

Field Sampling Plan

Oyster Bay Hortonsphere Site

Oyster Bay, New York
ACO Index No. A1-0595-08-07
Site #:

Submitted to:
KeySpan Corporation
One MetroTech Center
Brooklyn, NY 11201-3850

Submitted by:
GEI Consultants, Inc.
455 Winding Brook Drive
Glastonbury, CT 06033
860-368-5300

December 2007

072710-10-1901

GEI Consultants

Table of Contents

Abbreviations and Acronyms iii

1. Purpose 1
1.1 Introduction 1

2. General Field Procedures 2
2.1 Utility Clearance Procedure 2
2.2 Field Notebook Procedure 2
2.3 Daily Activity Report Procedure 5
2.4 Field Boring Data Logging 6

3. Subsurface Soil Sample Collection Procedure 8
3.1 Sampling Methods 8
3.2 Sample Interferences 8
3.3 Equipment/Apparatus 9
3.4 Subsurface Soil Sample Procedure 9
3.4.1 General Procedures 9
3.4.2 Direct Push Geoprobe® Procedures 10
3.4.3 Rotary Hollow Stem Auger Procedures 10
3.4.4 Rotosonic Procedures 11

4. Soil Description Procedure 12
4.1 Description Method 12
4.2 Sample Interferences 12
4.3 Equipment/Apparatus 12
4.4 Soil Sample Description Procedure 13
4.5 Soil Screening Procedure 15
4.6 Air Monitoring Procedure 16
4.7 Quality Assurance/Quality Control 16
4.8 Sample Labeling Procedure 17

5. Monitoring Well Installation and Development 18
5.1 Monitoring Well Specifications 18
5.2 Monitoring Well Development 19

6. Groundwater Sampling Procedure 20

7. Soil Vapor Sampling Procedure 22

8. Equipment Decontamination Procedure 26
8.1 Equipment/Apparatus 26
8.2 Equipment Decontamination Procedure 26
8.2.1 Sampling Equipment and Tools 26
8.2.2 Drill Rig Decontamination 27
8.3 Quality Assurance/Quality Control 27

9. Analytical Sample Handling and Transport 29

10. Investigation-Derived Waste Handling Procedure 30
10.1 General Waste Handling Procedures 30
10.2 Investigation Derived Waste Sample Collection Procedure 30

Appendices

A Daily Activity Report
B Visual-Manual Description Standards
C Chain-of-Custody
D Waste Tracking Form

Abbreviations and Acronyms

ASTM	American Society for Testing and Materials
COC	Chain Of Custody
DNAPL	Dense Non-Aqueous Phase Liquid
DO	Dissolved Oxygen
ELAP	Environmental Laboratory Approval Program
EPA	Environmental Protection Agency
FID	Flame Ionization Detector
FSP	Field Sampling Plan
GEI	GEI Consultants, Inc.
HASP	Health and Safety Plan
ID	Identification
KeySpan	KeySpan Corporation
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
NYSDOH	New York State Department of Health
PDA	Personal Data Assistant
PID	Photo Ionization Detector
PM	Project Manager
PPE	Personal Protection Equipment
PVC	Polyvinyl Chloride
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
QC	Quality Control
SOP	Standard Operating Procedures
SVOC	Semivolatile Organic Compound
VOC	Volatile Organic Compound
USDOT	United States Department of Transportation

1. Purpose

1.1 Introduction

GEI Consultants, Inc. (GEI) has prepared this Draft Field Sampling Plan (FSP) to address the Site Characterization of the Oyster Bay Hortonsphere Site located in Oyster Bay, New York. The FSP is a companion document to the *Oyster Bay Hortonsphere Site Characterization Work Plan* dated November 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 Oyster Bay Hortonsphere Site Characterization.

A quality assurance project plan (QAPP) dated November 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 number and names of the utility operators that will be notified by the New York City and Long Island One Call Center. 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 daily 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 bore hole 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

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

2. 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
- 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 Oyster Bay Hortonsphere 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-Identification (ID) (SAMPLE DEPTH-FEET)	SAMPLE-ID – [DATE]
OHS-SS-01 (0-0.2)	OHS-SS-FB-033107
Boring -ID (SAMPLE DEPTH-FEET)	OHS-GP-FB-033107
OHS-GP-01 (10-15)	OHS-MW-FB-033107
GROUNDWATER SAMPLES	OHS-GW-FB-033107
Monitoring Well-ID	**MATRIX SPIKE/DUP**
OHS-MW-01	SAMPLE [ID] [DEPTH] [EITHER Matrix Spike (MS) OR Matrix Spike Duplicate (MSD)]
Temporary Groundwater Monitoring Point-ID (SAMPLE DEPTH-FEET)	OHS-SS-01 (10-15) MS/MSD
OHS-GW-01 (10-14)	OHS-GP-01 (10-15) MS/MSD
SOIL VAPOR SAMPLES	OHS-MW-01 (10-15) MS/MSD
Soil Vapor-ID	OHS-GW-01 (10-15) MS/MSD
OHS-SV-01	**TRIP BLANKS**
	SAMPLE- ID [DATE]
	OHS-TB-063007
	BLIND DUPLICATES
	SAMPLE -ID[XX][DATE]
	OHS-SS-XX-063007
	OHS-GP-XX-063007
	OHS-MW-XX-063007
	OHS-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

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

2. 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, 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 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. Where appropriate a bentonite pellet seal or 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 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 dissolved oxygen (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.

7.1.2 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 (10 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 (COC) 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 COC form will be included in the shipping packaging, as directed by the laboratory. A copy of the COC 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.

7.1.3 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 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
- 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 and stored in temporary 5-gallon buckets for off-site disposal.

8.3 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 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 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

10.1General Waste Handling Procedures

The following procedure provides guidelines for the management of investigation derived wastes. Wastes anticipated to be generated as part of the Oyster Bay Hortonsphere 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 COC 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 (electronic only)

DAILY ACTIVITY REPORT

DATE:	**GEI Personnel:**	
PROJECT: East Hampton Gasoline Vaporization Site	**KeySpan Personnel:**	
GEI PROJECT NO.:	**Other Personnel:**	
SITE LOCATION:49 Buell Lane, East Hampton, NY	**NYSDEC Personnel:**	
	Site Visitors:	

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

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

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

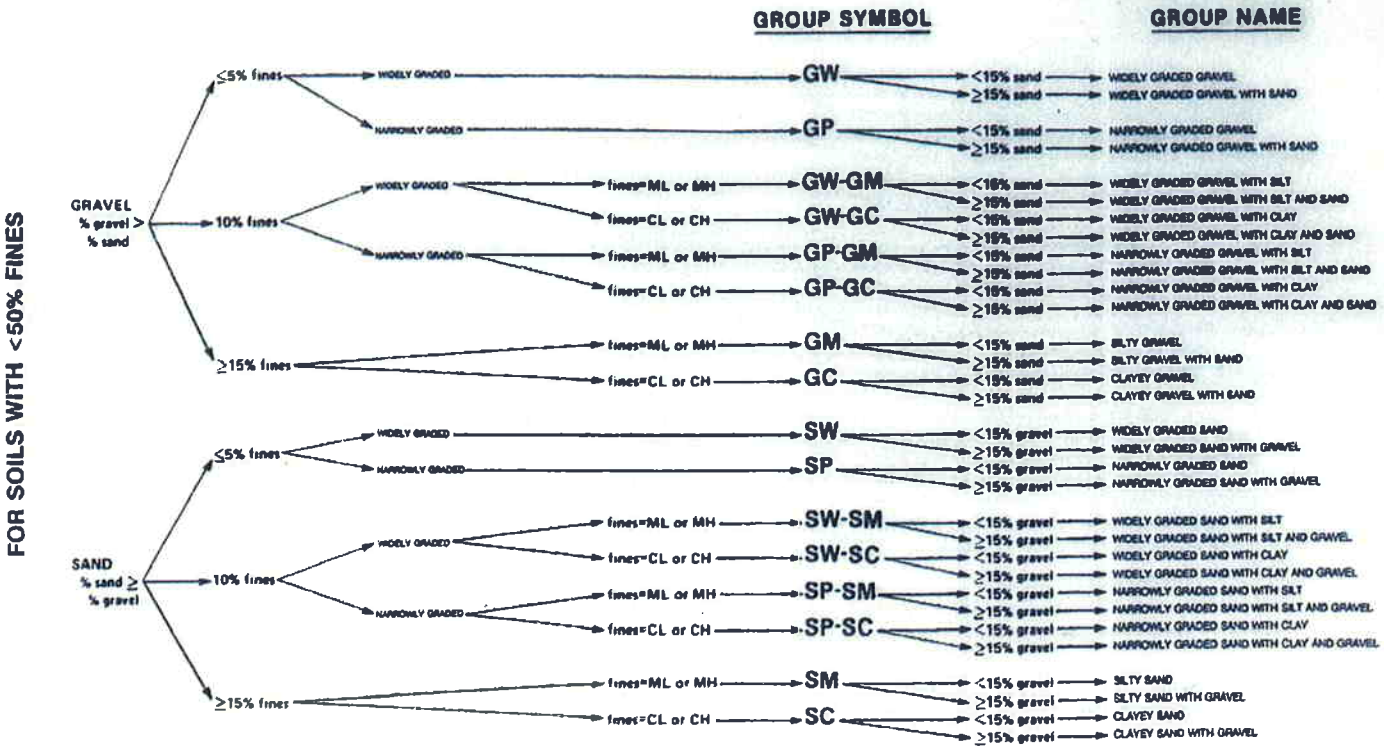
Appendix B

Visual-Manual Description Standards (electronic only)

GEI Consultants

COARSE GRAINED SOILS

VISUAL-MANUAL DESCRIPTIONS

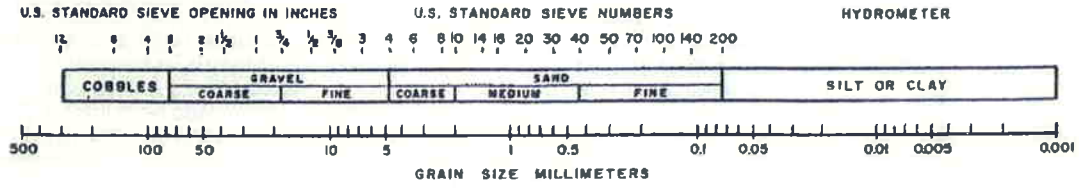


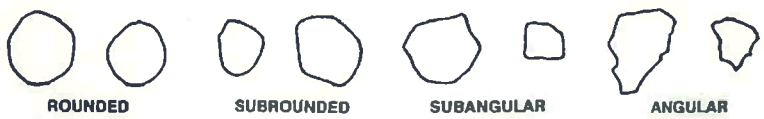
SOIL DESCRIPTION FORMAT

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.





TYPICAL SOIL COLORS

YELLOW
OLIVE
LIGHT BROWN
BROWN
REDDISH BROWN
RED
GRAY
BLACK

STANDARD\GEOLOGY_SOIL_CHARTS.DWG

GEI Consultants

FINE GRAINED SOILS
VISUAL-MANUAL DESCRIPTIONS

FOR SOILS WITH ≥50% FINES

GROUP SYMBOL				GROUP NAME
CL	<30% plus No. 200	<15% plus No. 200		LEAN CLAY
		15-25% plus No. 200	% sand ≥% gravel	LEAN CLAY WITH SAND
			% sand <% gravel	LEAN CLAY WITH GRAVEL
	≥30% plus No. 200	% sand ≥% of gravel	<15% gravel	SANDY LEAN CLAY
			≥15% gravel	SANDY LEAN CLAY WITH GRAVEL
		% sand <% gravel	<15% sand	GRAVELLY LEAN CLAY
			≥15% sand	GRAVELLY LEAN CLAY WITH SAND
ML	<30% plus No. 200	<15% plus No. 200		SILT
		15-25% plus No. 200	% sand ≥% gravel	SILT WITH SAND
			% sand <% gravel	SILT WITH GRAVEL
	≥30% plus No. 200	% sand ≥% of gravel	<15% gravel	SANDY SILT
			≥15% gravel	SANDY SILT WITH GRAVEL
		% sand <% gravel	<15% sand	GRAVELLY SILT
			≥15% sand	GRAVELLY SILT WITH SAND
CH	<30% plus No. 200	<15% plus No. 200		FAT CLAY
		15-25% plus No. 200	% sand ≥% gravel	FAT CLAY WITH SAND
			% sand <% gravel	FAT CLAY WITH GRAVEL
	≥30% plus No. 200	% sand ≥% of gravel	<15% gravel	SANDY FAT CLAY
			≥15% gravel	SANDY FAT CLAY WITH GRAVEL
		% sand <% gravel	<15% sand	GRAVELLY FAT CLAY
			≥15% sand	GRAVELLY FAT CLAY WITH SAND
MH	<30% plus No. 200	<15% plus No. 200		ELASTIC SILT
		15-25% plus No. 200	% sand ≥% gravel	ELASTIC SILT WITH SAND
			% sand <% gravel	ELASTIC SILT WITH GRAVEL
	≥30% plus No. 200	% sand ≥% of gravel	<15% gravel	SANDY ELASTIC SILT
			≥15% gravel	SANDY ELASTIC SILT WITH GRAVEL
		% sand <% gravel	<15% sand	GRAVELLY ELASTIC SILT
			≥15% sand	GRAVELLY ELASTIC SILT WITH SAND
OL/OH	<30% plus No. 200	<15% plus No. 200		ORGANIC SOIL
		15-25% plus No. 200	% sand ≥% gravel	ORGANIC SOIL WITH SAND
			% sand <% gravel	ORGANIC SOIL WITH GRAVEL
	≥30% plus No. 200	% sand ≥% gravel	<15% gravel	SANDY ORGANIC SOIL
			≥15% gravel	SANDY ORGANIC SOIL WITH GRAVEL
		% sand <% gravel	<15% sand	GRAVELLY ORGANIC SOIL
			>15% sand	GRAVELLY ORGANIC SOIL WITH SAND

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 (electronic only)

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	
Project Name and Location (State)	Carrier/Waybill Number		
Contract/Purchase Order/Quote No.			

Sample I.D. No. and Description (Containers for each sample may be combined on one line)	Date	Time	Matrix: Air	Aqueous	Sed.	Soil		Containers & Preservatives: Unpres.	H2SO4	HNO3	HCl	NaOH	ZnAc/ NaOH		Analysis (Attach list if more space is needed)	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)

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

Comments

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

Appendix D

Waste Tracking Form (electronic only)

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

HEALTH AND SAFETY PLAN (HASP)

Site:	**OYSTER BAY HORTONPHSERE SITE**
Location:	**OYSTER BAY, NEW YORK**
Date Prepared:	**December 21, 2007**
Revision:	**0**
Project Description:	**SURFACE SOIL/ SUBSURFACE SOIL SAMPLING, GROUNDWATER SAMPLING, SOIL VAPOR SAMPLING**

Potential Waste types:	Possible dense non-aqueous phase liquid (DNAPL) tar, tar-impacted soil, groundwater,
Characteristics:	Volatile Compounds, Toxic
Unusual Site Features:	The Oyster Bay Hortonsphere site is currently a vacant ornamental lawn abutting a church and a residence.
Status:	A vacant site in a residential neighborhood.
Background Review:	Limited Site Records Review.
Overall Hazard:	Low

KEYSPAN CORPORATION, KEYSPAN CORPORATION CONTRACTORS AND SUBCONTRACTORS DO NOT GUARANTEE THE HEALTH OR SAFETY OF ANY PERSON ENTERING THIS SITE. DUE TO THE NATURE OF THIS SITE AND THE ACTIVITY THAT OCCURRED THEREON, IT IS NOT POSSIBLE TO DISCOVER, EVALUATE, AND PROVIDE PROTECTION FOR ALL POSSIBLE HAZARDS THAT MAY BE ENCOUNTERED. STRICT ADHERENCE TO THE HEALTH AND SAFETY GUIDELINES SET FORTH HEREIN WILL REDUCE, BUT NOT ELIMINATE, THE POTENTIAL FOR INJURY AT THIS SITE. THE HEALTH AND SAFETY GUIDANCE IN THIS PLAN WAS PREPARED TO SERVE AS AN EXAMPLE TO POTENTIAL CONTRACTORS AND SUBCONTRACTORS THAT MAY WORK AT THIS SITE AND SHOULD NOT BE USED ON ANY SPECIFIC PROJECT WITHOUT PRIOR RESEARCH AND EVALUATION BY TRAINED HEALTH AND SAFETY SPECIALISTS.

CONTRACTOR CERTIFICATIONS

By their signature, the undersigned hereby certify that this HASP has been reviewed and approved for use at the KeySpan Corporation (KeySpan) Oyster Bay Hortonsphere site located in Oyster Bay, New York.

PROJECT MANAGER	DATE
SITE SAFETY OFFICER	DATE
CORPORATE ENVIRONMENTAL AND SAFETY MANAGER	DATE

Health and Safety Plan
Oyster Bay Hortonsphere Facility
Site Characterization
Oyster Bay, New York

TABLE OF CONTENTS

1.0 INTRODUCTION 1
1.1 Purpose 1
1.2 Scope of Work 1
2.0 PROJECT ORGANIZATION AND RESPONSIBILTIES 2
2.1 KeySpan 2
2.2 Consultant 2
2.3 Contractor 3
3.0 SITE HISTORY AND PROJECT DESCRIPTION 6
3.1 Location 6
3.2 Site History and Current Site Conditions 6
3.2.1 Oyster Bay Hortonsphere Site History 6
3.2.2 Post Hortonsphere facility History 6
3.2.3 Current Site Conditions 6
3.3 Project Description 7
4.0 POTENTIAL SITE HAZARDS 8
4.1 Chemical Hazards 8
4.1.1 Volatile Organic Compounds (VOCs) 8
4.1.2 Coal Tar and Oil Products 9
4.1.3 Heavy Metals 9
4.1.4 Asbestos-Containing Materials 10
4.1.5 Polychlorinated Biphenyls 10
4.1.6 Hydrogen Sulfide 10
4.1.7 Evaluation of Organic Vapor Exposure 11
4.1.8 Evaluation of Respirable Dust Inhalation 16
4.1.9 Evaluation of Skin Contact and Absorption 16
4.1.10 Other Chemical Hazards 16
4.2 Physical Hazards 17
4.2.1 High Loss Potential Physical Hazards 17
4.2.2 Line Breaking 20
4.2.3 Fire and Explosion 20
4.2.4 Cold Stress 20
4.2.5 Heat Stress 20
4.2.6 Noise 21
4.2.7 Hand and Power Tools 21
4.2.8 Slips, Trips, and Falls 21
4.2.9 Manual Lifting 21
4.2.10 Steam, Heat, Splashing 21
4.3 Biological Hazards 22
4.3.1 Animals 22
4.3.2 Insects 22

4.3.3 Plants 24
4.3.4 Blood Poisoning 24
4.4 Hazard Analysis 25
5.0 TRAINING 27
5.1 General Health and Safety Training 27
5.2 Annual Eight-Hour Refresher Training 27
5.3 Supervisor Training 27
5.4 Site Safety Officer (SSO) 27
5.5 Site-Specific Training 27
5.6 On-Site Safety Briefings 28
5.7 First Aid and CPR 28
5.8 Hazard Communication 28
6.0 PERSONAL PROTECTIVE EQUIPMENT 29
6.1 PPE Abbreviations and Selection 30
7.0 MEDICAL SURVEILLANCE 32
7.1 Medical Surveillance Requirements 32
8.0 MONITORING 33
9.0 SITE CONTROL MEASURES 35
9.1 Site Zones 35
9.2 Communications 35
10.0 DECONTAMINATION 37
10.1 Minimization of Contact with Contaminants 37
10.2 Personnel Decontamination 37
10.3 Emergency Decontamination 37
10.4 Hand Held Equipment Decontamination 38
10.5 Heavy Equipment Decontamination 38
11.0 EMERGENCY RESPONSE PLAN 39
11.1 Pre-emergency Planning 39
11.2 Roles and Responsibilities 39
11.2.1 Corporate Environmental and Safety Manager (CESM) 39
11.2.2 Site Safety Officer (SSO) 39
11.2.3 Site Personnel 40
11.3 Evacuation Routes and Procedures 40
11.4 Contingency Plans 40
11.4.1 Fire Prevention and Protection 40
11.4.2 Overt Chemical Exposure 41
11.4.3 Decontamination during Medical Emergencies 41
11.4.4 Adverse Weather Conditions 42
11.4.5 Spill Control and Response 42
11.6 Emergency Equipment 44
11.7 Postings 45
11.8 Restoration and Salvage 45
12.0 LOGS, REPORTS, AND RECORD KEEPING 46
12.1 Medical and Training Records 46

12.2 On-Site Log 46
12.3 Exposure Records 46
12.4 Accident/Incident Reports 46
12.5 OSHA Form 300 46
12.6 Hazard Communication Program/MSDS 46
12.7 Work Permits 46
13.0 FIELD PERSONNEL REVIEW 47

LIST OF APPENDICES

Appendix A – Organizational Structure/Contact Information
Appendix B – Site-Specific Information
Appendix C – Project Specific Activity Hazard Analysis
Appendix D – Hazard Communications Program
Appendix E – Cold Stress Program
Appendix F – Heat Stress Program
Appendix G – Personal Protective Equipment (PPE) Program
Appendix H – Lock Out / Tag Out Program
Appendix I – Confined Space / Hot Work Permitting Procedure
Appendix J – Incident Reporting
Appendix K - Addendum

1.0 INTRODUCTION

1.1 Purpose

This Health and Safety Plan (HASP) addresses the health and safety practices that will be employed by workers participating in investigation activities at the Oyster Bay Hortonsphere site (Site) that are under the direction of the Consultant. This work will be performed on behalf of KeySpan Corporation (KeySpan) at the Site located in Oyster Bay, New York. The HASP takes into account the specific hazards inherent to the Site, and presents procedures to be followed by the Consultant, Contractor, Subcontractor(s), and all site visitors in order to avoid and if necessary, protect against health and/or safety hazards.

Activities performed under this HASP will comply with applicable parts of OSHA Regulations, primarily 29 CFR Parts 1910 and 1926 and attached KeySpan policies and procedures. A copy this HASP will be maintained at the Site for the duration of work.

All workers who may participate in activities at the Site are required to comply with the provisions specified in this HASP. All site visitors who enter designated work zones must also comply with this HASP. Refusal or failure to comply with the HASP or violation of any safety procedures by field personnel and/or subcontractors performing work covered by this HASP may result in immediate removal from the Site following consultation with the Contractor.

1.2 Scope of Work

This HASP addresses all general activities listed below:

Preliminary Site Visit
- Evaluate Site Logistics

Pre-Investigation Activities
- Location of all utilities to and from the Site
- Location and protection of all active utility lines on site

Investigation Activities
- Subsurface soil boring installation and sample collection
- Monitoring well and temporary groundwater monitoring point installation and sample collection
- Air monitoring
- Investigation-derived waste handling and storage activities

2.0 PROJECT ORGANIZATION AND RESPONSIBILTIES

This section includes the project organization and structure, and establishes the specific chain-of-command for responsibilities and communications. The organizational structure shall be reviewed and updated as necessary to reflect the current status of project operations.

2.1 KeySpan

KeySpan will have final responsibility and authority for all aspects of the project, and is also responsible for approving all changes to this HASP.

A KeySpan project-specific organization chart with contact information is included in Appendix A.

2.2 Consultant

Consultant provides general health and safety oversight as KeySpan's Agent. The Consultant also conducts perimeter air monitoring and work zone monitoring for Consultant employees. The Consultant will monitor daily operations and will serve as the Contractor's primary point of contact with KeySpan and regulatory agencies for health-and-safety related matters. Consultant health-and-safety roles for this project include:

- Project Manager
- Site Safety Officer
- Corporate Environmental Safety Manager

The Consultant's health-and-safety roles and responsibilities are structured the same as the Contractors. Details of these roles are presented below in Section 2.3.

Task	**Consultant**
General Health-and-Safety Oversight of The Oyster Bay Hortonsphere Site Characterization Work Plan:	GEI Consultants, Inc. 455 Winding Brook Drive, Suite 201 Glastonbury, CT 06033 (860) 368-5396 KeySpan Program Manger: David Terry

A Consultant project-specific organization chart with contact information is included in Appendix A.

2.3 Contractor

Contractor is responsible for all work detailed in the project work plan and/or Contractor Statement of Work. The Contractor is also responsible for the health and safety of Contractor and Subcontractor employees, and conducts work zone monitoring for Contractor and Subcontractor workers. Specific Contractor health and safety roles include:

Project Manager – responsibilities include the following:

- Ensures implementation of this program
- Conducts periodic inspections
- Participates in incident investigations
- Ensures the HASP has all of the required approvals before any site work is conducted
- Ensures that the Site Safety Officer is informed of project changes which require modifications of the site health and safety plan
- Has overall project responsibility for Project Health and Safety.

Site Safety Officer (SSO) – responsibilities include the following:

- Ensures that the HASP is implemented and that all health-and-safety activities identified in site safety plans are conducted and/or implemented
- Ensures that field work conducted safely and enforces site health and safety rules
- Ensures that adequate communication between field crews and emergency response personnel is maintained
- Ensures that field site personnel are medically cleared and adequately trained and qualified to work at the Site and that proper personal protective equipment is utilized by field teams
- Investigate and report all accidents/incidents to the PM and to the Corporate Environmental and Safety Manager (CESM)
- Conducts and documents daily safety briefings
- Stops work if necessary
- Identifies operational changes which require modifications to health-and-safety procedures and site safety plans, and ensures that the procedure modifications are implemented and documented through changes to the HASP, with CESM approval
- Directs and coordinates health-and-safety monitoring activities
- Evaluates air monitoring data relative to site and activity-specific action levels
- Ensures that monitoring instruments are calibrated
- Reports to the CESM to provide summaries of field operations and progress

- Conducts routine safety inspections of their work areas
- Conducts incident investigations and together with the CESM, prepares appropriate reports (i.e., OSHA 300 Report)
- Maintains files on all personal monitoring results, laboratory reports, calculations, and air sampling data sheets
- Ensure that all necessary information including emergency phone numbers, hospital directions, and warning signs are kept posted in an area accessible to all site employees
- Maintain a daily list of workers and visitors present on the Site.

Corporate Environmental and Safety Manager (CESM) – responsibilities include the following:

- Provides for the development and approval of the HASP
- Serves as the primary contact to review health and safety matters that may arise
- Approves revised or new safety protocols for field operations
- Coordinates revisions of this HASP with field personnel
- Coordinates upgrading or downgrading of personal protective equipment with the SSO
- Maintains a copy of fit test certification, documents of medical clearance, and exposure reports from site activities.
- Assists in the investigation of all accidents/incidents.

Site Personnel – responsibilities include the following:

- Reports any unsafe or potentially hazardous conditions to the SSO
- Maintains knowledge of the information, instructions and emergency response actions contained in the HASP
- Complies with rules, regulations and procedures as set forth in the HASP and any revisions
- Prevents admittance to work sites by unauthorized personnel
- Inspect all tools and equipment, including personal protective equipment (PPE), prior to use.

The following Contractors have been selected for the implementation of the Oyster Bay Hortonsphere Site Characterization Work Plan.

Task	**Contractor**
Field Management and Implementation of The Oyster Bay Hortonsphere Site Characterization Work Plan:	GEI Consultants, Inc. 455 Winding Brook Drive, Suite 201 Glastonbury, CT 06033 (860) 368-5396 KeySpan Program Manger: David Terry

Proposed Drilling Subsurface Soil Borings and Monitoring Well Installation	Aquifer Drilling and Testing Contact: Dennis Mayer 150 Nassau Terminal Road New Hyde, New York Tel. 800-238-3745

A Contractor project-specific organization chart with contact information is included in Appendix A. Changes or modifications of Contractor roles listed above are located in Appendix K.

3.0 SITE HISTORY AND PROJECT DESCRIPTION

3.1 Location

The Oyster Bay Hortonsphere site is located in a residential section of Oyster Bay, New York. Figure 1 in Appendix B shows the location of the Site. A West Main Street and then Mill Pond abuts the subject property to the south, wooded vacant land abuts the subject property to the west, Long Island Rail Road tracks, then West End Avenue and then Theodore Roosevelt Memorial Park abut the subject property to the north, and several residential properties abut the subject property to the east. Figure 2 depicts the Oyster Bay Hortonsphere site and surrounding conditions. (Appendix B).

3.2 Site History and Current Site Conditions

The site history of the Oyster Bay Hortonsphere site and surrounding area was developed through the review of available Sanborn Fire Insurance (Sanborn) Maps, aerial photographs, and city directories.

3.2.1 Oyster Bay Hortonsphere Site History

The Oyster Bay Horotonsphere was constructed prior to 1941, according to property information records. The subject property was operated by the Oyster Bay Electric Light and Power Company from prior to 1897 until at least 1909. By 1915 the site was operated by the Nassau Light and Power Company and by 1964 it was operated by Long Island Lighting Company according to Sanborn maps. No gas production facilities were present at the site according to Sanborn Map information. The location of the Hortonsphere is shown on Figure 2. The site is currently partially occupied by an electric substation (northeast portion of the site), the wood building (former transformer facility), and partially vacant wooded and grass covered land.

3.2.2 Post Hortonsphere facility History

The Hortonsphere and associated out building are not shown on the 1980 aerial photograph. The Site is shown on the 1980 photograph as partially occupied by an electric substation, a wood building (south end of site), and partially vacant wooded and grass covered land as it is today.

3.2.3 Current Site Conditions

GEI visited the former Oyster Bay Hortonsphere site on May 22, 2007. The footprint of the former Hortonsphere site location includes a single roughly square parcel (Figure 2, Appendix B). The site is currently occupied by an electrical substation, a vacant wood building, and is wooded and grass covered. There is a fence partially securing the property. The site conditions are shown on a recent aerial photograph on Figure 2 in Appendix B.

3.3 Project Description

KeySpan has retained GEI Consultants, Inc. (GEI) and other contractors specified in Section 2 of the HASP to perform a Site Characterization program at the Oyster Bay Hortonsphere Site in a residential neighborhood in Oyster Bay , New York. This Site Characterization was prepared to investigate the potential impacts to the Site from the operation of the Hortonsphere.

The purpose of the Site Characterization program is to evaluate the presence or absence of chemical compounds within soils and groundwater that may be associated with the operation of the Oyster Bay Hortonsphere and will also evaluate if human health or the fish and wildlife resources are or may be exposed to any identified impacts.

The scope of the Site Characterization sampling program is presented in the Oyster Bay Hortonsphere Site Characterization Work Plan dated June 2007. A summary of the site characterization will include the following tasks:

- Site Mobilization
- Site Utility Survey
- Subsurface Soil Boring Installation and Soil Sample Collection
- Surface Soil Sample Collection
- Soil Vapor Boring and Sample Collection
- Temporary Groundwater Monitoring Point Installation and Groundwater Sample Collection
- Survey

Zebra Environmental or other selected contractor will utilize a Geoprobe® direct-push drilling rig to sample subsurface soils and install temporary groundwater monitoring points and soil vapor points. The surface soil samples will be installed by hand with a stainless steel hand trowel or hand auger. Soil borings, soil vapor points and temporary groundwater monitoring points will be located within the area of the former Hortonsphere on the subject property.

4.0 POTENTIAL SITE HAZARDS

This section presents an assessment of potential chemical, physical, and biological hazards that may be encountered during the project work. This section also includes an activity hazard analysis (AHA) to assess and control potential site hazards for each general project task. A more detailed Contractor Project specific AHA is included in Appendix C, which addresses the health and safety hazards of each specific project task or operation and includes requirements and procedures for worker protection. The following appendices include information on additional programs, which will be used to mitigate potential hazards:

Appendix D – Hazard Communication Program
Appendix E – Cold Stress Program
Appendix F – Heat Stress Program
Appendix G – Personal Protective Equipment Program
Appendix H – Lock Out / Tag Out Program
Appendix I – Confined Space / Hot Work Permitting Procedure
Appendix J – Incident Reporting
Appendix K – Addendum

4.1 Chemical Hazards

The characteristics of compounds that may be encountered at the Site are discussed below in the following subsections for informational purposes. Adherence to the safety and health guidelines in this HASP should reduce the potential for exposure to the compounds discussed below. Chemical characteristics and potential exposure information for the compounds that may be encountered during site activities are presented in Table 4-1 below. Material safety data sheets (MSDS) for commonly used compounds and compounds that may be encountered during the site characterization activities are located in Appendix K.

4.1.1 Volatile Organic Compounds (VOCs)

Volatile organic chemicals (VOCs), such as benzene, toluene, ethyl benzene, and xylene (BTEX) are potentially present within subsurface soils and groundwater at the Site because of its former use for manufactured gasoline vapors. In some cases, the chemical components may be present in non-aqueous phase liquids (NAPL) such as fuels, oils, or tar within subsurface soils at the Site. These compounds generally have a depressant effect on the central nervous system (CNS), may cause chronic liver and kidney damage, and some are suspected human carcinogens. Benzene is a known human carcinogen. Acute exposure may include headache, dizziness, nausea, and skin and eye irritation. The primary route of exposure to VOCs is through inhalation and therefore air monitoring and respiratory protection is the primary control against exposure to VOCs. Air monitoring will be completed as specified in Section 8.0 to minimize airborne

exposures. Community air monitoring of the area immediately surrounding the work zone will be completed in accordance with the SC Work Plan and Appendix K of this HASP. Exposure through direct contact is possible and will be minimized through the use of PPE as prescribed in Section 6.0.

4.1.2 Coal Tar and Oil Products

Coal tar and petroleum products contain semi-volatile organic compounds (SVOCs). SVOCs consist of a mixture of acenaphthene, acenaphthylene, anthracene, benz(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, benzo(e)pyrene, benzo(g,h,i)perylene, chrysene, dibenz(a,h)anthracene, fluoranthene, fluorene, indeno(1,2,3-cd)pyrene, 2-methyl naphthalene, naphthalene, phenanthrene, phenols, pyrene and other compounds.

Coal tar products, petroleum products, and other SVOCs are potentially present within subsurface soils and groundwater at the site. Coal tar products within subsurface soils may have been associated with the former gas storage. Petroleum products within subsurface soils could be associated with commercial/ manufacturing activities.

Coal tar products such as those listed above may cause contact dermatitis. Direct contact can be irritating to the skin and produce itching, burning, swelling and redness. Direct contact or exposure to the vapors may be irritating to the eyes. Conjunctivitis may result from prolonged exposure. Coal tar is considered to be very toxic, if ingested. High levels of exposure to coal tar, though not anticipated during work activities conducted during this project, may increase the risk of cancer including lung, kidney, and skin cancer. Naphthalene is also an eye and skin irritant and can cause nausea, headache, fever anemia, liver damage, vomiting convulsions, and coma. Poisoning may occur by ingestion of large doses, inhalation, or skin absorption.

The major route of exposure of SVOCs during work activities to be conducted at this Site is through direct contact. Exposure is most likely when handling soil, and groundwater samples. Exposure through direct contact is possible and will be minimized through the use of PPE as prescribed in Section 6.0. Inhalation of SVOCs may occur when the soil is disturbed causing respirable and nuisance dust particles to become airborne or through the volatilization of naphthalene. Air monitoring will be completed as specified in Section 8.0 to minimize airborne exposures. Community air monitoring of the area immediately surrounding the work zone will be completed in accordance with the SC Work Plan and Appendix K of this HASP.

4.1.3 Heavy Metals

The subsurface soil may contain elevated levels of metals including: arsenic, beryllium, cadmium, chromium, copper, lead, mercury, nickel, selenium, thallium, and zinc.

As with SVOCs, the primary route of metal exposure is through inhalation of dust particles when subsurface soils are disturbed and become airborne. Air monitoring will be completed as specified in Section 8.0 to minimize airborne exposures during subsurface soil investigations. Community air monitoring of the area immediately surrounding the work zone will be completed in accordance with the SC Work Plan and Appendix K of this HASP.

4.1.4 Asbestos-Containing Materials

Asbestos containing materials (ACM) can be present at investigation sites in the form of demolition debris, ACM pipe insulation, and asbestos cement pipe. Chronic exposure to asbestos may cause asbestosis and mesothelioma. The primary route of exposure for asbestos is inhalation during the disturbance and/or removal of asbestos from the pipe insulation and cement pipes.

Asbestos is strictly regulated under OSHA 29 CFR 1910.1001/1926.1101. Employees that may be potentially exposed to ACM must participate in a medical surveillance program, have specific training in the hazards and controls of exposure to asbestos and wear respirators with high-efficiency particulate air (HEPA) filters. All work must be conducted in demarcated regulated areas to minimize the amount of people within the exposure area. Employers must conduct air sampling and provide signs and labels regarding the presence of asbestos.

4.1.5 Polychlorinated Biphenyls

It is not likely that polychlorinated biphenyls (PCBs) are of concern based on previous land uses at the Site. PCBs have historically been used from a number of sources including, but not limited to; electrical systems, hydraulic oils, lubricants, cutting oils, printer's ink, and asphalt. Exposure to PCBs can occur through unbroken skin without immediate pain or irritation. Acute affects of PCB exposure can include eye, skin, nose, and throat irritation. Chronic effects of PCB exposure can include skin swelling and redness, gastro-intestinal disturbances, and neurological effects such as headache, dizziness, nervousness and numbness of extremities. PCBs are suspected human carcinogens that can cause liver cancer. PCBs can accumulate in fatty tissues and result in health effects after the initial exposure has occurred. The primary route of exposure for PCBs is inhalation, dermal contact, and ingestion.

4.1.6 Hydrogen Sulfide

Hydrogen sulfide is a by-product of manufactured gas production and is also associated with the breakdown of sewage by bacteria in sewer pipes. Exposure to lower concentrations can result in eye irritation, a sore throat and cough, shortness of breath, and fluid in the lungs. These symptoms usually go away in a few weeks. Long-term, low-level exposure may result in fatigue, loss of appetite, headaches, irritability, poor memory, and dizziness. Breathing very high levels (>800 ppm) of hydrogen sulfide can cause death within just a few breaths. The primary route of exposure is through inhalation, and

therefore respiratory protection is the primary control against exposure to hydrogen sulfide. Air monitoring will be completed as specified in Section 8.0 to minimize airborne exposures during subsurface soil investigations.

4.1.7 Evaluation of Organic Vapor Exposure

Air monitoring reduces the risk of overexposure by indicating when action levels have been exceeded and when PPE must be upgraded or changed. Action levels for volatile organic compounds and associated contingency plans for the work zone are discussed within Section 8.0 of this Health and Safety Plan. Community air monitoring of the area immediately surrounding the work zone will be completed in accordance with the SC Work Plan and Appendix K of this HASP.

Exposure to organic vapors shall be evaluated and/or controlled by:

- Monitoring air concentrations for organic vapors in the breathing zone with a photoionization detector (PID) or a flame ionizing detector (FID)
- When possible, engineering control measures will be utilized to suppress the volatile organic vapors. Engineering methods can include utilizing a fan to promote air circulation, utilizing volatile suppressant foam, providing artificial ground cover, or covering up the impacted material with a tarp to mitigate volatile odors.
- When volatile suppression engineering controls are not effective and organic vapor meters indicate concentrations above the action levels, then appropriate respiratory protection (i.e. air purifying respirator with organic vapor cartridge) will be employed.

Table 4-1
Chemical Data

Compound	CAS #	ACGIH TLV	OSHA PEL	Route of Exposure	Symptoms of Exposure	Target Organs	Physical Data
Asbestos	1332-21-4	0.1 f/cc	0.1 f/cc over 8 hr period or 1.0f/cc over 30 min.	Inhalation Ingestion Skin Contact	Asbestosis (chronic exposure); mesothelioma, breathing difficulty, interstitial fibrosis' restricted pulmonary function, finger clubbing; irritate eyes, potential carcinogen	Respiratory system, eyes	White, greenish, blue, or gray-green fibrous solids FP: NA IP: NA LEL: NA UEL NA VP: 0 mm
Arsenic	7440-38-2	0.01 mg/m^3	0.01 mg/m^3 A.L. 0.5mg/m3	Inhalation Skin Absorption Ingestion Skin Contact	Ulceration of nasal septum, dermatitis, GI disturbances, peripheral neuropathy, respiratory irritation, hyper pigmentation of skin, potential carcinogen	Liver, kidneys, skin, lungs, lymphatic system	Metal: Silver-gray or tin-white, brittle, odorless solid FP: NA IP: NA LEL: NA UEL: NA VP: 0 mm
Benzene	71-43-2	0.5 ppm (Skin)	1 ppm TWA 5 ppm STEL	Inhalation Skin Absorption Ingestion Skin Contact	Irritation of eyes, skin, nose, respiratory system, giddiness, headache, nausea; staggering gait, fatigue, anorexia, weakness, dermatitis, bone marrow depression, potential carcinogen	Eyes, skin, CNS, bone marrow, blood	FP: 12^o F IP: 9.24 eve LEL: 1.2% UEL:7.8% VP: 75 mm
Chromium (Chromic Acid and Chromates)	1333-82-0	0.05 mg/m^3	0.1 mg/m^3	Inhalation Ingestion Skin Contact	Irritates respiratory system, nasal, septum perforation, liver and kidney damage, leucocytosis (increased blood leucocytes), leukopenis (reduced blood leucocytes), moncytosis (increased monocytes), Eosinophilia, eye injury, conjunctivitis, skin ulcer, sensitivity dermatitis, potential carcinogen	Blood, respiratory system, liver, kidney, eyes, skin, lung cancer	FP:NA IP:NA VP: Very Low LEL: NA UEL: NA
Ethyl benzene	100-41-4	100 ppm	100 ppm	Inhalation Ingestion Skin Contact	Eye, skin, mucous membrane irritation; headache; dermatitis, narcosis; coma	Eyes, skin, respiratory system, CNS	FP: 55^o F IP: 8.76 eV LEL: 0.8% UEL:6.7% VP: 7 mm

Table 4-1
Chemical Data

Compound	CAS #	ACGIH TLV	OSHA PEL	Route of Exposure	Symptoms of Exposure	Target Organs	Physical Data
Hydrogen cyanide	74-90-8	4.7 ppm (5 mg/m^3) STEL [skin]	10 ppm (11 mg/m^3) [skin]	Inhalation Ingestion Absorption Skin/Eye Contact	Asphyxia; weakness, headache, confusion; nausea, vomiting; increased rate and depth of respiration or respiration slow and gasping; thyroid, blood changes	CNS, CVS, thyroid, blood	Colorless or pale-blue liquid or gas (above 78°F) with a bitter, almond-like odor. VP: 630 mmHg IP: 13.60 eV
Hydrogen sulfide	7783-06-4	10 ppm TWA, 15 ppm STEL	20 ppm C, 50 ppm [10-min. Maximum peak]	Inhalation Skin/Eye Contact	Irritation eyes, respiratory system; apnea, coma, convulsions; conjunctivitis, eye pain, lacrimation (discharge of tears), photophobia (abnormal visual intolerance to light), corneal vesiculation; dizziness, headache, fatigue, irritability, insomnia; gastrointestinal disturbance; liquid: frostbite	Eyes, respiratory system, CNS	Colorless gas with a strong odor of rotten eggs. VP: 17.6 atm IP: 10.46 eV
Lead	7439-92-1	0.050 mg/m^3	0.05 mg/m^3 A.L. 0.03 mg/m3	Inhalation Ingestion Skin Contact	Weakness, insomnia; facial pallor; pal eye, anorexia, weight loss, malnutrition; constipation, abdominal pain, colic; anemia; gingival lead line; tremor; paralysis of wrist and ankles; irritates eyes, hypo tension	Eyes, GI tract, CNS, kidneys, blood, gingival tissue	A heavy, ductile, soft, gray solid. FP: NA IP: NA LEL: NA UEL: NA VP: 0 mm
Mercury	7439-97-6	0.025 mg/m^3	0.10 mg/m3	Inhalation Ingestion Skin Contact Skin Absorption	Irritates eyes and skin, chest pain, cough, difficulty breathing, bronchitis, pneumonitis, tremor, insomnia, irritability, indecision, headache, fatigue, weakness, stomatitis, salivation, Gastrointestinal disturbance, weight loss, proteinuria	Eyes, skin, respiratory tract, central nervous system	Silver-white, heavy odorless liquid FP: NA IP: Unknown LEL: NA UEL:NA VP: 0.0012 mm

Table 4-1
Chemical Data

Compound	CAS #	ACGIH TLV	OSHA PEL	Route of Exposure	Symptoms of Exposure	Target Organs	Physical Data
PAH's as Coal tar pitch Volatiles (CTPV)	65996-93-2	0.2 mg/m3	0.2 mg/m3	Inhalation Skin contact Ingestion	Irritant to eyes, swelling, acne contact dermatitis, chronic bronchitis	Respiratory system, CNS, liver, kidneys, skin, bladder, carc	Black or dark brown amorphous residue.
PCBs	11097-69-1	0.5 mg/m^3 (Skin)	0.5 mg/m^3 (Skin)	Inhalation Skin Absorption Ingestion Skin Contact	Irritate eyes; chloracne; liver damage;	Skin, eyes, liver, reproductive system	Colorless liquid or solid with a mild, hydro-carbon odor VP = 0.00006 mm
Phenol	108-95-2	10 ppm (skin)	5 ppm (19 mg/m^3) [skin]	Inhalation Skin Absorption Ingestion Skin Contact	Irritates eyes, nose, throat, anorexia, weight loss, weakness, muscle ache, pain, dark urine, cyanosis, liver and kidney damage, skin burns, dermatitis, tremors, convulsions, twitching,	Eyes, skin, respiratory system, liver, kidneys	Colorless to light pink crystalline solid with sweet, acrid odor. FP:175 ^{o}F IP:8.5 LEL:1.8% UEL: 8.6% VP: 0.4 mm
Selenium	7782-49-2	0.2 mg/m^3	0.2 mg/m^3	Inhalation Ingestion Skin Contact	Irritant to eyes, skin, nose and throat, visual disturbance, headache, chills, fever, breathing difficulty, bronchitis, metallic taste, garlic breath, GI disturbance, dermatitis, eye and skin burns,	Eyes, skin, respiratory system, liver, kidneys, blood spleen	Amphorous or crystalline, red to gray solid FP: NA IP: NA LEL: NA UEL: NA VP: 0 mm
Toluene	108-88-3	50 ppm	200 ppm	Inhalation Skin Absorption Ingestion Skin Contact	Eye, nose irritation; fatigue, weakness, confusion, euphoria, dizziness, headache; dilated pupils, tearing of eyes; nervousness, muscle fatigue, insomnia, tingling in limbs; dermatitis	Eyes, skin, respiratory system, CNS, liver, kidneys	FP: 40^{o}F IP: 8.82 eV LEL: 1.1% UEL:7.1% VP: 21 mm
Xylene	1330-20-7	100 ppm	100 ppm	Inhalation Skin Absorption Ingestion Skin Contact	Eye, skin, nose, throat irritation; dizziness, excitement, drowsiness; incoordination, staggering gait; corneal damage; appetite loss, nausea, vomiting, abdominal pain; dermatitis	Eyes, skin, respiratory system, CNS, GI tract, blood, liver, kidneys	FP: 90^{o}F IP: 8.56 eV LEL: 0.9% UEL: 6.7% VP: 9 mm

Table 4-1
Chemical Data

Compound	CAS #	ACGIH TLV	OSHA PEL	Route of Exposure	Symptoms of Exposure	Target Organs	Physical Data
Abbreviations							
C = ceiling limit, not to be exceeded					LEL = Lower explosive limit		
CNS = Central Nervous System					mm = millimeter		
CVS = Cardiovascular System					ppm = parts per million		
eV = electron volt					Skin = significant route of exposure		
FP = Flash point					STEL = Short-term exposure limit (15 minutes)		
IP = Ionization Potential					TWA = Time-weighted average (8 hours)		
GI = Gastro-intestinal					UEL = Upper explosive limit		
A.L. = Action Level					VP = vapor pressure approximately 68° F in mm Hg (mercury)		

4.1.8 Evaluation of Respirable Dust Inhalation

Inhalation of respirable dust containing metals, crystalline silica, asbestos, and SVOCs is possible when surrounding ground cover is disturbed by heavy equipment, conducting demolition work, or using power tools on surfaces that contain these materials. Contaminated particulate matter (soil, pavement, lead paint, insulation, etc.) becomes suspended in air due to a combination of factors including lack of vegetative cover and/or dry or dusty conditions. Air monitoring reduces the risk of overexposure to respirable dust inhalation by indicating when action levels have been exceeded and when PPE must be upgraded or changed. Action levels for respirable dust and associated contingency plans for the work zone and perimeter of the Site are discussed within Section 8.0 of this HASP. Community air monitoring of the area immediately surrounding the work zone will be completed in accordance with the SC Work Plan and Appendix K of this HASP.

Control of respirable dust shall be conducted at this Site as follows:

- When possible, dust control measures will be utilized to suppress the dust. These methods include wetting down the area, providing artificial ground cover, or covering up the material with a tarp.
- When dust suppression is not possible and respirable dust meters indicate concentrations above the action levels, a HEPA Filter must be used to prevent against inhalation of contaminated dusts.

4.1.9 Evaluation of Skin Contact and Absorption

Skin contact by contaminants may be controlled by use of proper hygiene practices, PPE, and good housekeeping procedures. The proper PPE (e.g., Tyvek®, gloves, safety glasses) as described in Section 6.0 will be worn for all activities where contact with potential contaminated media or materials are expected.

4.1.10 Other Chemical Hazards

Chemicals not identified in this HASP may be used during the Site Characterization activities. Prior to the initiation of any on-site tasks, each Contractor, Subcontractor, or Consultant shall provide Material Safety Data Sheets to the SSO for each of the chemicals to be used. The MSDS's will be maintained at the Site by the SSO and all site workers and visitors who may potentially be exposed to the chemicals will be made aware of these hazards and the location of the on-site MSDS's during a hazard briefing session by the SSO. MSDS of commonly used compounds are located in Appendix K.

4.2 Physical Hazards

4.2.1 High Loss Potential Physical Hazards

Activities to be conducted at the Site may involve operations that have the potential for a serious injury to occur, and can include the following:

- Lockout/Tag out
- Heavy Equipment Operation
- Excavation and Trenching
- Confined Space Entry
- Line Breaking
- Work within a Temporary Structure

Subsurface utilities will likely be located in the vicinity of the subsurface soil borings.

4.2.1.1 Lockout-Tag out

Site personnel will assume that all electrical equipment at surface, subsurface, and overhead locations is energized, until the equipment has been designated as de-energized by a KeySpan representative. If the equipment cannot de-energized, then work will stop and the SSO will consult with the PM and CESM. The Contractor will notify KeySpan prior to working adjacent to this equipment, and will verify that the equipment is energized or de-energized in the vicinity of the excavation location. The Control of Hazardous Energy Program "Lock Out/Tag Out" is included in Appendix H.

All power lines, which have been indicated by KeySpan to be de-energized must be locked out, such that the lines cannot be energized when personnel are working near them. The lines shall not be unlocked and re-energized until the Contractor notifies KeySpan that they have completed work in the area and that all personnel are clear of the area. KeySpan representatives will thoroughly familiarize Contractor personnel with site-specific lockout/tagout procedures during the site orientation. The lockout procedures must be equivalent in effectiveness to those found in Appendix H.

If power lines cannot be de-energized, the SSO will consult with the local utility provider safety personnel to determine the safe working distance from the energized line. Work tasks will only commence after determination that a safe working distance can be maintained and all personnel working in the area have been informed of the limitation.

4.2.1.2 Heavy Equipment Operation

Heavy equipment will be operated under the following conditions:

- The operation of heavy equipment will be limited to authorized personnel specifically trained in its operation. Subcontractor site supervisors must

provide this information to the SSO.

- Equipment shall be inspected daily to ensure that there are no exposed belts, fans, etc.
- When not in use, hydraulic and pneumatic components shall be left in down or "dead" position.
- Roll-over protection shall be provided on hilly terrain.
- Maintain all emergency shut-offs in sound working condition.
- The operator will use the safety devices provided with the equipment, including seat belts. Backup warning indicators and horns will be operable at all times.
- While in operation, all personnel not directly required in the area will keep a safe distance from the equipment.
- Personnel directly involved in activity will avoid moving in the path of operating equipment or any portion thereof. Areas blinded from the operator's vision will be avoided. Spotters will be used when personnel may be in areas where the operator's view is obstructed.
- Additional riders will not be allowed on equipment unless it is specifically designed for that purpose.

4.2.1.3 Excavation and Trenching

The safety requirements for each excavation must be determined by a competent person who is capable of identifying existing and predictable hazards and work conditions that are unsanitary, hazardous, or dangerous to employees. The competent person must also have the authorization to take prompt corrective measures to eliminate unsatisfactory conditions.

Subsurface utilities will likely be located in the vicinity of the SC investigation points.

The following are general requirements for work activities in and around excavations:

- Prior to initiation of any excavation activity (or ground intrusive activity, such as drilling), the location of underground installations will be determined. The New York State one-call center will be contacted by the Contractor / Subcontractor a minimum of 72 hours prior to excavation activities. It may also be necessary to temporarily support underground utilities during excavation. When excavations approach the estimated location of underground installations, the exact location of the underground installations shall be determined by means that are safe to workers, i.e., hand dig, test pits, etc.
- All excavations will be inspected daily by the competent person prior to commencement of work activities. Evidence of cave-ins, slides, sloughing, or surface cracks or excavations will be cause for work to cease until necessary precautions are taken to safeguard employees.

- Excavated and other materials or equipment that could fall or roll into the excavation shall be placed at least 5 feet from the edge of the excavation.
- Vehicular traffic and heavy equipment shall remain at least four feet from the face of the excavation.
- All excavation operations will cease immediately during hazardous weather conditions such as high winds, heavy rain, lightning and heavy snow.

4.2.1.4 Excavation Entry Safety

Personnel entering a trench or excavation that is greater than 4-feet deep shall implement the following procedures:

- The sides of all excavations in which personnel will be exposed to the danger of moving ground or potential cave-in will be adequately sloped, shored or contained within a trench box, or similar support structure designed and sealed by a professional engineer.
- The air in the excavation will be tested for oxygen deficiency, explosivity, organic vapors, carbon monoxide and hydrogen sulfide. The bottom, middle, top and corners of the excavation will be tested prior to entry and continuously during excavation entry.
- Ramps or ladders will be used to provide access and sufficient egress to the excavation. Ladders must be supplied for every 25 feet of lateral travel. Ladders must be securely anchored at the top or bottom and must extend at least 3 feet above the ground surface. A competent person is required to design ramps (those used exclusively for employee access/egress). Such ramps are constructed of wood, steel or earth. Structural ramps, used for vehicle/equipment access (steel or wood) must be designed by a competent person qualified in structural design. Vehicle ramps built of earth are not considered "structural ramps".
- Employees shall not work in excavations where there is an accumulation of water or in excavations where water is accumulating unless adequate precautions have been taken to protect employees against the hazard s posed by water accumulation.
- Emergency rescue equipment such as breathing apparatus, a safety harness and line, or a basket stretcher shall be readily available where hazardous atmospheric conditions exist or may reasonably be expected to develop during work in an excavation.

4.2.1.5 Working within a Temporary Enclosure

Any work conducted within a temporary enclosure shall employ work zone and ambient monitoring in accordance with the Air Monitoring Plan and Section 8.0 of this HASP. If internal combustion engine equipment is used within the temporary enclosure, engineering controls or additional air monitoring parameters will need to be evaluated. If monitoring indicates the enclosure atmosphere meets the definition of a Permit Required

Confined Space (PRCS), then the procedures of Appendix I will apply in accordance with OSHA 1910.146 and 1910.134.

4.2.2 Line Breaking

During line breaking activities, the potential exists for exposure to suspect asbestos containing materials (ACM). If suspect ACM is encountered, work will stop and will not resume until asbestos trained personnel have been upgraded to the proper PPE, and water is available to keep the work area and the suspect ACM wetted. All workers are to have completed asbestos awareness training prior to working with suspect ACM. The project management team (KeySpan Project Manager, Consultant Project Manager, and Contractor Project Manager and CESM) is to be notified if suspect ACM is encountered.

4.2.3 Fire and Explosion

Subsurface utilities including gas lines and electrical lines may be located in the vicinity of the subsurface soil borings.

When conducting excavating activities, the opportunity of encountering fire and explosion hazards also exists from contamination in the soils and the possibility of free product in the underground structures and pipelines. Additionally, the use of a diesel–powered excavating equipment could present the possibility of encountering fire and explosion hazards. Prevention and management of fire and explosion potential is addressed in the Contractor Project Specific AHA included in Appendix C of this HASP. All Contractor and Subcontractor activities shall conform with all applicable state, federal, and local regulations pertaining to fire and explosion prevention procedures.

4.2.4 Cold Stress

At certain times of the year, workers may be exposed to the hazards of working in cold environments. Potential hazards in cold environments include frostbite, trench foot or immersion foot, hypothermia as well as slippery surfaces, brittle equipment, poor judgment and unauthorized procedural changes. The procedures to be followed are found in Appendix E, the Cold Stress Program.

4.2.5 Heat Stress

Heat stress is a significant potential hazard, which is greatly exacerbated with the use of PPE in hot environments. The potential hazards of working in hot environments include dehydration, cramps, heat rash, heat exhaustion, and heat stroke. A heat stress prevention program will be implemented when ambient temperatures exceed 70ºF for personnel wearing chemical protective clothing. The procedures to be followed are found in Appendix F, the Heat Stress Program.

4.2.6 Noise

Noise is a potential hazard associated with the operation of heavy equipment, power tools, pumps and generators. Site workers who will perform suspected high noise tasks and operations for short durations (less than 1 hour) shall wear earplugs. If deemed necessary by the SSO, the CESM will be consulted on the need for additional hearing protection and the need to monitor sound levels for site activities. Other workers who do not need to be in proximity of the noise should distance themselves from the equipment generating the noise.

4.2.7 Hand and Power Tools

In order to complete the various tasks for the project, personnel will utilize hand and power tools. The use of hand and power tools can present a variety of hazards, including physical harm from being struck by flying objects, being cut or struck by the tool, fire, and electrocution. Work gloves, safety glasses, and hard hats will be worn by the operating personnel at all times when utilizing hand and power tools and Ground Fault Circuit Interrupter GFCI-equipped circuits will be used for all power tools.

4.2.8 Slips, Trips, and Falls

Working in and around the Site will pose slip, trip, and fall hazards due to slippery surfaces that may be oil covered, or from surfaces that are wet from rain or ice. Excavation at the Site will cause uneven footing in the trenches and around the spoil piles. Contractors shall employ good work practice and housekeeping procedures to minimize the potential for slip, trip, and fall hazards.

4.2.9 Manual Lifting

Manual lifting of heavy objects such as sections of pipe may be required. Failure to follow proper lifting technique can result in back injuries and strains. Site workers should use power equipment to lift heavy loads when ever possible and should evaluate loads before trying to lift them (i.e. they should be able to easily tip the load and then return it to its original position). Carrying heavy loads with a buddy and proper lifting techniques include: 1) make sure footing is solid, 2) make back straight with no curving or slouching, 3) center body over feet, 4) grasp the object firmly and as close to your body as possible, 5) lift with legs, and 6) turn with your feet, don't twist. In addition, hand digging may present lifting/ergonomic hazards.

4.2.10 Steam, Heat, Splashing

Exposure to steam/heat/splashing hazards can occur during steam cleaning activities. Exposure to steam/heat/splashing can result in scalding/burns, eye injury, and puncture wounds. Proper PPE will be worn during all steam cleaning activities including rain gear or Tyvek®, hardhat equipped with splashguard, and water resistant gloves and boots.

4.3 Biological Hazards

During the course of the project, there is a potential for workers to come into contact with biological hazards such as animals, insects, plants, and sewage. Workers should be aware of these potential hazards that are discussed below.

4.3.1 Animals

During the conduct of site operations, wild animals such as stray dogs or cats, raccoons, and rats may be encountered. Workers shall use discretion and avoid all contact with wild animals. If these animals present a problem, efforts will be made to remove these animals from the Site by contacting a licensed animal control technician.

4.3.2 Insects

Insects, including bees, wasps, hornets, mosquitoes, ticks, and spiders, may be present at the Site making the chance of a bite possible. Some individuals may have a severe allergic reaction to an insect bite or sting that can result in a life threatening condition. Some insect bites can transmit diseases such as Lyme Disease or a virus such as West Nile; any individuals who have been bitten or stung by an insect should notify the SSO. The following is a list of preventive measures:

- Apply insect repellent prior to performing any field work and as often as needed throughout the work shift
- Wear proper protective clothing (work boots, socks and light colored pants)
- When walking in wooded areas, avoid contact with bushes, tall grass, or brush as much as possible
- Field personnel who may have insect allergies shall have bee sting allergy medication on site and should provide this information to the SSO prior to commencing work.

4.3.2.1 Lyme Disease

Lyme disease is caused by infection from a deer tick that carries a spirochete. During the painless tick bite, the spirochete may be transmitted into the bloodstream often after feeding on the host for 12 to 24 hours. The ticks that cause the disease are often no bigger than a poppy seed or a comma in newsprint. The peak months for human infection are from May to September.

Symptoms appear in three stages. First symptoms usually appear from 2 days to a few weeks after a person is bitten by an infected tick. Symptoms usually consist of a ring-like red rash on the skin where the tick was attached. The rash is often bulls-eye like with red on the outside and clear in the center. The rash may be warm, itchy, tender, and/or "doughy." Unfortunately, this rash appears in only 60 to 80% of infected persons. An infected person also has flu-like symptoms of a stiff neck, chills, fever, sore throat, headache, fatigue and joint pain. These symptoms often disappear after a few weeks.

The second stage symptoms, which occur weeks to months later include meningitis, severe headache, drooping of the muscles on the face, called Bell's Pals, encephalitis, numbness, withdrawal and lethargy. These symptoms may last for several weeks to several months. Third stage symptoms, which occur months or years later include arthritis, heart problems, and loss of memory. The third stage symptoms may mimic multiple sclerosis and Alzheimer's disease.

It is recommended that personnel check themselves when in areas that could harbor deer ticks, wear light color clothing and visually check themselves and their buddy when coming from wooded or vegetated areas. If a tick is found biting an individual, the SSO should be contacted immediately. The tick can be removed by pulling gently at the head with tweezers. If tweezers are not available, cover your fingers (e.g., tissue paper) and use to grasp the tick. It is important to grasp the tick as close to the site of attachment and use a firm steady pull to remove it. Wash hands immediately after with soap and water. The affected area should then be disinfected with an antiseptic wipe. All mouth parts must be removed from the skin. If the tick is removed with breaking off the mouth parts, an irritation or infection may occur. Also, the organism that is causing the disease can still enter the body through the skin. The employee will be offered the option for medical treatment by a physician, which typically involves antibiotics. If personnel feel sick or have signs similar to those above, they should notify the SSO immediately.

Treatment with antibiotics is effective and recovery is usually complete. In the first stage antibiotics are usually given orally. Second and third stage treatment, however is prolonged and recovery may take longer. Antibiotic treatment is usually provided intravenously for second and third stage Lyme disease.

4.3.2.2 West Nile Virus

West Nile Virus (WNV) is a mosquito-borne infection transmitted through the bite of an infected mosquito. The symptoms of WNV can be asymptomatic (no symptoms) or in more serious cases can lead to West Nile fever. West Nile Fever can include fever, headache, tiredness, body ache, an occasional rash on the trunk of the body, and swollen lymph glands, In severe cases, people have developed West Nile encephalitis or meningitis which symptoms include fever, headache, neck stiffness, tremors, coma and in some cases death. The incubation period for the disease is usually 2 to 15 days. The symptoms can range from a few days to several weeks.

Since the initial outbreak in 1999, the virus has spread rapidly throughout New York State. There are about 65 different species of mosquitoes in New York State, but only a small percentage has been associated with the WNV. Most mosquitoes are not infected and the chance of infection from a mosquito bite of an on-site worker is very small. All residents of areas where virus activity has been identified are at risk of getting WNV, but those of the highest risk for becoming seriously ill from WNV are people are over 50 and individuals with some immunocompromised person (transplant patients).

The following precautions will be used to help reduce the risk of mosquito bites:

- Reduce mosquito-breeding areas by making sure wheelbarrows, buckets, and other containers are turned upside down when not used so that they do not collect standing water.
- Wear shoes, long pants with bottoms tucked into boots or socks, and a long-sleeved shirt when outdoors for long periods of time, or when many mosquitoes are most active (between dawn and dusk).
- Use mosquito repellant according to the manufacturer's directions when outdoors for long periods of time and when mosquitoes are most active.

4.3.3 Plants

The potential for contact with poisonous plants exists when performing fieldwork in undeveloped and wooded areas. Poison ivy, sumac, and oak may be present on site. Poison ivy can be found as vines on tree trunks or as upright bushes. Poison ivy consists of three leaflets with notched edges. Two leaflets form a pair on opposite sides of the stalk, and the third leaflet stands by itself at the tip. Poison ivy is red in the early spring and turns shiny green later in the spring. Poison sumac can be present in the form of a flat-topped shrub or tree. It has fern-like leaves, which are velvety dark green on top and pale underneath. The branches of immature trees have a velvety "down." Poison sumac has white, "hairy" berry clusters. Poison oak can be present as a sparingly branched shrub. Poison oak is similar to poison ivy in that it has the same leaflet configuration; however, the leaves have slightly deeper notches. Prophylactic application of Tecnu® may prevent the occurrence of exposure symptoms. Post exposure over the counter products are available and should be identified at the local pharmacist. Susceptible individuals should identify themselves to the SSO.

Contact with poison ivy, sumac, or oak may lead to a skin rash, characterized by reddened, itchy, blistering skin which needs first aid treatment. If you believe you have contacted one of these plants, immediately wash skin thoroughly with soap and water, taking care not to touch your face or other body parts.

4.3.4 Blood Poisoning

Blood poisoning is a term used to indicate a large number of bacteria present in the circulating blood. The most common symptom of blood poisoning is the reddening of skin which advances toward the heart. For example, if the point of contact is the hand, then a red line will appear at the hand and extend up the arm towards the heart.

Signs and symptoms include swelling, stiffness and tenderness in the affect area, fatigue chills and fever, pustules, abscesses. If allowed to progress without treatment, the organisms may multiply and cause an overwhelming infection which can lead to death.

Personal protective equipment shall be worn to prevent direct contact with equipment that may be contaminated with bacteria such as well caps and soil.

4.4 Hazard Analysis

This section includes an AHA to assess and control potential site hazards for each general project task. A more detailed Contractor Project-specific AHA is included in Appendix C, which addresses the health and safety hazards of each specific project task or operation and includes requirements and procedures for worker protection.

WORK TASK	POTENTIAL HAZARDS	CONTROLS
Activity: Site Mobilization and Utility Clearance		
Site Mobilization/Activity	Biological Hazards.	Proper clothes, body inspections, insect repellant.
	Slip, Trip, Fall Hazards	Identify and repair potential tripping hazards. Maintain safe and orderly work areas.
	Traffic Hazards	Use traffic cones, signage, and traffic safety vests in accordance with New York City Traffic Regulations. Use a traffic spotter
	Adverse Weather	Monitor weather daily. Discontinue work as necessary based on lightning, limited visibility, impaired mobility, etc.
	Noise	Distancing form noise, hearing protection
	Heat/Cold Stress	Acclimatization, work/rest regimes, drinking warm/cold fluids.
Activity: Subsurface Boring Installation and Sample Collection		
Subsurface Boring Installation and Sample Collection	Heavy Equipment / Proximity to Heavy Equipment	Distancing, safe work practices, inspections, wear hearing protection.
	Adverse Weather	Monitor weather daily. Discontinue work as necessary based on lightning, limited visibility, impaired mobility, etc.
	Heat/Cold Stress	Acclimatization, work/rest regimes, drinking warm/cold fluids.
	Slip/Trip/Fall	Maintain safe and orderly work areas. Unloading areas should be on even terrain. Identify and repair potential tripping hazards.
	Noise	Distancing form noise, hearing protection
	Tool Use	Use proper guarding, inspections, wear safety glasses with side shields, hearing protection.
	Contaminant Contact	Wear protective coveralls (e.g., Tyvek®) (if needed) with shoe covers, nitrile gloves, and safety glasses when handling samples. Dispose of gloves after sampling. Personal protective equipment will be decontaminated and disposed of in general accordance with Section 10 of this HASP.

	Exposure to vapors from contaminated soils	Use work zone air monitoring equipment including photoionization detector and multiple gas meter (that monitors % oxygen, lower explosive limit, hydrogen sulfide and hydrogen cyanide), and dust monitor to monitor the workzone as specified in Section 8.0 of the HASP. If air monitoring action levels are exceeded, then engineering controls will be implemented. If excursions of the action levels persist, then upgrade to half or full face respirator with HEPA/organic vapor cartridge as indicated in Section 6.0 of the HASP. Community air monitoring of the area immediately surrounding the work zone will be completed in accordance with the SC Work Plan and Appendix K of this HASP.

5.0 TRAINING

5.1 General Health and Safety Training

In accordance with 29 CFR 1910.120, hazardous waste site workers shall, at the time of job assignment, have received a minimum of 40 hours of initial health and safety training for hazardous waste site operations unless otherwise noted in the above reference. At a minimum, the training shall have consisted of instruction in the topics outlined in the standard. Personnel who have not met the requirements for initial training shall not be allowed to work in any site activities in which they may be exposed to hazards (chemical or physical). Proof of training shall be submitted to the SSO prior to the start of field activities.

5.2 Annual Eight-Hour Refresher Training

Annual eight-hour refresher training will be required of all hazardous waste site field personnel in order to maintain their qualifications for fieldwork. The training will cover a review of 29 CFR 1910.120 requirements and related company programs and procedures. Proof of current 8-hour refresher training shall be submitted to the SSO prior to the start of field activities.

5.3 Supervisor Training

Personnel acting in a supervisory capacity shall have received 8 hours of instruction in addition to the initial 40 hours training.

5.4 Site Safety Officer (SSO)

The SSO shall have completed the following training and work experience prior to the commencement of site activities:

- One year of construction experience
- 40-Hour Hazardous Materials training course
- Training specific to work activities (i.e., excavation and trenching activities, lock out/tag out, etc.

5.5 Site-Specific Training

Prior to commencement of field activities, the SSO will ensure all field personnel assigned to the project will have completed training that will specifically address the activities, procedures, monitoring, and equipment used in the site operations. It will include site and facility layout, hazards and emergency services at the Site and will highlight all provisions contained within this HASP. This training will also allow field workers to clarify anything they do not understand and to reinforce their responsibilities

regarding safety and operations for their particular activity. Personnel that have not received site-specific training will not be allowed on site.

5.6 On-Site Safety Briefings

Project personnel and visitors will be given health and safety briefings daily by the SSO to assist site personnel in safely conducting work activities. The briefings will include information on new operations to be conducted, changes in work practices or changes in the site's environmental conditions, as well as periodic reinforcement of previously discussed topics. The briefings will also provide a forum to facilitate conformance with safety requirements and to identify performance deficiencies related to safety during daily activities or as a result of safety inspections. The meetings will also be an opportunity to periodically update the crews on monitoring results.

5.7 First Aid and CPR

The SSO will identify individuals certified in first aid and CPR, or identify individuals for such training in order to ensure that emergency medical treatment is available during field activities. The training will be consistent with the requirements of the American Red Cross Association and will include training on blood borne pathogens.

5.8 Hazard Communication

Hazard communication training will be provided in accordance with the requirements contained in the Hazard Communication Program in Appendix D.

6.0 PERSONAL PROTECTIVE EQUIPMENT

The PPE specified in Table 6-1 represents PPE selection required by 29 CFR 1910.132, and is based on the AHA of Section 4. Specific information on the selection rationale for each activity can be found under Appendix G - Personal Protective Equipment (PPE) Program.

The PPE program addresses elements, such as PPE selection based on site hazards, use and limitations, donning and doffing procedures, maintenance and storage, decontamination and disposal, training and proper fitting, inspection procedures prior to / during / and after use, evaluation of the effectiveness of the PPE program, and limitations during temperature extremes, heat stress, and other appropriate medical considerations.

A summary of PPE for each level of protection is as follows:

Safety Equipment	Level A	Level B	Level C	Level D
Tyvek® suit or work overalls				•
Hard hats with splash shields and/or safety glasses			•	•
Steel-toe boots with over boots			•	•
Chemical-resistant gloves as appropriate for work being performed and materials handled			•	•
Disposable Respirator/ Half- or full-face respirators as approved by the CESM/SSO			•	
Tyvek® splash-resistant suit or chemical resistant clothing appropriate for the work being performed or materials handled			•	
Chemical-resistant clothing		•		
Pressure-demand, full-face SCBA or pressure-demand supplied air respirator with escape SCBA	•	•		
Inner and outer chemical-resistant gloves	•	•		
Chemical-resistant safety boots or shoes	•	•		
Two-way radio	•	•		
Fully encapsulating chemical-resistant suit	•			

Table 6-1 describes the anticipated task-specific PPE. For activities not covered by Table 6-1, the SSO/CESM will revise the hazard assessment and select the PPE using the information provided in Appendix G.

6.1 PPE Abbreviations and Selection

HEAD PROTECTION HH = Hard Hat HEARING PROTECTION EP = ear plugs	EYE/FACE PROTECTION PFS =Plastic Face shield SG = ANSI approved safety glasses with side shields	RESPIRATORY PROTECTION Level D = No respiratory protection required Level C = Half face or full face air purifying respirator with approved cartridges (HEPA filter/organic vapor cartridge) Level B = Full face air supplied respirator with escape bottle
HAND PROTECTION LWG = Leather Work Gloves Nit = Nitrile Gloves	BODY PROTECTION Poly = Polyethylene coated Tyvek® coveralls or apron WC = Work clothes	FOOT PROTECTION OB = Over boot STB = Leather work boots with steel toe

Table 6.1-PERSONAL PROTECTIVE EQUIPMENT SELECTION

TASK	HEAD	EYE/FACE	FEET	HANDS	BODY	HEARING	RESPIRATOR
Mobilization/Demobilization							
Mobilization/ demobilization of equipment and supplies	HH as needed	SG as needed	STB	LWG as needed	WC	EP as needed	Level D
Establishment of site security, work zones and staging area	HH as needed	SG as needed	STB	LWG as needed	WC	EP as needed	Level D
Locate all utilities to and from the site	HH as needed	SG as needed	STB	LWG as needed	WC	EP as needed	Level D
Locate all active utility lines on site	HH as needed	SG as needed	STB	LWG as needed	WC	EP as needed	Level D
Site Characterization Activities							
Subsurface Soil Boring and Monitoring Well Installation and Sampling	HH	SG	STB, OB as needed	Nit	WC, Poly as needed	EP	Level D initially, Level C-If action levels exceeded (see Section 8 of HASP)
Survey	HH as needed	SG as needed	STB	LWG as needed	WC	EP as needed	Level D
Monitoring Well Development	HH as needed	SG as needed	STB	Nit	WC	EP as needed	Level D
Groundwater Sampling	HH as needed	SG	STB, OB as needed	Nit	WC, Poly as needed	EP as needed	Level D
Waste Handling	HH	SG	STB, OB as needed	LWG and Nit as needed	WC, Poly as needed	EP as needed	Level D initially, Level C-If action levels exceeded (see Section 8 of HASP)

7.0 MEDICAL SURVEILLANCE

All personnel performing field work where potential exposure to contaminants exists at the Site are required to have passed a complete medical surveillance examination in accordance with 29 CFR 1910.120(f) and, where applicable, expanded health standards.

7.1 Medical Surveillance Requirements

A physician's medical release for work will be confirmed by the SSO before a worker can enter the exclusion zone. The examination will be taken annually at a minimum and upon termination of hazardous waste site work if the last examination was not taken within the previous six months. Additional medical testing may be required by the CESM in consultation with the SSO if an over-exposure or accident occurs, if an employee exhibits symptoms of exposure, or if other site conditions warrant further medical surveillance.

8.0 MONITORING

Monitoring shall be performed to identify and quantify airborne levels of hazardous substances and safety and health hazards in order to determine the appropriate level of worker protection needed on site.

The Consultant conducts perimeter air monitoring, and work zone monitoring for Consultant employees. The Consultant will monitor and document daily site conditions and operations on KeySpan's behalf.

The Contractor is responsible for the health and safety of Contractor and Subcontractor employees, and conducts work zone monitoring for Contractor and Subcontractor workers.

The CONTRACTOR is required to provide the following equipment for health and safety monitoring of its personnel:

- Photoionization Detector (PID), or Flame Ionization Detector (FID),
- Particulate Meter (PM-10 capable)
- Multiple gas Meter with Combustible Gas Indicator (CGI)/Oxygen (O_2) / H_2S / HCN sensors
- Dräger Chip Measurement System (CMS) (or equivalent instrument)
- Sound Level Meter if deemed necessary by the SSO and CESM (type to be appropriate to the activities performed)

The Consultant and Contractor will adopt the air monitoring action levels and contingency plan presented within the Table 8-1 below. In the event that a Contractor has a more stringent action level requirement than the HASP, the Contractor will notify KeySpan and the Consultant SSO and the CESM to rectify the action level discrepancy.

The perimeter air monitoring will be conducted during subsurface soil boring installations to conform to the community air monitoring plan (CAMP) guidelines presented by the New York State Department of Health in Appendix 1A of the Draft New York State Department of Conservation DER-10 Technical Guidance for Site Investigation and Remediation. The CAMP is located in Appendix K.

Total volatile organic compounds (VOCs), respirable particulate matter, and odor will be monitored during all intrusive subsurface soil activities in accordance with the CAMP.

Table 8-1 provides a summary of real time air monitoring action levels and contingency plans for work zone activities.

TABLE 8-1: Work Zone Air Monitoring Action Levels

Air Monitoring Instrument	Monitoring Location	Action Level	Site Action
PID/FID	Breathing Zone	2.0 ppm	Use Dräger Chip Measurement System (CMS) tube for benzene or Z-nose® to verify if concentration is benzene.
PID/FID	Breathing Zone	0 - 10 ppm	No respiratory protection is required.
		10 - 250 ppm	Stop work, withdrawal from work area, institute engineering controls, if levels persist Upgrade to Level C.
		> 250 ppm	Stop work, withdraw from work area; notify SSO & CESM.
Oxygen meter (O_2)	Breathing Zone	< 19.5%	Stop work; withdraw from work area; ventilate area, notify SSO & CESM.
		> 22%	Stop work; withdraw from work area; notify SSO & CESM.
Hydrogen Sulfide (H_2S) meter	Breathing Zone	<5 ppm	No respiratory protection is required.
		>5 ppm	Stop work, cover excavation, withdraw from work area, institute engineering controls, and notify SSO & CESM.
Hydrogen Cyanide (HCN) meter	Breathing Zone	<1.0 ppm	Run CMS Dräger tube, continue monitoring with real time meter, and continue work if CMS Dräger Tube Reading is less than 2ppm.
		1.0< HCN <2.0 ppm	Run CMS Dräger tube and confirm concentration is less than 2.0 ppm, notify SSO and CESM. Run CMS Dräger tube for sulfur dioxide, hydrogen sulfide, and phosphine chip potential interferences. Continue to monitor with real time meter.
		>2.0 ppm	Stop work, and move (with continuous HCN monitoring meter) at least 25 feet upwind of the excavation until continuous meter reads less than 1 ppm, Notify SSO & CESM. Run CMS Dräger hydrogen cyanide chip and re-evaluate activity, continue monitoring with a real time meter, resume work if concentrations read less than 1.0 ppm.
Combustible Gas Indicator (CGI)	Excavation/ Work Zone	< 10 % Lower Explosive Limit (LEL)	Investigate possible causes, allow excavation to ventilate; use caution during procedures.
		> 10% LEL	Stop work; allow excavation, borehole to ventilate to < 10% LEL; if ventilation does not result in a decrease to < 10% LEL, withdraw from work area; notify SSO & CESM.
Particulate Meter	Excavation/ Work Zone	0.150 ug/m^3	Implement work practices to reduce/minimize airborne dust generation, e.g., spray/misting of soil with water.

Carry cellular telephones for communication in a designated area away from subsurface investigation and sampling activities. Cellular phone use will not be permitted in the Exclusion Zone while work is being conducted in Level C PPE.

9.0 SITE CONTROL MEASURES

9.1 Site Zones

Site zones are intended to control the potential spread of contamination and to assure that only authorized individuals are permitted into potentially hazardous areas. A three-zone approach will be utilized. It shall include an Exclusion Zone (EZ), Contamination Reduction Zone (CRZ), and a Support Zone (SZ). Specific zones shall be established on the work site when operations begin for each task requiring such delineation (i.e. drilling, construction, excavation, trenching in impacted areas of the Site). Maps depicting the zones will be available at the Site.

This project is being conducted under the requirements of 29 CFR 1910.120, and any personnel working in an area where the potential for exposure to site contaminants exists, will only be allowed access after proper training and medical documentation as required by KeySpan. These records are maintained by the CESM, and copies are provided to the SSO prior to mobilization for project activities.

The following shall be used for guidance in revising these preliminary zone designations, if necessary.

Support Zone - The SZ is an uncontaminated area that will be the field support area for most operations. The SZ provides for field team communications and staging for medical emergency. Appropriate sanitary facilities and safety equipment will be located in this zone. Potentially contaminated personnel/materials are not allowed in this zone. The only exception will be appropriately packaged/decontaminated and labeled samples.

Contamination Reduction Zone - The CRZ is established between the EZ and the SZ. The CRZ contains the contamination reduction corridor and provides an area for decontamination of personnel and portable hand-held equipment, tools and heavy equipment. A personnel decontamination area will be prepared at each exclusion zone. The CRZ will be used for Exclusion Zone entry and egress in addition to access for heavy equipment and emergency support services.

Exclusion Zone - All activities which may involve exposure to site contaminants, hazardous materials and/or conditions should be considered an exclusion zone. This zone will be clearly delineated by cones, tapes or other means. The SSO may establish more than one EZ where different levels of protection may be employed or different hazards exist. The size of the EZ shall be determined by the site SSO allowing adequate space for the activity to be completed, field members and emergency equipment.

9.2 Communications

The following communications equipment shall be specified as appropriate:

- Telephones - A cellular telephone will be located in the SZ for communication with

emergency support services/facilities and the home office. Personnel in the EZ can carry cellular telephones for communication in a designated area way from subsurface investigation and sampling activities. Cellular phone use will not be permitted in the EZ while work is being conducted in Level C PPE.

- Hand Signals - Hand signals shall be used by field teams along with the buddy system. They shall be known by the entire field team before operations commence and their use covered during site-specific training. Typical hand signals are the following:

Signal	Meaning
Hand gripping throat	Out of air, can't breathe
Grip on a partner's wrist or placement of both hands around a partner's waist	Leave area immediately, no debate
Hands on top of head	Need assistance
Thumbs up	Okay, I'm all right, I understand.
Thumbs down	No, negative.

10.0 DECONTAMINATION

PPE helps prevent the wearer from becoming contaminated or inhaling contaminants, and good work practices help reduce contamination on protective clothing, instruments, and equipment. Even with these safeguards, contamination may occur. Harmful materials can be transferred to clean areas, exposing unprotected personnel. To prevent such occurrences, the following contamination reduction and decontamination procedures have been developed.

10.1 Minimization of Contact with Contaminants

During completion of all site activities, personnel should attempt to minimize the degree of contact with contaminated materials. This involves a conscientious effort to keep "clean" during site activities. All personnel should minimize kneeling, splash generation, and other physical contact with contamination. This may ultimately minimize the degree of decontamination required and the generation of waste materials from site operations.

10.2 Personnel Decontamination

Personnel hygiene, coupled with diligent decontamination, will significantly reduce the potential for exposure. Consideration will be given to prevailing wind directions so that the decontamination line, the support zone, and contamination reduction zone exit is upwind from the exclusion zone and the first station of the decontamination line. Decontamination will be performed by removing all PPE used in EZ and placing in drums/trash cans at CRZ. Disinfecting hand wipes shall be available for wiping hands and face. For Level D Decontamination, personnel should wash and rinse gloves, and use anti bacterial wipes/gel and wash and rinse hands and face with potable water.

For Level C Decontamination, personnel should wash and rinse gloves and over boots, remove boot covers, remove outer gloves, remove Tyvek® splash-resistant suit or chemical resistant clothing, wash inner gloves, remove respirator, rinse inner gloves, remove inner gloves and wash and rinse hands and face.

If exposed to subsurface soils, wash with soap and water.

10.3 Emergency Decontamination

If circumstances dictate that contaminated clothing cannot be readily removed, then remove gross contamination, wrap injured personnel with clean garments/blankets to avoid contaminating other personnel or transporting equipment. If the injured person can be moved, he/she will be moved to the exclusion zone boundary and decontaminated by site personnel as described above before emergency responders handle the victim. If the person cannot be moved because of the extent of the injury (a back or neck injury) provisions shall be made to ensure that emergency response personnel will be able to

respond to victim without being exposed to potentially hazardous atmospheric conditions. The only time an injured person should be removed is if the worker's life is threatened to a greater degree than if he/she is left in the spot where the accident occurred. If emergency response personnel have to enter hazardous conditions to respond to victim this should communicated when the emergency call is made and responders can come prepared in appropriate PPE. If the potential for inhalation hazards exist, such as with an open excavation, this area will be covered with plastic sheeting, or similar controls, to eliminate any potential inhalation hazards. All emergency personnel are to be immediately informed of the injured person's condition, potential contaminants, and provided with all pertinent chemical data.

10.4 Hand Held Equipment Decontamination

Hand held equipment includes all monitoring instruments, samples, hand tools, and notebooks. The hand held equipment is dropped at the first decontamination station to be decontaminated by one of the decontamination team members. These items must be decontaminated or discarded as waste prior to removal from the exclusion zone.

To aid in decontamination, monitoring instruments can be sealed in plastic bags or wrapped in polyethylene. This will also protect the instruments against contaminants. The instruments will be wiped clean using antibacterial wipes and paper towels if contamination is visually evident.

Decontamination procedures for sampling equipment, hand tools, etc., shall include the use of steam cleaning or a detergent wash, as appropriate for the site conditions. The standard decontamination procedures will be used as presented in the Oyster Bay Hortonsphere Site Characterization Work Plan. All liquids generated in the decontamination will be stored at the Site in drums and then disposed of at an approved facility in accordance with federal, state and local regulations. Personnel performing this task will wear the proper PPE as prescribed in Table 6-1.

10.5 Heavy Equipment Decontamination

Decontamination of chemically contaminated heavy equipment will be accomplished using high -pressure steam or dry decontaminated with brushes and shovels. Decontamination shall take place on a decontamination pad and all liquids used in the decontamination procedure will be collected. Vehicles or equipment brought into an exclusion zone will be treated as contaminated, and will be decontaminated prior to removal. All liquids used in the decontamination procedure will be stored at the Site drums and then disposed of at an approved facility in accordance with federal, state and local regulations. Personnel performing this task will wear the proper PPE as prescribed in Table 6-1.

11.0 EMERGENCY RESPONSE PLAN

This section establishes procedures and provides information for use during a project emergency. Emergencies happen unexpectedly and quickly, and require an immediate response; therefore, contingency planning and advanced training of staff are essential. Specific elements of emergency support procedures which are addressed in the following subsections include communications, local emergency support units, preparation for medical emergencies, first aid for injuries incurred on-site, record keeping, and emergency site evacuation procedures.

11.1 Pre-emergency Planning

Before the field activities begin, the local emergency response personnel may be notified by KeySpan of the schedule for field activities and about the materials that are thought to exist on the Site so that they will be able to respond quickly and effectively in the event of a fire, explosion, or other emergency.

In order to be able to deal with any emergency that might occur during remedial activities at the Site, emergency telephone numbers will be readily available in the SSO vehicle or construction office. These telephone numbers are presented in Appendix A. A hospital route map will also be readily available at the Site, and is in Appendix B as Figure 3.

11.2 Roles and Responsibilities

11.2.1 Corporate Environmental and Safety Manager (CESM)

The CESM oversees and approves the Emergency Response Plan and performs audits to determine that the plan is in effect and that all pre-emergency requirements are met. The CESM acts as a liaison to applicable regulatory agencies and notifies OSHA of reportable accidents.

11.2.2 Site Safety Officer (SSO)

The SSO is responsible for ensuring that all personnel are evacuated safely and that machinery and processes are shut down or stabilized in the event of a stop work order or evacuation. The SSO is required to immediately notify the Consultant and KeySpan Project Managers, and CESM of any fatalities or injuries requiring more than basic first aid treatment. The CESM will notify OSHA within the required time frame if a reportable incident has occurred. The CESM will be notified of all OSHA recordable injuries, fires, spills, releases or equipment damage in excess of $500 within 24 hours.

The SSO also serves as the Emergency Coordinator. In the event of an emergency, the Emergency Coordinator, with KeySpan representatives, shall make contact with Local Emergency Response personnel. In these contacts, the Emergency Coordinator will inform response personnel about the nature of work on the Site, the type of contaminants

and associated health or safety effects, and the nature of the emergency, particularly if it is related to exposure to contaminants.

The Emergency Coordinator shall review this plan and verify emergency phone numbers, identify hospital routes, and shall ensure the appropriate emergency equipment is available and in working order prior to beginning work on site.

The Emergency Coordinator shall implement the Emergency Response Plan whenever conditions at the Site warrant such action.

11.2.3 Site Personnel

Site personnel are responsible for knowing the Emergency Response Plan and the procedures contained herein. Personnel are expected to notify the Emergency Coordinator of situations that could constitute a site emergency.

11.3 Evacuation Routes and Procedures

All project personnel will be instructed on proper emergency response procedures and locations of emergency telephone numbers during the initial site safety meeting. If an emergency occurs at the work area, including but not limited to fire, explosion, or significant release of toxic gas into the atmosphere, immediate evacuation of all personnel is necessary due to an immediate or impending danger. All heavy equipment will be shut down and all personnel will evacuate the work areas and assemble at a pre-determined location.

11.4 Contingency Plans

11.4.1 Fire Prevention and Protection

In the event of a fire or explosion, procedures will include immediately evacuating the work area. The Emergency Coordinator will immediately notify the local fire and police departments. No personnel will fight a fire beyond the stage where it can be put out with a portable extinguisher (incipient stage).

Fires will be prevented by adhering to the following precautions:

- Good housekeeping and storage of materials
- Storage of flammable liquids and gases away from oxidizers
- No smoking in the exclusion zone or any work area
- No hot work without a properly executed hot work permit
- Shutting off engines to refuel
- Grounding and bonding metal containers during transfer of flammable liquids
- Use of UL approved flammable storage cans

- Fire extinguishers rated at least 10 pounds ABC located on all heavy equipment, in all trailers and near all hot work activities
- Monthly inspections of all fire extinguishers.

The SSO is responsible for the maintenance of fire prevention and/or control equipment. The SSO is responsible for the control of fuel source hazards.

11.4.2 Overt Chemical Exposure

The following are standard procedures to treat chemical exposures. Other, specific procedures detailed on the Material Safety Data Sheet will be followed as necessary. If first aid or emergency medical treatment is necessary the Emergency Coordinator will contact the appropriate emergency facilities.

SKIN AND EYE CONTACT:	Use copious amounts of soap and water. Wash/rinse affected areas thoroughly, then provide appropriate medical attention. Eyes should be rinsed for 15 minutes upon chemical contamination. Skin should also be rinsed for 15 minutes if contact with caustics, acids or hydrogen peroxide occurs. Transport to hospital or local medical provider.
INHALATION:	Move to fresh air. Decontaminate. Transport to hospital or local medical provider.
INGESTION:	Decontaminate and transport to emergency medical facility.
PUNCTURE WOUND OR LACERATION:	Decontaminate and transport to emergency medical facility.

11.4.3 Decontamination during Medical Emergencies

If emergency life-saving first aid and/or medical treatment are required, normal decontamination procedures may need to be abbreviated or postponed. The SSO or designee will accompany contaminated victims to the medical facility to advise on matters involving decontamination, when necessary. The outer garments can be removed if they do not cause delays, interfere with treatment or aggravate the problem. Respiratory equipment must always be removed. Protective clothing can be cut away. If the outer contaminated garments cannot be safely removed on site, a plastic barrier between the injured individual and clean surfaces should be used to help prevent contamination of the inside of ambulances and/or medical personnel. Outer garments may then be removed at the medical facility. No attempt will be made to wash or rinse the victim if his/her injuries are life threatening, unless it is known that the individual has been contaminated with an extremely toxic or corrosive material which could also cause severe injury or loss of life to emergency response personnel. For minor medical problems or injuries, the normal decontamination procedures will be followed.

11.4.4 Adverse Weather Conditions

In the event of adverse weather conditions, the SSO will determine if work can continue without potentially risking the safety of all field workers. Some of the items to be considered prior to determining if work should continue are:

- Potential for heat stress and heat-related injuries
- Potential for cold stress and cold-related injuries
- Treacherous weather-related working conditions (hail, rain, snow, ice, high winds)
- Limited visibility (fog)
- Potential for electrical storms
- Earthquakes
- Other major incidents.

Site activities will be limited to daylight hours, or when suitable artificial light is provided, and acceptable weather conditions prevail. The SSO will determine the need to cease field operations or observe daily weather reports and evacuate, if necessary, in case of severe inclement weather conditions.

When severe weather has passed, the SSO will direct all contractors to inspect project equipment to ensure its readiness for operation prior to commencing field activities.

11.4.5 Spill Control and Response

All small hazardous spills/environmental releases shall be contained as close to the source as possible. Whenever possible, the MSDS will be consulted to assist in determining the best means of containment and cleanup. For small spills, absorbent materials such as sand, sawdust, or commercial sorbents should be placed directly on the substance to contain the spill and aid recovery. Any acid or caustic spills should be diluted or neutralized carefully prior to attempting recovery. Berms of earthen or sorbent materials can be used to contain the leading edge of the spills. Drains or drainage areas should be blocked. All spill containment materials will be properly disposed. An exclusion zone of 50 to 100 feet around the spill area should be established depending on the size and type of the spill.

Refueling of sampling equipment will be done with NFPA-approved safety cans and by approved USCG refueling methods. Fuel will be stored in containers meeting applicable fuel storage safety regulations.

The Emergency Coordinator should take the following steps:

1. Determine the nature, identity and amounts of major spill components
2. Make sure all unnecessary persons are removed from the spill area
3. Notify appropriate response teams and authorities

4. Use proper PPE in consultation with the SSO and information provided on the MSDS for the spilled material
5. If a flammable liquid, gas or vapor is involved, remove all ignition sources and use non-sparking and/or explosive proof equipment to contain or clean up the spill (diesel only vehicles, air operated pumps, etc.)
6. If possible, try to stop the leak with appropriate material
7. Remove all surrounding materials that can react or compound with the spill
8. Notify the KeySpan Project Manager.

11.5 Emergency Contact Information

Emergency Phone List
Oyster Bay Hortonsphere Site

Medical Emergencies	
Emergency Medical Services (Local Fire Department)	
Emergency	911
All other communications	(516) 674-7300
Nearest Emergency Room - Glen Cove Hospital	(516) 674-7300
Fire and Rescue Emergencies	
Emergency	911
All other communications	(516) 742-3300
Police Emergencies	
Local Police Department	
Emergency	911
All other communications	311
Switchboard	(516) 573-6200
Utility Emergencies	
Electric (LIPA)	(800) 490-0025
Water/Sewer (Town of Oyster Bay Building Division)	(516) 624-6266
Natural Gas (KeySpan)	(718) 643-4050
KeySpan Site Contacts	
Richard Schmitz-Project Manager	(516) 545-2569 (office) (917) 282-4247 (mobile)
Underground Utilities (New York City One Call Center)	(800) 272-4480
Spill Incident	
New York State Department of Environmental Conservation	(800)-457-7362
National Response Center	(800) 424-8802
National Information Centers	
Chemtrec	(800) 424-9300
Poison Control Center	(800) 222-1222

11.6 Emergency Equipment

The following minimum emergency equipment shall be kept and maintained at the Site.

- Industrial first aid kit
- Portable eye washes

- ABC-rated fire extinguishers (one per vehicle and heavy equipment [drill rig and sample vessel])
- Absorbent material [Sorbent pads and booms]
- Bloodborne pathogen kit.

In case of minor injuries, on-site care shall be administered with the Site first aid kit. The first aid kit will include at a minimum the items specified in Appendix J of this HASP. A first aid kit will be kept in a waterproof container at the Site. In addition, eye wash, antibacterial wipes/gel, soap, and potable water will be kept at the Site.

For serious injuries that can not be treated with the first aid kit, call 911 and request emergency medical assistance. Seriously injured persons should not be moved, unless they are in immediate danger.

11.7 Postings

The following information shall be posted or be readily visible and available at the Site:

- Emergency telephone numbers
- Hospital Route Map

The expected travel time from the Site to the nearest hospital is approximately 10 minutes, depending on local traffic conditions.

11.8 Restoration and Salvage

After an emergency, prompt restoration of utilities, fire protection equipment, medical supplies and other equipment will reduce the possibility of further losses. Some of the items that may need to be addressed are:

- Refilling fire extinguishers
- Refilling medical supplies
- Recharging eyewashes and/or showers
- Replenishing spill control supplies
- Replacing used air horns.

12.0 LOGS, REPORTS, AND RECORD KEEPING

The following is a summary of required health and safety logs, reports, and record keeping. The SSO will maintain an on-site file for all the following logs, reports, and records. The CESM or designee will maintain a parallel file off-site.

12.1 Medical and Training Records

Copies or verification of training (40 hour, 8 hour, supervisor, and site-specific training) and medical clearance for hazardous waste site work and respirator use will be maintained by the CESM and copies provided to the SSO prior to the initiation of work on site.

12.2 On-Site Log

A log of personnel on site each day will be kept by the SSO in a field logbook.

12.3 Exposure Records

All personal monitoring results, laboratory reports, calculations, and air sampling data sheets will be maintained by the SSO during site work. At the end of the project they may be maintained in employee files if deemed necessary by the CESM.

12.4 Accident/Incident Reports

The incident reporting and investigation during site work will follow the Incident Reporting Program in Appendix J.

12.5 OSHA Form 300

An OSHA Form 300 will be maintained at the Contractor or Consultant home office. The SSO may retain a copy of the OSHA Form 300 on site. All recordable injuries or illnesses will be recorded on this form. The incident report form referenced in Appendix J meets the requirements of the OSHA Form 101(supplemental record) and must be maintained with the OSHA Form 300 for all recordable injuries or illnesses.

12.6 Hazard Communication Program/MSDS

Material Safety Data Sheets (MSDSs) will be obtained for applicable substances and included in the site hazard communication file. The hazard communication program will be maintained on site in accordance with 29 CFR 1910.1200 and the Hazard Communication Program in Appendix D.

12.7 Work Permits

All work permits, including confined space entry, hot work, lockout/tagout, and line-breaking permits will be maintained in the project files. Copies of the work permits shall also be provided to the SSO, and the KeySpan Project Manager.

13.0 FIELD PERSONNEL REVIEW

This form serves as documentation that field personnel have read, or have been informed of, and understand the provisions of this HASP for the Oyster Bay Hortonsphere site. It is maintained on site by the SSO as a project record. Each field team member shall sign this section after training on the contents of this HASP has been completed. Site workers must sign this form after site-specific training is completed and before being permitted to work on site.

I have read, or have been informed of, the Health and Safety Plan and understand the information presented. I have also completed site-specific training for the work detailed in the project Work Plan. I will comply with the provisions contained therein.

PRINT NAME	SIGNATURE	DATE

PRINT NAME	SIGNATURE	DATE

PRINT NAME	SIGNATURE	DATE

APPENDIX A

ORGANIZATIONAL STRUCTURE / CONTACT INFORMATION

KeySpan
Contact Information

Name	Title	Contact Information
Richard Schmitz	Principal Engineer Environmental Asset Management	Office: (516) 545-2569 Mobile: (917) 282-4247 E-mail: rschmitz@keyspanenergy.com
		Office: Mobile: E-mail:
		Office: Mobile: E-mail:
		Office: Mobile: E-mail:
		Office: Mobile: E-mail:

GEI Consultants, Inc.
Tentative Project Team Contact Information

Name	Title	Contact Information
David Terry	Program Manager	Office: (860) 368-5396 Mobile: (860) 608-9647 E-mail: dterry@geiconsultants.com
Timothy Burke	Project Manager	Office: (860) 368-5400 Mobile: (860) 331-5401 E-mail: tburke@geiconsultants.com
Chris Scharkopf	Field Team Leader / Site Safety Officer (SSO)	Office: (631) 760-9300 Mobile: (631) 481-5286 E-mail: cscharkopf@geiconsultants.com
Chris Scharkopf	Senior Geologist	Office: (631) 760-9300 Mobile: (631) 481-5286 E-mail: cscharkopf@geiconsultants.com
Chris Scharkopf	Site Characterization Team	Office: (631) 760-9300 Mobile: (631) 481-5286 E-mail: cscharkopf@geiconsultants.com
Michael Williams	Site Characterization Team	Office: (631) 760-9304 Mobile: (631) 481-5094 E-mail: mwilliams@geiconsultants.com
Robin DeHate	Corporate Health and Safety Officer / Corporate Environmental Safety Manager (CESM)	Office: (813) 910-3104 Mobile: (813) 323-6220 E-mail: rdehate@geiconsultants.com
Dennis Unites	In-House Program Consultant	Office: (860) 368-5398 Mobile: (860) 608-0281 E-mail: dunites@geiconsultants.com
Dr. Raymond Harbison	Toxological Consultant MedTox	Office: (813) 910-3104 E-mail: rharbiso@ix.netcom.com

Aquifer Drilling & Testing, Inc. (ADT) / Selected Boring Subcontractor Contact Information

Name	Title	Contact Information
Dennis Mayer	Project Manager	Office: (800) 238-3745 Mobile: E-mail:
	Field Team Leader/ Site Safety Officer (SSO)	Office: Mobile: E-mail:
	Corporate Environmental Safety Manager (CESM)	Office: Mobile: E-mail:
		Office: Mobile: E-mail:
		Office: Mobile: E-mail:

APPENDIX B

SITE-SPECIFIC INFORMATION

APPENDIX C

PROJECT SPECIFIC ACTIVITY HAZARD ANALYSIS

WORK TASK	POTENTIAL HAZARDS	CONTROLS
ACTIVITY: Mobilization and Utility Clearance		
Site Mobilization/Activity	Biological Hazards.	Proper clothes, body inspections, insect repellant.
	Slip, Trip, Fall Hazards	Identify and repair potential tripping hazards. Maintain safe and orderly work areas.
	Traffic Hazards	Use traffic cones, signage, and traffic safety vests in accordance with New York City Traffic Regulations. Use a traffic spotter
	Adverse Weather	Monitor weather daily. Discontinue work as necessary based on lightning, limited visibility, impaired mobility, etc.
	Noise	Distancing form noise, hearing protection
	Heat/Cold Stress	Acclimatization, work/rest regimes, drinking warm/cold fluids.
Protective Equipment: Safety glasses and steel-toe boots. Hard hat and leather work gloves as needed.		
WORK TASK	**POTENTIAL HAZARDS**	**CONTROLS**
Activity: Subsurface Boring and Monitoring Well Installation and Sample Collection		
Subsurface Boring and Monitoring Well Installation and Sample Collection	Heavy Equipment / Proximity to Heavy Equipment	Distancing, safe work practices, inspections, wear hearing protection.
	Excavation Hazards	Sloping/shoring practices, distancing personnel from excavation, hard hat.
	Adverse Weather	Monitor weather daily. Discontinue work as necessary based on lightning, limited visibility, impaired mobility, etc.
	Heat/Cold Stress	Acclimatization, work/rest regimes, drinking warm/cold fluids.
	Slip/Trip/Fall	Maintain safe and orderly work areas. Unloading areas should be on even terrain. Identify and repair potential tripping hazards.
	Noise	Distancing form noise, hearing protection
	Tool Use	Use proper guarding, inspections, wear safety glasses with side shields, hearing protection.
	Contaminant Contact	Wear protective coveralls (e.g., Tyvek®) (if needed) with shoe covers, nitrile gloves, and safety glasses when handling samples. Dispose of gloves after sampling. Personal protective equipment will be decontaminated and disposed of in general accordance with Section 10 of this HASP.
	Exposure to vapors from contaminated soils	Use work zone air monitoring equipment including photo-ionization detector and multiple gas meter (that monitors % oxygen, lower explosive limit, and hydrogen cyanide), and dust monitor to monitor the works zone as specified in Section 8.0 of the HASP. If air monitoring action levels are exceeded, then engineering controls will be implemented. If excursions of the action levels persist, then upgrade to half or full face respirator with HEPA/organic vapor cartridge as indicated in Section 6.0 of the HASP.
Protective Equipment: Hardhat, safety glasses, steel toe boots, nitrile gloves, protective coveralls. Ability to upgrade to half or full face respirator with HEPA/organic vapor cartridge if work zone action level is exceeded.		

APPENDIX D

HAZARD COMMUNICATION PROGRAM

1.0 POLICY AND PURPOSE

It is the policy of the Consultant to furnish employees with a working environment safe from recognized hazards. This program is designed to provide the Consultant compliance with OSHA's Federal Hazard Communication Standard (29 CFR 1910.1200 and 1926.59).

The Consultant Hazard Communication (HAZCOM) Program has been compiled to provide guidelines for assisting this corporation in meeting the requirements of OSHA's Hazard Communication Standard. This program addresses the evaluation of potential Consultant workplace hazards and communication of pertinent hazard information to Consultant employees.

The **CONTRACTOR** must develop a HAZCOM for **CONTRACTOR** employees and **SUBCONTRACTORs**.

Although most **CONTRACTOR** field projects do not involve the use of hazardous substances, it is imperative that all hazardous materials be managed in accordance with this program. This applies to any usage of hazardous materials regardless of volume. The Contractor shall generate a list of chemicals that are anticipated to be used during work activities.

2.0 SCOPE

In accordance with 29 CFR 1910.1200 and 1926.59, this program applies to any potentially hazardous chemical which is known to be present in the workplace in such a manner that employees may potentially be exposed under normal conditions of use. This program also addresses chemicals that may be constituents of waste that may be encountered on a typical Consultant job site.

3.0 LOCATION OF WRITTEN PROGRAM

A complete original of this written program is located with the Consultant Corporate Health and Safety Specialist (CHSS) and with each Consultant Office/Branch Manager.

4.0 RESPONSIBILITIES

Overall coordination and implementation of Consultant HAZCOM Program is the responsibility of the CHSS. Any questions, comments, or suggestions relating to Consultant HAZCOM Program should be directed to the CHSS.

The following subsections delineate the responsibilities of personnel as required for successful implementation of this program.

Corporate Health and Safety Specialist (CHSS)

The CHSS shall:

- Develop and oversee implementation of the written HAZCOM Program
- At a minimum, determine that field personnel engaged in hazardous waste operations receive OSHA 40-hour Health and Safety Training, 24-hour supervised on-the-job training, 8-hour Supervisory Training, and annual 8-hour Retraining as required by OSHA (29 CFR 1910.120 and 29 CFR 1926.65).

Office/Branch Managers

The Office/Branch Managers shall:

- Determine that all new employees at their office/branch receive training in accordance with the HAZCOM Program within 30 days of hire or prior to performing field work (whichever is sooner)
- Maintain at the office/branch an inventory of Material Safety Data Sheets (MSDSs) as available for all hazardous materials with which employees have the potential of coming into contact while on the job
- Determine that MSDSs are made readily available for employee review upon request by the employee
- Determine that label and warning protocol for hazardous materials is complied with.

Supervisors (Project Mangers and/or Field Team Leaders)

Supervisors shall:

- Develop and oversee completeness of site-specific HASPs for their projects
- Implement the hazard communication programs and HASPs for their projects
- Determine that field personnel are familiar with the HAZCOM Program regarding chemical use and potential chemical exposures in the field
- Determine that employees working on their project sites are familiar with site-specific HASPs and perform in compliance with the requirements of those HASPs.

Employee

It is the employee's responsibility to:

- Read the HAZCOM procedure within 30 days of employment by the Consultant or prior to performing field work for CONSULTANT (whichever is sooner)
- Gain familiarization with MSDSs of those hazardous materials which they use or may be exposed to
- Utilize information and measures as learned from the HAZCOM Program, including associated training and professional experiences, to protect themselves from adverse exposure to hazardous materials.

5.0 PROGRAM REQUIREMENTS

Material Safety Data Sheets (MSDSs) and Chemical List

Complete sets of MSDSs for chemicals specific to each office/branch are maintained by the Consultant Office/Branch Manager and made readily available for review upon request by any employee.

A list of chemicals potentially used/encountered by Consultant personnel at offices/branches involved in hazardous waste operations is provided in Table 11-1. Note that Table 11-1 is not necessarily complete.

MSDSs are available for the listed chemicals described below.

- MSDSs for chemicals that are typically used for decontamination and/or sample preservation are compiled. Supplies of these chemicals are generally kept in Consultant field equipment storerooms.
- MSDSs for chemicals and materials that may be encountered on typical Consultant job sites are compiled. These MSDSs are typically included in site-specific Health and Safety Plans. MSDSs should be reviewed prior to performing fieldwork on those sites.
- MSDSs for chemicals used for Photoionization detector (PID) soil gas instrument and standards are compiled. These chemicals are generally kept in small quantities to be used only by soil gas instrument technical personnel.

In addition, the consultant maintains an a comprehensive collection of MSDSs as printed by Genium Publishing Corporation and as obtained from manufacturers of products received at Consultants office are available for use by employees by request to the CHSS. This MSDS collection is updated periodically.

TABLE 11-1
CHEMICAL LIST

DECONTAMINATION AND/OR PRESERVATION CHEMICALS (Field/Storeroom Personnel)		
Chemical	*Amount Stored	Location
Acetone	2 liters	Field Equipment Room Flammable Storage Cabinet
Acetonitrile	2 liters	Field Equipment Room Flammable Storage Cabinet
1-Butanol (n-Butyl Alcohol)	0.5 liter	Field Equipment Room Flammable Storage Cabinet
Hexane	0.5 liter	Field Equipment Room Flammable Storage Cabinet
Hydrochloric Acid	0.5 liter	Field Equipment Room Corrosive Storage Cabinet

DECONTAMINATION AND/OR PRESERVATION CHEMICALS (Field/Storeroom Personnel)		
Chemical	*Amount Stored	Location
Methanol	40 liters	Field Equipment Room Flammable Storage Cabinet
Nitric Acid	15 liters	Field Equipment Room Corrosive Storage Cabinet
Sodium Hydroxide	1 kg	Field Equipment Room Corrosive Storage Cabinet (separated from acids)
Sulfuric Acid	0.5 liter	Field Equipment Room Corrosive Storage Cabinet
CHEMICALS POTENTIALLY ENCOUNTERED ON TYPICAL JOB SITES		
Benzene Coal Tar Creosote Coal Tar Pitch Cresol Cyanide 1,1-Dichloroethylene 1,2-Dichloroethylene (both isomers) Ethyl benzene Gasoline Naphtha (Coal Tar) Naphthalene and related PAHs Pentachlorophenol Perchloroethylene Polychlorinated Biphenyls Styrene 1,1,2,2-Tetrachloroethane Tetraethyl Lead Toluene 1,1,1-Trichloroethane (methyl chloroform) Trichloroethylene Xylene		
**SOIL GAS STANDARD CHEMICALS (used by soil gas personnel only)		
Chemical	*Amount Stored	Location
Stored for Occasional or Potential Future Use		
Benzene	10 grams	Field Equipment Room Refrigerator
1,1-Dichloroethylene	10 grams	Field Equipment Room Refrigerator
1,2-Dichloroethylene (both isomers)	14 grams	Field Equipment Room Refrigerator
Ethyl benzene	10 grams	Field Equipment Room Refrigerator
Perchloroethylene	10 grams	Field Equipment Room

**SOIL GAS STANDARD CHEMICALS (used by soil gas personnel only)		
Chemical	*Amount Stored	Location
Stored for Occasional or Potential Future Use		
		Refrigerator
Toluene	10 grams	Field Equipment Room Refrigerator
Trichloroethylene	10 grams	Field Equipment Room Refrigerator
Xylenes (o, m, & p)	6 grams	Field Equipment Room Refrigerator
Bromodichloromethane	1 gram	Field Equipment Room Refrigerator
Bromoform	5 grams	Field Equipment Room Refrigerator
2-Chloroethyl vinyl ether	5 grams	Field Equipment Room Refrigerator
Dibromochloromethane	1 gram	Field Equipment Room Refrigerator
1,4-Dichlorobenzene	5 grams	Field Equipment Room Refrigerator
1,2-Dichloropropane	5 grams	Field Equipment Room Refrigerator
1,3-Dichloropropene	2 grams	Field Equipment Room Refrigerator
Styrene	2 grams	Field Equipment Room Refrigerator
1,1,2,2-Tetrachloroethane	2 grams	Field Equipment Room Refrigerator
1,1,1-Trichloroethane	2 grams	Field Equipment Room Refrigerator
1,1,2-Trichloroethane	5 grams	Field Equipment Room Refrigerator
Trichlorofluoromethane	5 grams	Field Equipment Room Refrigerator
1,2,4-Trimethylbenzene	2 grams	Field Equipment Room Refrigerator
* Amounts stored are based on typical field equipment room inventory (Glastonbury Office). Actual amounts may vary depending on facility location and project requirements. ** Soil gas standard chemicals are used for field testing/calibration of soil gas, field, analytical equipment.		

LABELS AND WARNINGS

The Consultant labeling system for containers of hazardous materials is as follows:

- Containers are labeled, tagged, or marked in a legible fashion, with the identity of the hazardous materials contained therein.
- Containers are labeled, tagged, or marked in a legible fashion with the appropriate hazard warnings. This warning may be of any type of message, words, pictures or symbols that convey the hazards of the chemical.
- All required container labels, tags and/or markings are legible.
- Labels are affixed to the container itself (vs. lid). Note that lids may also be labeled, but not in lieu of container labeling.

The Consultant field equipment room maintenance technician is responsible that the Consultant labeling system is complied with at his/her office location. Project Managers and Field Team Leaders are responsible for determining that the Consultant labeling system is complied with for the field portion of their projects.

TRAINING

The Consultant Office/Branch Manager is responsible for determining that the HAZCOM Training Program is complied by personnel employed at their office/branch.

The Consultant's HAZCOM Program training requirements are listed below:

- Newly hired employees who may use or be exposed to hazardous materials will be required to familiarize themselves with the HAZCOM Program, and with the MSDSs associated with their job function.
- Selected employees will be required to attend a HAZCOM Program classroom training session. Training shall provide information on:

    - The physical and health hazards of the chemicals in the work area.
    - Methods and observations that may be used to detect the presence or release of a hazardous chemical in the work area.
    - Measures employees can take to protect themselves from these hazards.
    - The details of the HAZCOM Program, including an explanation of MSDSs and CONSULTANTs container labeling system.

- As required to achieve compliance with OSHA 1910.120 and 1926.65, technical staff engaged in hazardous waste operations will be provided with OSHA 40-hour HAZWOPER safety training, 24 hours of on-the-job training, and annual 8-hour HAZWOPER refresher courses.

6.0 MULTI-EMPLOYER WORK PLACES

The Consultant is obligated to provide the identity of any hazardous materials/conditions to other employers sharing the same workplace whose employees may be exposed. Likewise, all employers sharing the same workplace with the Consultant shall be obligated to identify all

hazardous materials/conditions to which employees may be exposed. The employer sharing space with the Consultant will be required by the Consultant Project Manager to:

- Determine that a mutual exchange of this information occurs, and that health and safety hazards are minimized.
- Provide to project employees, as part of the subcontractor HASP, MSDSs of identified hazardous materials to which they may be exposed.
- Conform in full to the requirements of 29 CFR 1910.1200 and 29 CFR 1926.59, applicable HASPs, and established work procedures.

These obligations may be accomplished via the exchange of written HAZCOM Programs, project HASPs, or MSDSs as appropriate.

7.0 BIENNIAL REVIEW

This program will be formally reviewed by the Consultant CHSS and company management on a biennial basis or more frequently if the CHSS deems it necessary to promote personnel safety. The program will be revised as necessary for continuing compliance with the OSHA Federal Hazard Communication Standard.

APPENDIX E

COLD STRESS PROGRAM

1.0 PURPOSE & INTRODUCTION

The purpose of this document is to educate the employee about exposure to cold environments and the effects of hypothermia and other cold-related injuries. Through proper use of Personal Protective Equipment (PPE), engineering and administrative controls; and education, cold injury, both to the extremities and the body's core temperature, can be prevented.

2.0 SCOPE

This program is intended for use by employees engaged in work with the potential for exposure to cold environments. This program will be reviewed annually by the Health and Safety Division. Training will be provided annually to all those potentially affected, and will include this written program.

3.0 WORKING IN COLD ENVIRONMENTS

1. Metabolic Responses

The human body is designed to function best at a rectal temperature of 99-100F. The body maintains this temperature in two ways: by gaining heat from food and muscular work; or, by losing it through radiation and sweating. By constricting blood vessels of the skin and/or shivering, the body uses its first line of cold defense.

Temperature control of the body is better understood by dividing the body into two main parts: the shell; and, the core. The shell is comprised of the skin, capillaries, nerves, muscles and fat. Other internal organs such as the heart, lungs, brain and kidneys make up the core.

During exposure to cold, the skin is first affected. Blood in the peripheral capillaries is cooled, sending a signal to a portion of the brain called the hypothalamus. Regulating body temperature is one of the many basic body functions of the hypothalamus. Acting like a thermostat, adjustments are performed in order to maintain normal body temperatures. When a chill signal is received, two processes are begun by the hypothalamus: conserve heat already in the body; and, generate new heat.

Heat conservation is performed through constriction of the blood vessels in the skin (shell), thus reducing heat loss from the shell and acting as an insulator for the core. Sweat glands are also inhibited, thus preventing heat loss by evaporation.

Additional fuel for the body is provided in the form of glucose. Glucose causes the heart to beat faster, sending oxygen and glucose-rich blood to the tissue where needed. In an attempt to produce heat, the muscles rapidly contract. This process is better known as “shivering”, and generates heat similarly to that created by strenuous activity, raising the body’s metabolic rate.

During physical activity and fatigue, the body is more prone to heat loss. As exhaustion approaches, blood vessels can suddenly enlarge, resulting in rapid loss of heat. Exposure to extreme cold causes nerve pulses to be slowed, resulting in fumbling, sluggish and clumsy reactions.

4.0 COLD INJURIES

Cold injuries are classified into two categories: local; or, general. Local injuries include frostbite, frostnip, chilblain and trenchfoot. General injuries include hypothermia and blood vessel abnormalities (genetically or chemically induced). Major factors contributing to cold injury are exposure to humidity and high winds; contact with wetness or metal; inadequate clothing; age; and, general health. Allergies, vascular disease, excessive smoking and/or drinking, and certain drugs and medicines are physical conditions that can compound the effects of exposure to a cold environment.

1. Hypothermia

Hypothermia is a condition of reduced body temperature. Most cases develop in air temperatures between 30-50°F, not taking wind-chill factor in consideration.

Symptoms of hypothermia are uncontrolled shivering and the sensation of cold. The heartbeat slows and sometimes becomes irregular, weakening the pulse and changing blood pressure. Changes in the body chemistry cause severe shaking or rigid muscles; vague or slow slurred speech; memory lapses; incoherence; and, drowsiness. Cool skin, slow irregular breathing, low blood pressure, apparent exhaustion, and fatigue after rest can be seen before complete collapse.

As the core temperature drops, the victim can become listless, confused, and make little or no effort to keep warm. Pain in the extremities can be the first warning of dangerous exposure to cold. Severe shivering must be taken as a sign of danger. At a core body temperature of about 85°F, serious problems develop due to significant drops in blood pressure, pulse rate and respiration. In some cases, the victim may die.

Sedative drugs and alcohol increase the risk of hypothermia. Sedative drugs interfere with the transmission of impulses to the brain. Alcohol dilates blood vessels near the skin's surface, increasing heat loss and lowering body temperature.

Table I provides information on the onset of hypothermia and metabolic responses at different body temperatures.

2. Raynaud's Phenomenon

Raynaud's Phenomenon is the abnormal constriction of the blood vessels of the fingers on exposure to cold temperatures, resulting in blanching of the ends of the fingers. Numbness, itching, tingling or a burning sensation may occur during related attacks. The disease is also associated with the use of vibrating hand tools in a condition sometimes called White Finger Disease. Persistent cold sensitivity, ulceration and amputations can occur in severe cases.

3. Acrocyanosis

Acrocyanosis is caused by exposure to the cold and reduces the level of hemoglobin in the blood, resulting in a slightly blue, purple or gray coloring of the hands and/or feet.

4. Frostbite

Frostbite is the freezing of the body tissues due to exposure to extremely low temperatures, resulting in damage to and loss of tissue. Frostbite occurs because of inadequate circulation and/or insulation, resulting in freezing of fluids around the cells of the body tissues. Most vulnerable parts of the body are the nose, cheeks, ears, fingers and toes.

Frostbite can affect outer layers of skin or can include the tissues beneath. Damage can be serious, with permanent loss of movement in the affected parts, scarring, necrotic tissue, and amputation are all possibilities. Skin and nails that slough off can grow back.

The freezing point of the skin is about 30F. As wind velocity increases, heat loss is greater and frostbite will set in more rapidly.

There are three (3) degrees of frostbite: first degree, freezing without blistering and peeling; second degree, freezing with blistering and peeling; and, third degree, freezing with death of skin tissues and possibly the deeper tissues.

The following are symptoms of frostbite:

a. Skin changes color to white or grayish-yellow, progresses to reddish-violet, and finally turns black as the tissue dies;

b. Pain may be felt at first, but subsides;

c. Blisters may appear;

d. Affected part is cold and numb.

The first symptom of frostbite is usually an uncomfortable sensation of coldness followed by numbness. Tingling, stinging, cramping and aching feelings will be experienced by the victim. Frostbite of the outer layer of the skin has a waxy or whitish look and is firm to the touch. Cases of deep frostbite cause severe injury. The tissues are cold, pale and solid. The victim is often unaware of the frostbite until someone else observes these symptoms. It is therefore important to use the "buddy system" when working in cold environments, so that any symptoms of overexposure can be noted.

Table II describes the cooling power of wind on exposed flesh. This information can be used as a guide for determining equivalent chill temperatures when the wind is present in cold environments.

5. Trench Foot and Chilblains

Trench foot is swelling of the foot caused by long, continuous exposure to cold without freezing, combined with persistent dampness or immersion in water. Edema (swelling), tingling, itching and severe pain occurs, followed by blistering, necrotic tissue and ulcerations. Chilblains have similar symptoms as trench foot, except that other areas of the body are affected.

6. Frostnip

Frostnip occurs when the face or extremities are exposed to a cold wind, causing the skin to turn white.

5.0 PREVENTION OF COLD STRESS

Cold Stress can be prevented through a combination of various factors: acclimation; water and salt displacement; medical screening, proper clothing selection; and, training and education. Through the use of engineering controls, work practices, work/rest schedules, environmental monitoring and consideration of the wind-chill temperature, the employee can be protected.

1. Acclimatization

Acclimation can be achieved to some degree. Sufficient exposure to cold causes the body to undergo changes to increase comfort and reduce the risk of injury. But, these changes are minor and require repeated exposure to cold and uncomfortable temperatures to induce them.

2. Dehydration

The dryness of cold air causes the body to lose a significant amount of water through the skin and lungs. It is essential that caffeine-free, non-alcoholic beverages be available at the worksite for fluid replacement. Dehydration also increases the risk of injury due to cold and affects blood flow to the extremities.

3. Diet

A well-balanced diet is important for employees working in cold environments. Diets restricted only to certain foods may not provide the necessary elements for the body to withstand cold stress, leaving the worker vulnerable.

4. Control Measures

When the wind chill factor results in an equivalent temperature of -26F, continuous exposure of the skin will not be permitted. Any worker exposed to temperatures of 36F or less that becomes immersed in water will be given dry clothing immediately and treated for hypothermia at the local hospital if any symptoms of hyperthermia are present. Notification of this incident will be provided to the Health and Safety Division immediately after sending the worker to the hospital.

5. Engineering Controls

The following are some ways that environmental controls can be used to reduce the effects of a cold environment:

a. General or spot heating should be used to increase temperature in certain areas in the workplace;

b. Warm air jets, radiant heaters or contact warm plates can be used to warm the worker's hands if fine work is to be performed with bare hands for 10 to 20 minutes or more;

c. Shield the work area if air velocity at the work site is increased by wind, draft or ventilating equipment;

d. Metal handles of tools and control bars should be covered with thermal insulating material at temperatures below 30F;

e. Unprotected metal chair seats will not be used in cold environments;

f. When appropriate and feasible, equipment and processes will be substituted, isolated, relocated, or redesigned;

g. Power tools, hoists, cranes or lifting aids will be used to reduce the metabolic workload;

h. Heated warming shelters will be made available for continuous work being performed in an equivalent temperature of 20F or below. Workers will be encouraged to use the shelters regularly.

6. Administrative Work Practice Controls

Work practices and guidelines can be designed and developed to reduce exposure to cold stress. Some of these may include:

a. Work-rest schedules to reduce the peak of cold stress;

b. Enforce scheduled breaks;

c. Enforce intake of warm caffeine-free, non-alcoholic beverages;

d. Schedule work that has potential exposure to cold stress for the warmest part of the day;

e. Move work to warmer areas, whenever possible;

f. Assign extra workers for high-demand tasks;

g. Provide relief workers for other workers needing breaks;

h. Teach basic principles of recognizing and preventing cold stress;

i. Use the buddy system for work at 10F or below, and keep within eyeshot;

j. Allow new employees to adjust to the conditions before they work full-time in cold environments;

k. Minimize sitting and standing in one place for long periods of time;

l. Include weight and bulkiness of clothing when estimating work performance requirements and weights to be lifted;

Table III provides a work/warm-up schedule for cold environments, with wind chill taken into account.

7. Special Considerations

Older workers and workers with circulatory problems should be extra careful in cold environments. Sufficient sleep and good nutrition are important preventive measures for maintenance tolerance to the cold. Double shifts and overtime work should be avoided when working in cold environments.

If any of the following symptoms are observed on site, the affected worker will immediately go to warm shelter:

- Onset of heavy shivering;
- Frostnip;
- Feeling of excessive fatigue;
- Drowsiness;
- Euphoria.

After entering the warm shelter, the outer layer of clothing should be removed. If the clothing is wet from sweat and perspiration, dry clothing should be provided. If this is not feasible, then the clothing should be loosened to allow sweat to evaporate.

Anyone working in cold environments and on prescribed medication should consult their physician concerning any possible side effects due to cold stress. Those individuals suffering from diseases and/or taking medication that interferes with normal body temperature regulation or reduces the tolerance to cold will not be allowed to work in temperatures of 30F or below.

6.0 PERSONAL PROTECTIVE EQUIPMENT (PPE)

In choosing PPE for cold environments, it is important to maintain airspace between the body and outer layer of clothing to retain body heat. The more air pockets, the better the insulation. The clothing should also allow for the evaporation of sweat if the skin is wet.

The most important parts of the body to protect are the feet, hands, head and face. Hands and feet become cooled most easily, because of their distance from the heart. Keeping the head covered is equally important. As much as 40% of body heat loss is through the head when it is exposed.

Ideal clothing for exposure to cold environments is made of cotton. Cotton picks up sweat off the body and brings it to the surface. Loosely fitted clothing also aids in sweat evaporation. Recommended clothing may include the following:

a. Polypropylene under shirt and shorts under thermal underwear (preferably two-piece);

b. Wool socks;

c. Wool or thermal pants, lapped over boot tops to keep out snow and water;

d. Suspenders (belts can constrict and reduce circulation);

e. Insulated work boots, preferably waterproof. Safety toe, if necessary;

f. Wool or cotton shirt;

g. Parka;

h. Knit cap/hard hat liner;

i. Wool mittens or gloves (depending on the dexterity required);

j. Face mask or scarf.

Dirty or greasy clothing loses much of its insulation value. Dirty clothing crushes air pockets, allowing air to escape more easily. Also, denim is not a good protective fabric. It is loosely woven and allows water to penetrate and wind to blow away body heat.

TABLE I
Progressive Clinical Presentation of Hypothermia*

Core Temperature Deg. C	Deg. F	Clinical Signs
37.6	99.6	"Normal" rectal temperature.
37	98.6	"Normal" oral temperature.
36	96.8	Metabolic rate increases in an attempt to compensate for heat loss.
35	95.0	Maximum shivering.
34	93.2	Victim conscious and responsive, with normal blood pressure.
33	91.4	Severe hypothermia below this temperature.
32	89.6	Consciousness clouded; blood pressure becomes difficult to obtain;
31	87.8	pupils dilated but react to light; shivering ceases.
30	86.0	Progressive loss of consciousness; muscular rigidity increases;
29	84.2	pulse and blood pressure difficult to obtain; respiratory rate decreases.
28	82.4	Ventricular fibrillation possible with myocardial irritability.
27	80.6	Voluntary motion ceases; pupils non-reactive to light; deep tendon and superficial reflexes absent.
26	78.8	Victim seldom conscious.
25	77.0	Ventricular fibrillation may occur spontaneously.
24	75.2	Pulmonary edema.
22	71.6	Maximum risk of ventricular fibrillation.
20	68.0	Cardiac standstill.
18	64.4	Lowest accidental hypothermia victim to recover.
17	62.6	Isoelectric electroencephalogram.
9	48.2	Lowest artificially cooled hypothermia patient to recover.

* Presentations approximately related to core temperature. Reprinted from the January 1982 issue of American Family Physician, published by the American Academy of Family Physicians.

TABLE II
Cooling Power of Wind on Exposed Flesh as Equivalent Temperature (under calm conditions)*

Estimated Wind Speed (mph)	**Actual Temperature Reading (Degrees Fahrenheit)**											
	50	**40**	**30**	**20**	**10**	**0**	**-10**	**-20**	**-30**	**-40**	**-50**	**-60**
	Equivalent Chill Temperature (F)											
Calm	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
5	48	37	27	16	6	-5	-15	-26	-36	-47	-57	-68
10	40	28	16	4	-9	-24	-33	-46	-58	-70	-83	-95
15	36	22	9	-5	-18	-32	-45	-58	-72	-85	-99	-112
20	32	18	4	-10	-25	-39	-53	-67	-82	-96	-110	-121
25	30	16	0	-15	-29	-44	-59	-74	-88	-104	-118	-133
30	28	13	-2	-18	-33	-48	-63	-79	-94	-109	-125	-140
35	27	11	-4	-20	-35	-51	-67	-82	-98	-113	-129	-145
40	26	10	-6	-21	-37	-53	-69	-85	-100	-116	-132	-148
(Wind speeds greater than 40 mph have little additional effect).	LITTLE DANGER In < hr with dry skin. Maximum danger of false sense of security.				INCREASING DANGER Danger from freezing of exposed flesh within one minute.			GREAT DANGER Flesh may freeze within 30 seconds.				
	Trenchfoot and immersion foot may occur at any point on this chart.											

* Developed by the U.S. Army Research Institute of Environmental Medicine, Natick, MA

Note #1: Wind speeds greater than 40 mph have little additional effect.

Note #2: Trenchfoot and immersion foot may occur at any point on this chart

TABLE III

Threshold Limit Values Work/Warm-up Schedule for 4 Hour Shift (*)

Air Temp.-Sunny Sky		**No Noticeable Wind**		**5 mph Wind**		**10 mph Wind**		**15 mph Wind**		**20 mph Wind**	
˚C (approx)	**˚F (approx)**	**Max. Work Period**	**No. of Breaks**	**Max. Work Period**	**No. of Breaks**	**Max. Work Period**	**No. of Breaks**	**Max. Work Period**	**No. of Breaks**	**Max. Work Period**	**No. of Breaks**
-26˚ to -28˚	-15˚ to -19˚	(Norm. Breaks)	1	(Norm.Breaks)	1	75 min.	2	55 min.	3	40 min.	4
-29˚ to -31˚	-20˚ to -24˚	(Norm. Breaks)	1	75 min	2	55 min.	3	40 min.	4	30 min.	5
-32˚ to -34˚	-25˚ to -29˚	75 min	2	55 min.	3	40 min.	4	30 min.	5	Non-emergency work should cease	
-35˚ to -37˚	-30˚ to -34˚	55 min.	3	40 min.	4	30 min.	5	Non-emergency work should cease			
-38˚ to -39˚	-35˚ to -39˚	40 min.	4	30 min.	5	Non-emergency work should cease					
-40˚ to -42˚	-40˚ to -44˚	30 min.	5	Non-emergency work should cease							
-43˚ & below	-45˚ & below	Non-emergency work should cease									

Notes for TABLE III:

1. Schedule applies to moderate to heavy work activity with warm-up breaks of 10 minutes in a warm location. For light to moderate work (limited physical motion), apply the schedule one step lower. For example, at -30F with no noticeable wind (step 4, a worker at a job with little physical movement should have a maximum work period of 40 minutes with 4 breaks in a 4 hour period.

2. The following is suggested as a guide for estimating wind velocity if accurate information is not available: 5 mph, light flag moves; 10 mph, light flag fully extended; 15 mph, raises newspaper sheet; 20 mph, blowing drifting snow.

3. If only the wind-chill cooling rate is available, a rough rule of thumb for applying it rather than the temperature and wind velocity factors given above would be: 1) special warm-up breaks should be initiated at a wind-chill cooling rate of about 17 W/m2; 2) all non-emergency work should have ceased at or before a wind-chill of 2250 W/m2. In general the warm-up schedule provided above slightly under-compensates for the wind at the warmer temperatures, assuming acclimatization and clothing appropriate for winter work. On the other hand, the chart over-compensates for the actual temperatures in the colder ranges, since windy conditions prevail at extremely low temperatures.

4. TLVs apply only for workers in dry clothing.

* Adapted from Occupational Health and Safety Division, Saskatchewan Department of Labour.

APPENDIX F

HEAT STRESS PROGRAM

1.0 INTRODUCTION

Heat stress is one of the most common (and potentially serious) illnesses at job sites. Although it is caused by a number of interacting factors, the wearing of personal protective equipment (PPE) puts the worker at a much higher risk during warmer environmental conditions. The results of heat stress range from fatigue to serious illness or death. Through regular fluid replacement and other preventive measures, heat stress can be controlled, leading to increased efficiency and a higher level of safety on the job.

2.0 PURPOSE

To create an awareness among employees concerning the body's physiologic responses to heat; different types of heat stress that can affect the body; recognition of signs and symptoms; first aid treatment; and, preventive measures.

3.0 SOURCES OF HEAT

There are two sources of heat that are important to anyone working in a hot environment:

- Internally generated metabolic heat;
- Externally imposed environmental heat.

4.0 PHYSIOLOGIC RESPONSES TO HEAT

The human body maintains a fairly constant internal temperature, even though it is exposed to varying environmental temperatures. To keep internal body temperatures within safe limits, the body must get rid of its excess heat, primarily through varying the rate and amount of blood circulation through the skin and the release of fluid onto the skin by the sweat glands. These automatic responses usually occur when the temperature of the blood exceeds 98.6°F and are kept in balance and controlled by the brain. In this process of lowering internal body temperature, the heart begins to pump more blood, blood vessels expand to accommodate the increased flow, and the microscopic blood vessels (capillaries) which thread through the upper layers of the skin begin to fill with blood. The blood circulates closer to the surface of the skin, and the excess heat is lost to the cooler environment.

If the heat loss from increased blood circulation through the skin is not adequate, the brain continues to sense overheating and signals the sweat glands in the skin to release large quantities of sweat onto the skin surface. Evaporation of sweat cools the skin, eliminating large quantities of heat from the body.

As environmental temperatures approach normal skin temperature, cooling of the body becomes more difficult. If air temperature is as warm as or warmer than the skin, blood brought to the body surface cannot lose its heat. Under these conditions, the heart continues to pump blood to the body surface, the sweat gland pour liquids containing electrolytes onto the surface of the skin, and the evaporation of the sweat becomes the principal effective means of maintaining a constant body temperature. Sweating does not cool the body unless the moisture is removed from the skin by evaporation. In high humidity, the evaporation of sweat from the skin is decreased and the body's efforts to maintain an acceptable body temperature may be significantly impaired. These conditions adversely affect an individual's ability to work in the hot environment. With so much blood going to

the external surface of the body, relatively less goes to the active muscles, the brain, and other internal organs; strength declines; and fatigue occurs sooner than it would otherwise. Alertness and mental capacity also may be affected. Workers who must perform delicate or detailed work may find their accuracy suffering, and others may find their comprehension and retention of information lowered.

When temperature differences exist between two or more bodies, heat can be transferred. Net heat transfer is always from the body (or object) of higher temperature to that of lower temperature and occurs by one or more of the following mechanisms:

Conduction. The transfer of heat from one point to another within the body, or from one body to another when both bodies are in physical contact. Conduction can be a localized source of discomfort from direct physical contact with a hot or cold surface, it is normally not a significant factor to total heat stress.

Convection. The transfer of heat from one place to another by moving gas or liquid. Natural convection results from differences in density caused by temperature differences. Thus warm air is less dense than cool air.

Radiation. The process by which energy, electromagnetic (visible and infrared), is transmitted through space without the presence or movement of matter in or through this space.

5.0 PREDISPOSING FACTORS TO HEAT STRESS

Factors that may predispose an individual to heat stress vary according to the individual. These factors include:

- Lack of physical fitness;
- Lack of acclimatization;
- Age;
- Dehydration;
- Obesity;
- Drug/alcohol abuse;
- Infection;
- Sunburn;
- Diarrhea;
- Chronic disease.

Predisposing factors and an increased risk of excessive heat stress are both directly influenced by the type and amount of PPE worn. PPE adds weight and bulk, reduces the body's access to normal heat exchange mechanisms (evaporation, convection and radiation) and increases energy expenditure.

6.0 FORMS OF HEAT STRESS AND FIRST AID

(The following excerpts were taken from NIOSH Publication No. 86-112, Working in Hot Environments):

"Excessive exposure to a hot work environment can bring about a variety of heat-induced disorders. Among the most common are heat stroke, heat exhaustion, heat cramps, fainting and heat rash.

Heat Stroke

Heat Stroke is the most serious of health problems associated with working in hot environments. It occurs when the body's temperature regulatory system fails and sweating becomes inadequate. The body's only effective means of removing excess heat is compromised with little warning to the victim that a crisis stage has been reached.

A heat stroke victim's skin is hot, usually dry, red or spotted. Body temperature is usually 105°F or higher, and the victim is mentally confused, delirious perhaps in convulsions, or unconscious. Unless the victim receives quick and appropriate treatment, death can occur.

Individuals with signs or symptoms of heat stroke require immediate hospitalization. First aid should be immediately administered. This includes removing the victim to a cool area, thoroughly soaking the clothing with water, and vigorously fanning the body to increase cooling. Further treatment, at a medical facility, should be directed to the continuation of the cooling process and the monitoring of complications which often accompany heat stroke. Early recognition and treatment are the only means of preventing permanent brain damage or death.

Heat Exhaustion

Heat Exhaustion includes several clinical disorders having symptoms which may resemble the early symptoms of heat stroke. Heat exhaustion is caused by the loss of large amounts of fluid by sweating, sometimes with excessive loss of salt. A worker suffering from heat exhaustion still sweats but experiences weakness or fatigue, giddiness, nausea or headache. In more serious cases, the victim may vomit or lose consciousness. The skin is clammy and moist, the complexion is pale or flushed, and the body temperature is normal or only slightly elevated.

In most cases, treatment involves having the victim rest in a cool place and drink plenty of liquids. Victims with mild cases of heat exhaustion usually recover spontaneously with this treatment. Those with severe cases may require extended care for several days. There are no known permanent effects.

Heat Cramps

Heat cramps are painful spasms of the muscles that occur among those who sweat profusely in heat, drink large quantities of water, but do not adequately replace the body's salt loss. The drinking of large amounts of water tends to dilute the body's fluids, while the body continues to lose salt. Shortly after, the low salt level in the muscles causes painful cramps. The affected muscles may be part of the arms, legs, or abdomen; but tired muscles

(those used in performing the work) are usually the ones most susceptible to cramps. Cramps may occur during or after work hours and may be relieved by taking salted liquids by mouth.

Fainting

Fainting occurs in workers not accustomed to hot environments and who stand erect and immobile in the heat.

With enlarged blood vessels in the skin and in the lower part of the body due to the body's attempts to control internal temperature, blood may pool there rather than return to the heart to be pumped to the brain. Upon lying down, the worker should soon recover. By moving around, and thereby preventing blood from pooling, the patient can prevent further fainting.

Heat Rash (Prickly Heat)

Heat rash, also known as prickly heat, is likely to occur in hot, humid environments where sweat is not as easily removed from the surface of the skin by evaporation and the skin remains wet most of the time. The sweat ducts become plugged, and a skin rash soon appears. When the rash is extensive or when it is complicated by infection, prickly heat can be very uncomfortable and may reduce a worker's performance. The worker can prevent this condition by resting in a cool place part of each day and by regularly bathing and drying the skin."

7.0 SELECTION OF PERSONAL PROTECTIVE EQUIPMENT (PPE)

During work periods where the increased risk of heat stress exists, each item's benefit will be carefully evaluated. Once the PPE is chosen, safe work durations/rest periods will be determined based on the following conditions:

- Anticipated work rate;
- Ambient temperature and humidity;
- Level of protection.

8.0 PREVENTION OF HEAT STRESS

Prevention of heat stress will be addressed in the following manner:

1. Adjustment of work schedules.

    a. Modify work/rest schedules.
    b. Enforce work slowdowns, as needed.
    c. Rotate personnel to minimize overstress or overexertion.
    d. When possible, work will be scheduled and performed during cooler hours.

1. Provide shelter or shaded areas to protect personnel during rest periods.

2. Maintain worker's body fluids at normal levels.

a. Drink approximately 12 to 16 ounces of non-caffeinated liquid (preferably water, Gatorade or equivalent) prior to the start of work. Caffeinated fluids act to dehydrate the worker.

b. Workers will be urged to drink a cup or two every 15 to 20 minutes, or at each break. A total of 1 to 1.5 gallons of water per individual per day are recommended for fluid replacement under heat stress conditions, but more may be required.

3. Encourage physical fitness among the workers.

   Gradually acclimatize workers on site to help build up an "immunity" to the conditions.

   - Heat acclimatization can usually be induced in 5 to 7 days of exposure at a hot job. For workers with previous experience with the job, acclimatization will include exposures of 50% for day 1, 60% for day 2, 80% for day 3, and 100% for the remaining additional days.

4. Provide cooling devices during prolonged work or severe heat exposure.

   a. Supply field showers or hose down areas.

   b. Supply personnel with cooling jackets, vests, and suits.

5. Train workers in recognition and treatment of heat stress.

6. Use of the buddy system that depends on the recognition of signs and symptoms of heat stress.

7. Identification of heat-intolerant individuals through medical screening.

APPENDIX G

PERSONAL PROTECTIVE EQUIPMENT (PPE) PROGRAM:

1.0 PURPOSE

This program has been developed to aide in the proper selection and use of personal protective equipment (PPE) to protect workers from identified potential hazards. Careful selection and use of adequate PPE should protect the respiratory system, skin, eyes, face, hands, feet, head, body and hearing. **CONTRACTOR** employees may work at a variety of job sites and locations, which may require different types of protective equipment. Client specific requirements will always be adhered to. **CONTRACTOR** will supply all PPE or reimburse the employee for the costs of PPE if the PPE is required as part of the project.

2.0 SCOPE

This program establishes criteria for the selection, use, donning and doffing, inspection, maintenance, storage, decontamination of PPE, and evaluation. This information is general, and specific PPE use should be included in the site-specific health and safety plan prepared for each project.

3.0 OSHA REQUIREMENTS (29 CFR 1910.120)

A written personal protective equipment program, which is part of the employer's safety and health program and also part of the site-specific health and safety plan shall be established. The PPE program shall address the elements listed below.

- PPE selection based upon site hazards
- PPE use and limitations of the equipment
- Work mission duration
- PPE maintenance and storage
- PPE decontamination and disposal
- PPE training and proper fitting
- PPE donning and doffing procedures
- PPE inspection procedures prior to, during and after use
- Evaluation of the effectiveness of the PPE program
- Limitations during temperature extremes, heat stress, and other appropriate medical considerations

OSHA Standard 29 CFR 1910.132 requires employers to assess the employer's workplace and determine if hazards are present that necessitate the use of PPE. This assessment must be certified in writing and documented.

Due to the variety of job sites and situations that **CONTRACTOR** personnel may be involved in, it is important that **CONTRACTOR** maintain a consistent approach in complying with health and safety procedures. The project manager and/or site supervisor are responsible for ensuring that all personnel wear the appropriate PPE. Failure to comply with these requirements may result in disciplinary action. Employee safety is a paramount concern for all **CONTRACTOR** managers and employees. These procedures will now require the following:

1. Protective footwear must be worn by all field personnel working in the field. Footwear must at a minimum include steel toe and shank protection. Additionally, chemical

protective footwear may also be required if the potential for contaminated materials exists. This type of protection will be required on a site-specific basis.

2. Eye protection must be worn by all field personnel during all sampling activities, drilling and earth removal activities, stack sampling, and inside manufacturing facilities. Eye protection must include side shields. Prescription lenses worn as eye protection and other protective eyewear must meet ANSI Z87.1-1989.

3. Hardhats are to be worn by all field personnel when in the field. New hardhats must meet ANSI Z89-1986.

4. Hand protection is to be worn on a task-specific basis. The hand protection must be selected based on the chemical hazards expected to be encountered. **CONTRACTOR** maintains a stock of a variety of gloves including:

Best:	Nitrile N-Dey
	PVC
	Latex
	Vinyl
	Solvex, Nitrile
	Leather Work Gloves

Additionally, nitrile coated Kevlar gloves or other types of puncture resistant gloves are to be worn by all personnel working with or cleaning glass impingers. Manufacturers that supply these gloves include Ansell Edmont, Jomac and Wells Lamont. Insulated electrical gloves with outer leather gloves is required when working around high-voltage systems. **CONTRACTOR** is responsible for supplying all personal protective equipment required for **CONTRACTOR**'s projects.

4.0 WORK MISSION DURATION

Before donning any PPE ensembles, workers will estimate their anticipated work duration. There are several limiting factors that affect the length of work time. These factors must be addressed:

- Air supply consumption
- Breakthrough time on respirator cartridges.
- Available cartridge for the chemical for air purifying respirators
- Permeation and penetration of the Chemical Protective Clothing/ensemble;
- Ambient temperature; and
- Coolant supply (ice or chilled area to keep the worker's body temperature at a normal temperature).

No single combination of PPE is capable of protection against all hazards. Thus PPE must be used in conjunction with other protective methods and its effectiveness evaluated periodically.

The use of PPE can itself create significant worker hazards, such as heat stress, physical and psychological stress and impaired vision, mobility and communication. For any given situation, equipment and clothing should be selected that provide an adequate level of protection. However, over-protection as well as under-protection can be hazardous and should be avoided when possible.

5.0 LEVEL OF PROTECTION

The following section describes the different levels of protection (A through D). Each level is described in the following manner: the protection provided; when this particular level of protection should be used; recommended and optional equipment; and, any limiting criteria. Combinations of PPE other than those described for Levels A, B, C and D protection may be more appropriate and may be used to provide the proper level of protection.

1. Level A

   a. Protection provided:

      - Level A provides the highest available level of respiratory, skin and eye protection.

   b. Should be used when:

      - The chemical substance has been identified and requires the highest level of protection for skin, eyes, and the respiratory system based on any of the following circumstances;

      - Measured (or potential for) high concentration of atmospheric vapors, gases or particulates;

      - Site operations and work functions involving a high potential for splash, immersion, or exposure to unexpected vapors, gases or particulates of materials that are harmful to skin or capable of being absorbed through intact skin;

      - Substances with a high degree of hazard to the skin are known or suspected to be present, and skin contact is possible;

      - The Operations must be conducted in confined, poorly ventilated areas until absence of conditions requiring Level A protection is determined.

   c. Recommended equipment:

      - Pressure-demand, full face piece SCBA or pressure-demand supplied-air respirator with escape SCBA;

      - Fully-encapsulating, chemical-resistant suit (pressure-tested immediately before use);

- Inner chemical-resistant suit;
- Inner chemical-resistant gloves;
- Chemical-resistant safety boots/shoes; and
- Two-way radio communications.

d. Optional equipment:

- Cooling unit;
- Coveralls;
- Long cotton underwear;
- Hard hat; and
- Disposable gloves and boot covers.

e. Limiting criteria:

- Fully encapsulating suit material must be compatible with the substances involved.

2. Level B

a. Protection provided:

- The same level of respiratory protection, but less skin protection than Level A.

b. Should be used when:

- The type and atmospheric concentration of substances have been identified and require a high level of respiratory protection, but less skin protection. This involves atmospheres with IDLH concentrations of specific substances that do not represent a severe skin hazard, or that do not meet the criteria for use of air purifying respirators;
- Atmospheres contain less than 19.5% oxygen; and
- Presence of incompletely identified vapors or gases indicated by direct-reading organic vapor detection instrument, but vapors and gases are not suspected of containing high levels of chemicals harmful to skin or capable of being absorbed through the intact skin.

c. Recommended equipment:

- Pressure-demand, full face piece SCBA or pressure-demand supplied-air respirator with escape SCBA;

- Chemical-resistant clothing (overalls and long-sleeved jacket; hooded, one- or two-piece chemical splash suit; disposable chemical-resistant one-piece suit);

- Inner and outer chemical-resistant gloves;

- Chemical-resistant safety boots/shoes;

- Hard hat; and

- Two-way radio communications.

d. Optional equipment:

- Coveralls;
- Disposable boot covers;
- Face shield; and
- Long cotton underwear.

e. Limiting criteria:

- Use only when the vapors or gases present are not suspected of containing high concentrations of chemicals that are harmful to skin or capable of being absorbed through the intact skin.

- Use only when it is highly unlikely that the work being done will generate either high concentrations of vapors, gases or splashes of material that will affect the exposed skin.

3. Level C

a. Protection provided:

- Level C provides the same level of skin protection as Level B, but a lower level of respiratory protection.

b. Should be used when:

- The atmospheric contaminants, liquid splashes, or other direct contact will not adversely affect any exposed skin;

- The types of air contaminants have been identified, concentrations measured, and a canister/cartridge is available that can remove the contaminant; and

- All criteria for the use of air-purifying respirators are met.

c. Recommended equipment:

- Full face piece or half face piece air-purifying negative pressure respirator;

- Chemical-resistant clothing;
- Inner and outer chemical-resistant gloves;
- Chemical-resistant safety boots and shoes;
- Disposable boot covers;
- Hard hat; and
- Two-way radio communications.

d. Optional equipment:

- Coveralls;
- Face shield;
- Escape bottle; and
- Long cotton underwear.

e. Limiting criteria:

- Atmospheric concentration of chemicals must not exceed IDLH levels; and
- The atmosphere must contain at least 19.5% oxygen.

4. Level D

a. Protection provided:

- No respirator protection and minimal skin protection.

b. Should be used when:

- The atmosphere contains no known hazard; and

- Work functions preclude splashes, immersion, or the potential for unexpected inhalation of or contact with hazardous levels of any chemicals.

c. Recommended equipment:

- Coveralls;
- Safety boots/shoes;
- Safety glasses or chemical splash goggles; and
- Hardhat.

d. Optional equipment:

- Gloves;
- Face shield.

e. Limiting criteria:

- This level should not be worn in the exclusion zone; and
- The atmosphere must contain at least 19.5% oxygen.

6.0 LEVEL OF PROTECTION UTILIZED BY CONTRACTOR PERSONNEL

Due to the nature of our work, personnel will not perform any work that will require the use of Level A protection. Contractor will not directly undertake assignments and Contractor does not train or equip its personnel to handle circumstances involving Level A protection. If Contractor is working on a site and Level A is deemed necessary, the work will be subcontracted to a qualified firm. Contractor personnel should not directly undertake these tasks.

Sites where Contractor is working often require the use of Level C or D, with Level B equipment available on-site for emergency rescue if necessary. Any questions concerning the level of protection necessary to complete a certain task will be directed to the Corporate Environmental Safety Manager before setting up the job.

7.0 TYPES OF CONTRACTOR PPE

The following list contains all types of PPE that the **CONTRACTOR** has ready access to if required by site conditions or KeySpan bid requirements for site activities.

1. Respiratory Equipment:

    a. SCBAs:

        - Used for emergency rescue and exposures greater than maximum use concentration limits set for canister/cartridge type negative pressure respirators.

    b. Supplied-air respirators:

        - MSA Premaire system.

    c. Negative pressure respirators:

        - Half face and full face, used for exposure to certain types of acid gases, organic vapors and particulates not greater than the canister/cartridge maximum use concentration limit.

2. Chemical protective apparel suits:

    a. Polycoated Tyvek®, Saranex, Chemrel and Tyvek® (porous). Provide protection against certain liquid chemicals.

        - Tyvek® provides protection against particulates only.

    b. Fire/flame retardant coveralls:

        - Provide protection against flash fires.

3. Insulated clothing (Provides protection against exposure to the cold:

a. Chemical resistant gloves:

- Provide protection for the hands against skin contact and skin absorption.

b. Disposable boot covers:

- Protect safety boots from contamination and feet from contact with chemicals.

4. Eye protection:

a. Safety glasses and chemical splash goggles.

- Safety glasses protect the eyes against large particles and projectiles.
- Chemical splash goggles protect the eyes against vaporized chemicals, splashes, large particles, and projectiles.

b. Vented goggles do not provide protection against vapors and are not adequate for splashes, as material may seep inside the goggles.

5. Hard hat:

- Provides protection against blows to the head. When worn with a liner, provides protection against the cold.

6. Construction safety boots:

- Steel-toe and shank construction boots with chemically resistant soles protect the feet from heavy and sharp objects, and contact with chemicals.

7. Safety harnesses and lifelines:

- Enable the individual to work in elevated areas or enter confined spaces to prevent falls and aid in rescue.

8. Hearing protection:

- Provides protection against physiological damage.

9. Canvas work gloves:

- Provide protection for the hands against abrasions and slivers.

8.0 SELECTION OF CHEMICALLY PROTECTIVE CLOTHING

1. Chemically-protective clothing (CPC) will be chosen in the following manner:

a. Determine what chemicals are present on the site.

b. CPC chosen must be resistant to permeation, degradation and penetration of the chemical(s).

- Permeation - Process by which a chemical dissolves in and/or moves through a protective clothing material on a molecular level.

- Degradation - The loss of or change in the fabric's chemical resistance or physical properties due to exposure to chemicals, use or ambient conditions (e.g., sunlight).

- Penetration - The movement of chemicals through zippers, stitched seams or imperfections (e.g., pinholes) in CPC.

c. Review manufacturer's permeation data to determine the performance characteristics of the material to the specific chemical. .

d. Select CPC that protects against the greatest range of chemicals on the site and has the longest breakthrough time.

e. Discuss choice of CPC with the project CESM, PM, and SSO prior commencing work.

9.0 DONNING AND DOFFING PROCEDURES

The following procedures will be used by **CONTRACTOR** employees for donning and doffing PPE at protection Levels B and C. Donning and doffing will be performed with the assistance of an individual(s) located in the Support Zone and Contamination Reduction Zone, respectively. This individual will help the worker tape up and adjust PPE for proper fit, as well as remove PPE after decontamination.

1. Donning PPE

- Inspect the clothing and respirator before donning.
- Unzip the suit.
- Step into the legs of the suit, slipping the feet through the legs. Push arms through the sleeves.
- Pull leg cuffs over the feet.
- Put on chemical-resistant safety boots over the feet. Tape the leg cuff over the tops of the boots.
- Pull over chemical-resistant boot covers and tape over the leg cuff.
- If suit contains protective feet, wear chemical-resistant safety boots inside the suit with chemical-resistant boot covers over the suit and taped securely to the leg.
- If wearing a SCBA, don the face piece and adjust it to be secure, but comfortable. Do not connect the breathing hose. Open valve on the air tank.
- If wearing a negative pressure respirator, pull hood over the head and perform positive and negative pressure face piece seal test.
- Pull on chemical protective inner gloves.
- Pull on chemical protective outer gloves and tape securely to the sleeve of the suit.
- Securely tape the suit to protect all exposed skin around the neck area, and if wearing a full-face piece, tape around the edge of the hood-to-face piece junction.
- Put on hardhat, if needed, and tape securely on top of head so that the hard hat does not slide off.

2. Doffing PPE

- Doffing of PPE will not take place until the individual has been properly decontaminated by a suitably attired assistant. Both the worker and assistant will make every effort to avoid any direct contact with the outside of the suit.

- If the individual is wearing a SCBA, the hose connection to the diaphragm will be disconnected, leaving the face piece on the wearer. The remainder of the unit will be removed and decontaminated before proceeding further.

- If the individual is wearing a half-face or full-face negative pressure respirator, she/he will be instructed to leave it on until the doffing procedure is complete.

NOTE: Decontamination is to be performed in accordance with the Site-Specific Health and Safety Plan for the site.

10.0 DECONTAMINATION OF PPE

Whenever possible, disposable PPE will be used on-site. Disposable PPE includes the following:

- Chemical protective suits;
- Gloves; and
- Chemical protective boot covers.

After decontaminating the worker, PPE is disposed of on-site in labeled disposal containers.

11.0 INSPECTION OF PPE

PPE will be inspected prior to, during and after each use according to the procedure outlined below.

1. Prior to use (Reusable and Disposable PPE):

    a. Through reviewing available literature, determine that the clothing material is correct for the task.

    b. Visually inspect for:

        - Imperfect seams;
        - Non-uniform coatings;
        - Tears or holes; and
        - Malfunctioning closures.

    c. Hold up to the light and check for pinholes (inflate gloves and check for leaks).

    d. Flex and check for:

        - Cracks; and
        - Shelf deterioration.

e. If previously used, check for:

- Discoloration;
- Swelling;
- Stiffness and cracking; and
- Holes and tears.

2. During use (Reusable and Disposable PPE), check for:

a. Evidence of chemical attack.
b. Discoloration, swelling, stiffening, softening and/or cracking.
c. Tears.
d. Punctures.
e. Seam discontinuities.

Note: Report any sense of breakthrough to the Health and Safety Assessment Division. Medical monitoring may be necessary to determine the extent of exposure.

3. After use (Reusable PPE), check for:

a. Malfunctioning parts.
b. Evidence of chemical attack.
c. Punctures.
d. Tears.
e. Cracks.

12.0 MAINTENANCE AND STORAGE OF PPE

PPE, other than respiratory equipment, will be maintained and stored in accordance with the manufacturer's recommendations at a minimum to prevent damage due to exposure to dust, moisture, sunlight, chemicals, temperature extremes and sudden impact.

Employees are given Field Operations Equipment bags prior to working on any **CONTRACTOR** sites. PPE that is given to the individual solely for his/her use will be stored in this bag. Before and after each use, the PPE will be inspected to determine whether or not it is still “field worthy”. Any PPE found to be defective will be reported to the Health and Safety Assessment Division and either discarded or repaired, as appropriate. Under no circumstances will defective PPE be used in the field.

8. The SSO will periodically inspect PPE issued for individual use.

a. Unless the equipment can be repaired, any PPE found to be defective will be removed from service and discarded immediately.

b. Repairable PPE will be tagged, returned to the SSO and sent out for repair.

13.0 EVALUATION OF PPE PROGRAM

CONTRACTOR's Personal Protection Equipment Program will be reviewed annually by the CESM. Any program deficiencies that are identified by a **CONTRACTOR** employee will be reported to the CESM, so that changes will be made immediately. All employees affected by the change(s) will be notified in writing.

Review of the PPE Program will include, but not be limited to, the following:

- Accident and illness experience on various job sites.
- Type and degree of exposure.
- Adequacy of equipment selection process.
- Degree of fulfillment of program objectives.
- Employee acceptance.
- Coordination with overall health and safety program elements.
- Recommendations for program improvements and modifications.
- Adequacy of program records.

APPENDIX H

CONTROL OF HAZARDOUS ENERGY PROGRAM “LOCK OUT/TAG OUT”

1.0 INTRODUCTION

The Lock Out/Tag Out Standard, 29 CFR 1910.147, is prevents approximately 120 deaths and 60,000 injuries per year. Under this standard, **CONTRACTOR** is required to establish a program that utilizes procedures for locking out and/or tagging to isolate and disable the equipment to prevent accidental start-up or release of stored energy. **CONTRACTOR** employees will identify, locate and control these energy sources, as necessary.

DEFINITIONS

Affected Employee: An employee whose job requires operation/use of equipment or machines on which servicing or maintenance is being performed under lockout or tagout, or whose job requires him/her to work in an area in which such servicing or maintenance is being performed. All **CONTRACTOR** personnel or subcontractors working in these circumstances are "affected employees".

Authorized Employee: A person who locks out or implements a tagout system procedure on machines or equipment in connection with the servicing or maintenance on that machine or equipment. An authorized person and an affected employee may be the same person when the affected employee's duties also include performing a lock out or tag out on a machine or equipment.

Capable of being Locked Out: An energy isolating device will be considered to be capable of being locked out either if it designed with a hasp or other attachment or integral part to which, or through which, a lock can be affixed, or if it has a locking mechanism built into it. Other energy isolating devices will also be considered to be capable of being locked out, if lockout can be achieved without the need to dismantle, rebuild, or replace the energy isolating device or permanently alter its energy control capability.

Energized: Connected to an energy source or containing residual or stored energy.

Energy Isolating Device: A mechanical device that physically prevents the transmission or release of energy, including but not limited to the following: a manually operated electrical circuit breaker; a disconnect switch; a manually operated switch by which the conductors of a circuit can be disconnected from all ungrounded supply conductors, and, in addition, no pole can be operated independently; a slide gate; a slip blind; a line valve; a block; and, any similar device used to block or isolate energy. The term does not include a push button, selector switch, and other control circuit type devices.

Energy Source: Any source of electrical, mechanical, hydraulic, pneumatic, chemical, thermal, or other energy.

Lockout: The placement of a lockout device on an energy isolating device, in accordance with an established procedure, ensuring that the energy isolating device and the equipment being controlled cannot be operated until the lockout device is removed.

Lockout Device: A device that utilizes a positive means such as a lock, either key or combination type, to hold an energy isolating device in the safe position and prevent the energizing of a machine or equipment.

Tagout: The placement of a tagout device on an energy isolating device, in accordance with an established procedure, to indicate that the energy isolating device and the equipment being controlled may not be operated until the tagout device is removed.

Tagout Device: A prominent warning device, such as a tag and a means of attachment, which can be securely fastened to an energy isolating device in accordance with an established procedure, to indicate that the energy isolating device and the equipment being controlled may not be operated until the tagout device is removed.

2.0 PURPOSE

To establish procedures for locking out and/or tagging to isolate and disable equipment to prevent accidental startup or release of stored energy, and possible injury to employees.

3.0 SCOPE

This procedure applies to all field/facility operations that require all operative energy sources, including line breaking, in the work area to be shut down, locked out and tagged, so that **CONTRACTOR** employees may safely perform their job. Contractors and subcontractors performing work on **CONTRACTOR** projects will be required to comply with these requirements if their employer does not have a comparable lock out/tag out program already in place.

4.0 PROCEDURE

1. The authorized employee will evaluate the scope of work and all equipment, machines or industrial processes in the area that require the use of stored energy. Energized equipment that may cause a safety hazard will be shut down to eliminate the potential for injury.

2. Prior to beginning the work, the authorized employee will be sure that appropriate lock out/tag out equipment is available to isolate the energy source.

3. The authorized employee will ensure that all affected employees have been trained on the following topics:

    a. Scope of Work.

    b. Energy sources.

    c. Energy isolation devices.

    d. Lock out devices.

    e. Tags.

    f. Test procedures.

    g. Authorized personnel. Those individuals charged with the responsibility for deenergizing and reenergizing energy sources).

4. A safety meeting will take place immediately prior to work, and will be documented and placed in the job folder for future reference. All employees will sign the Lockout Worksheet prior to starting the work. See Attachment A for a copy of the Lockout Worksheet.

5. All energized equipment will be shut down before **CONTRACTOR** personnel or its contractors/subcontractors begin work on site. Shut down will take place in the following manner:

    a. The authorized employee will inform the client's representative of the need to shut down the equipment.

    b. The authorized employee, with assistance from the client's representative, will locate all power sources on the process or equipment.

    c. All power sources will be shut down and verified as such by the authorized employee.

    d. A KeySpan standardized lockout device must be applied by all parties entering the energized area. Each authorized employee shall affix a personal lockout or tagout device to the group lockout device. Locks and tags shall identify the identity of the employee applying the device.

    e. Any necessary testing of equipment will be conducted to ensure that the process or equipment is free of energy.

    f. The authorized employee will attempt to operate the machine to be sure that it remains inoperative. All activation controls will be returned to the "off" position after testing.

    g. The authorized employee will apply a tag that bears the following warning, “DANGER - EQUIPMENT LOCKOUT” along with the authorized employee’s name, the date, and the time of the lockout.

    h. The authorized employee will complete the Lockout Worksheet.

    i. Equipment may now be released for work by the authorized employee. No release will be given until all required inspections and testing are performed.

6. Residual energy, i.e., pneumatic/hydraulic power, spring compression, and residual electrical energy in transformers are examples of residual energy that, when unsuspected, may present a greater hazard to the employee. These sources of energy will be identified, located and controlled in the following manner:

    a. Residual electrical energy can be controlled through grounding.

    b. Pneumatic/hydraulic line pressure can be released, allowing the weight to come to a rest.

    c. Spring tensions can be relieved.

d. Product lines will be double blocked (panned) and bled to prevent product from being released.

e. A lockout device and tag will be applied and secured by the authorized employee for the duration of the job to prevent residual energy from reaccumulating and creating a hazard to employees.

f. The lockout/tagout will be documented by the authorized employee on the Lockout Worksheet.

7. After all work is completed, the authorized employee will perform the following:

a. The authorized employee will inform everyone that the job is complete.

b. The Lockout Worksheet will be reviewed by the authorized employee with all employees to make sure that all employees are accounted for before re-energizing the equipment.

c. The authorized employee will be sure that all tools, debris or other material that could be placed into motion are removed before the equipment or process is re-energized. All employees will be instructed to stay clear of movable parts of the equipment or process.

d. All residual energy controls will be removed by the authorized employee, as well as all energy isolation lockouts and tags.

e. In the presence of the client's representative, energy will be restored to the equipment or process.

f. All lockout equipment removal will be documented on the Lockout Worksheet by the authorized employee. The Lockout Sheet will be placed in the job file at the end of the shift.

8. All employees must be accounted for before re-energizing equipment. When employees that have worked on the job are absent from the final inspection before re-energizing the equipment, the authorized employee will initiate the following:

a. The lockout sheet will be checked to account for all employees.

b. The authorized employee will obtain a Lockout/Tagout Absent Employee form (See Attachment B).

c. The authorized employee will appoint employees to look for the individual, paying special attention to high hazard areas where physical harm could result from the start-up of the equipment or process.

d. After a complete search of the equipment or process, and it has been determined by the authorized employee that the employee is not present, all outlying areas surrounding the site will be searched.

e. The area surrounding the site will be guarded to prevent the absent employee from inadvertently entering a hazardous situation.

f. The employer must make all reasonable efforts to contact the authorized employee to inform him/her that his/her lockout or tagout device has been removed.

g. The equipment or process will be cleared for re-energizing only by the authorized employee once all of the above conditions are met.

h. A copy of the completed Absent Employee form will be posted conspicuously in the work area, and not removed until the employee has been located. The client's representative will be notified of the situation so that the absent employee does not endanger himself/herself by entering an energized process or equipment.

9. When appropriate, contractors and subcontractors working under **CONTRACTOR**'s direction will be informed of their responsibilities, under the Lockout/Tagout Standard, to provide protection against hazardous energy.

a. When necessary within the scope of work, contractors and subcontractors without such a program, at the discretion of **CONTRACTOR**, will be disqualified from bidding on these projects.

b. Contractors and subcontractors with such a program will submit their program to the CESM for review. The contractor or subcontractor program must be comparable or more strict than **CONTRACTOR**'s program.

- Programs found to be insufficient in some areas will be returned, with the requested changes to be made before the program is acceptable for implementation.

- The copy of the program will be returned to the contractor or subcontractor, and will not be duplicated by **CONTRACTOR** or any of its employees.

10. All affected employees will be given training in these procedures prior to performing any lockout/tagout work. This training will be documented and maintained in the employees' training file with the CESM.

11. This procedure will be reviewed annually by the CESM to ensure that it is relevant to **CONTRACTOR** operations.

ATTACHMENT A

LOCKOUT WORKSHEET

LOCKOUT WORKSHEET

Job Location: _____ Project Manager: _____

Date: _____ Time: _____ a.m./p.m.

Equipment Description to be locked out: _____

Equipment No:_____

Energy Source(s): _____

Pre-Work Safety Meeting Minutes: _____

Lockout Hardware Used: _____
No of locks required: _____

HAZARDOUS ENERGY		ISOLATING DEVICES			CONTROL DEVICES			
Type	Magnitude	Type	Location	I.D. No.	Lock	Tag	Both	Add'l Measures

Methods use to verify isolation:
___Design of machine reviewed
___Circuitry tested
___Are valves or hydraulic system attached to electrical sources?
___Does the electrical cabinet have any live wire circuits?
___Based on the energy sources listed above, indicate all energy isolating verification procedures required to ensure lockout

_____
_____

Energy Restoration (Check each as you Progress): Time Completed

__ All personnel accounted for and in the clear. _____

__ Point(s) of operation free of tools and debris. _____

__ Points of operation restraints removed. _____

__ Lockout hardware removed. _____

__ Personnel clear of points of operation. _____

___ Energy restored. _____

___ Equipment operation verified, client's rep on site. _____

___ Lockout terminated. _____

Employees' Signatures: _____
Date: _____

ATTACHMENT B

LOCKOUT/TAGOUT ABSENT EMPLOYEE FORM

LOCKOUT/TAGOUT ABSENT EMPLOYEE FORM

NOTICE

Upon completion of work performed under lockout/tagout conditions, the following employee(s) listed below could not be located or accounted for:

_____

_____

_____

All attempts have been made to locate this employee at the jobsite. It has been verified that this employee is not in the vicinity of the hazardous energy source and will not be affected by the startup of equipment which was under lockout conditions.

_____ _____

Signature of Authorized Employee Date

Signature of Employer _____ Date_____

APPENDIX I

CONFINED SPACE/HOT WORK PERMITTING PROCEDURE

1.0 INTRODUCTION

Any material that is combustible or flammable is susceptible to ignition by heat-producing activity. Common materials such as floors, partitions, roofs, wooden members, paper, textiles, plastics, chemicals, flammable liquids and gases, and grass or brush are very likely to become involved in fire during hot work operations if adequate precautions are not taken.

Hot work is any work that requires the use of tools/equipment that have the potential to produce temperatures which could reasonably be expected to ignite flammable/combustible material or atmospheres in the vicinity of the work area. These tools/equipment have the capability of producing sparks, open flames, heat, or an electrical arc during use. Hot work is not limited to just welding, cutting and brazing, but also grinding, sawing (metal to metal) and chipping operations.

Confined spaces are defined as spaces that which is not designated or intended for normal human occupancy, has limited means of egress and poor natural ventilation. Confined space hazards exist if the potential for hazardous or explosive atmospheres and/or oxygen deficient hazards exist or if there is an engulfment hazard. Other hazards that could exist include mechanical sources and falls. Two types of confined spaces exist: permit required and non-permit required.

DEFINITIONS

Fire Blanket: Blanket made of fire-resistant material, such as NOMEX or KEVLAR (**not asbestos**), or treated wool, which can be used to cover combustible materials to prevent their ignition from sparks, flames or heat during hot work.

Attendant: Person who observes the confined space activities/hot work to ensure that ignition of the surrounding material does not occur. The Attendant will be equipped with a fully charged, suitable fire extinguisher and/or charged fire hose at the work area at the time of the hot work. The Attendant will not be assigned to any other duties.

Confined Space: Confined spaces are spaces that can be bodily entered but are not meant for human occupancy.

Entrant: Person who is trained and authorized to enter a confined space. Entrants are required to review air-monitoring data prior to entry into a permit required confined space PRCS and understand the hazards.

2.0 PURPOSE

To provide **CONTRACTOR** employees, who oversee hot work performed and confined space entry on projects, with a standard permitting and safety procedure to prevent injury or loss of life and property.

3.0 SCOPE

This procedure will apply to all **CONTRACTOR** employees who oversee hot work on projects utilizing welding, cutting, brazing, grinding, chipping, portable heaters, and other potential heat-producing equipment for field/facility activities. This procedure is also to be followed for all

confined space entry situations. This procedure will apply to all contractors or subcontractors working under **CONTRACTOR** that do not have an adequate Permitting Procedure in place with the company in which they are currently employed. All **CONTRACTOR** employees involved with confined space entry will be properly trained for the role and duties performed. Training will consist of hands-on training with **CONTRACTOR**'s confined space entry equipment including harnesses, retrieval equipment, air-line respirators and monitoring equipment. Certification that the training was satisfactorily complete will be provided and documentation maintained.

4.0 PROCEDURE

1. Hazard Identification

    a. The Project Manager will identify all work that requires tools, equipment, or operations that may produce sparks or temperatures that are sufficient to ignite flammable/combustible materials or atmospheres.

    b. The Project Manager, SSO and CESM will determine if a confined space entry is required and determine if the entry requires a permit. Any situation that has the potential to produce hazardous atmospheres or deplete oxygen will require a permit.

    c. This information will be included in the Site Specific Health and Safety Plan to be reviewed with the CESM prior to starting the project.

    d. The Project Manager will determine if the work can be performed without the use of hot work, i.e. alternative method to reduce the hazard.

    e. The CESM should consult the Project Manager if the there are questions on hazard determination. The SSO will act as the Entry Supervisor.

    f. The CESM will review entry with the Project Manager and review this program at least annually to make sure the Program is effective and enforced. Copies of completed permits will be retained for at least one year.

    g. The permit program will be reviewed to determine if it is adequate for the projects conducted. Incident reports will be reviewed, employee issues raised and entries reviewed. The permit program will be evaluated to determine if all hazards were adequately identified and evaluated. Additional protective equipment will be purchased, if necessary, for future entries if the review process shows that all hazards were not properly controlled. This review will be part of annual confined space training.

2. Area Preparation

    a. The following preparation for the work area will be made once it is determined that hot work is necessary:

        - All flammable/combustible materials will be relocated at least 35 feet away from the work area.

- All combustible materials that cannot be reasonably removed from the area will be covered with a fire blanket.

- An appropriate fully charged fire extinguisher and/or charged fire hose will be available at the work area before, during and 1/2 hour after hot work procedures have ended.

- All safety equipment will be on-site and functional.

The confined space entry area will be identified with a posted sign that reads:

Caution- Confined Space, and barricaded to prevent impact from external hazards and vehicles. Ground level entries will be ringed with a toe board to prevent objects from inadvertently being dropped into the space.

3. Pre-Work Safety Meeting

a. The Project Manager will assure that a pre-work safety meeting has been provided to the crew prior to any hot work/confined space entry being performed. Individuals involved with confined space entry will be identified as the authorized entrant(s), attendant and the entry supervisor. Additional individuals may be designated to conduct monitoring for multiple entries. This meeting will include, but not be limited to:

- Permitting conditions (environmental conditions, type of work to be performed). This would include reviewing the results of the initial monitoring of the test results, ventilation requirements, potential hazards and continuous testing procedures.

- Personnel authorized to sign-off on the permit. All personnel involved with the confined space entry must sign the permit and acknowledge the hazards expected to be encountered.

- Location of the permit. (Must be conspicuously posted.)

- Type of monitoring required.

- Designation of attendant and discussion of duties.

- Returning completed permit to Project Manager or client when work is complete and project has concluded.

b. During the pre-work safety meeting the authorized entrants will be identified and the entry procedure reviewed. The attendant will be specified and the monitoring and communication procedures reviewed. The entry will be reviewed with the designated entry supervisor before entry. The attendant will be responsible for conducting the air monitoring during the entry and providing results to the entrants and entry supervisor. The designated positions will be posted on the entry permit.

c. The entry supervisor will be responsible for meeting with the client prior to entry to identify if other contractors or client personnel will be working in close proximity to the confined space entry. The entry supervisor will coordinate entry activities in order to make sure the other work does not impact the entry or endanger entry personnel. The entry supervisor will attend scheduled project meetings with the client and other contractor representatives in order to properly coordinate the entry with other projects.

d. Initial air-monitoring results will be conducted immediately prior to entry and will be reviewed with the entry supervisor and the authorized entrants prior to entry. Air-monitoring procedures and alarm levels will also be reviewed. Ventilation of the space will be initiated before entry and periodic monitoring conducted prior to entry to verify the ventilation is adequate. Monitoring will be performed throughout entry by the attendant and entrants will wear meters with alarms to conduct monitoring during the entry.

e. The Project Manager will meet with the client to arrange for adequate rescue services from the client, if available, or from outside rescue operations. The Project Manager will discuss rescue procedures with representatives of the rescue operation and allow the rescue team to examine the area, practice the rescue and decline to act as the rescue team if they feel they are not adequately staffed or equipped. The entry cannot be conducted until adequate rescue services are provided.

f. The Project Manager will meet with the client to discuss other projects or contractors that could interfere with **CONTRACTOR**'s confined space work. **CONTRACTOR** will coordinate the entry to have minimal impact on other contractors in the area and to make sure **CONTRACTOR** personnel are not endangered by other contractors work.

4. Permit Completion

The Confined Space Work Permit (see Attachment A) will be completed by the Project Manager prior to beginning work each day. The permit will not be considered valid until all personnel involved with the entry have reviewed and signed the entry permit. The entry supervisor will review each permit at the completion of the entry to determine if monitoring and safety procedures are adequate for this project. The permit will be modified if appropriate. The permit will be conspicuously posted at the site of the work.

5. Attendant

A designated Attendant will be present to observe the hot work/confined space operation. The Attendant will maintain contact with personnel and conduct air monitoring. The Attendant will oversee safety retrieval systems and initiate the alarm if rescue is necessary. The Attendant will not perform entry rescue or enter the confined space unless relieved of duty by another authorized Attendant and is equipped with maximum respirator protection. The Attendant will monitor only one confined space entry at one time.

6. Entrant

Entrants will be identified on the permit and instructed on the purpose for the entry of the confined space. Entrants are responsible for adhering to the permit requirements and communicating with the Attendant. Once work tasks are completed the Entrant is responsible for removing equipment, sampling devices and exiting the confined space safely.

7. Entry Procedures:

- A minimum of three workers must be assigned and dedicated to each confined space entry activity: the confined space entrant, the confined space attendant and the entry supervisor.
- Where air-moving equipment is used to ventilate space, chemicals shall be removed from the vicinity to prevent introduction into the confined space.
- If flammable liquids, gases or vapors may be contained within the confined space, explosion-proof equipment will be used. All equipment shall be positively grounded.
- Blank, double block and bleed or otherwise isolate, lockout and tagout all chemical, physical and/or electrical hazards wherever possible. Reduce all forms of energy to zero state energy.
- One person (standby) must remain at the entryway at all times and must keep continuous contact wit the person entering the confined space. Contact must be maintained by line-of-sight, the safety line and/or radio. The standby attendant must not enter the confined space unless another trained person is available to act as standby, and he/she is equipped wit adequate respiratory protection and dermal protection.
- A ladder is required in all confined spaces deeper than the employee's shoulders. The ladder should be secured and not removed until all employees have exited the space. Do not rely on permanent ladders because they are often in poor condition. If the must be used, be sure of footing. Inspect permanent ladders for deterioration before entering and while descending. Try each step with one foot, while standing on the step above. When in doubt, use a portable ladder of adequate height to reach 3 feet above opening or a rope ladder or lower the entry person using a tripod. If a portable ladder is used, it should be tied off, if possible; otherwise, it should be held in place by the standby person.
- Vehicles should not be left running near confined space work or near air-moving equipment being used for confined space ventilation.
- Do not work without lighting. Use only "Explosion proof "lights or hand lamps. Lights and other illumination utilized in confined spaces shall be equipped with guards t prevent contact with light bulb.
- Any deviation from these confined space entry procedures requires the prior approval of the Safety Manager.

8. Atmospheric Monitoring

a. When cutting, grinding, heating or welding surfaces coated with epoxy finishes or paint, or when cutting certain metals with a welding torch, toxic fumes or vapors can

be emitted in the process. In these instances, monitoring may be required under the OSHA Standard. Therefore, it is the responsibility of the Project Manager to notify the Health and Safety Coordinator of these coatings and have them sampled (if unknown) to determine what type of monitoring will be required.

b. Occasionally, a "liner" will be adhered to the inside of a metal duct or tank. When hot work will be performed on such material, the liner will be removed at least 4 inches to each side of the cut to prevent toxic vapors from being emitted, or fire from occurring.

c. After moving all flammable materials out of the work area, the area will be monitored with a Combustible Gas Meter immediately before hot work takes place. LEL readings at or above 5% will necessitate that the area be ventilated before hot work operations begin. **Hot work should not proceed if readings of five percent or below cannot be achieved.**

d. All area monitoring must be performed continuously in hot work areas.

e. Hot work performed in confined spaces requires that contaminant specific air monitoring be performed. Air monitoring should be conducted in confined spaces whether there is hot work or not. Even non-permit spaces must be monitored initially to confirm the lack of hazardous atmospheres in the confined space. Contact the CESM to determine the type of air monitoring required for the contaminant.

f. Hot work performed on containers that previously contained flammable liquids (i.e. underground storage tanks) will not be performed until the Health and Safety Division has been contacted and has approved the work to be performed. **CONTRACTOR**'s Site Specific Health and Safety Plan for Flammable and Combustible Underground Storage Tank Removals contains detailed procedures for cleaning, inerting and cutting these types of containers.

g. Entrants and the attendant will continuously evaluate the permit-required space to determine if additional monitoring or more frequent monitoring is necessary. The permit may be revoked or modified accordingly. All entrants will leave the space if unsafe conditions are observed or measured. The permit will be invalidated and reviewed with the supervisor before re-entry is allowed. Additional monitoring will be performed at the request of employees or attendants. Atmospheric monitoring for confined space entry shall include the following procedures:

- Prior to employee entry and before validation/revalidation of a CSEP, remote atmospheric testing of the confined space shall be conducted at the top, middle, bottom and corners of the space.
- Monitoring shall be conducted with a remote monitor on a wand attached to a toxic gas meter. The monitor shall be able to reach the lowest point of the confined space.
- Air monitoring shall be performed in the following sequence: Oxygen content, flammability, toxicity (organic vapors, hydrogen sulfide, carbon monoxide, etc.)

- If toxic , explosive or oxygen-deficient atmospheres are detected, the area will be purged or ventilated prior to entry. Area must be retested prior to entry. A person can enter the space only if all three test results are within the limits set in the permit.
- If remote testing is not possible, Level B is required for entry.
- Monitors for oxygen content, combustible gases and toxic vapors will be carried into the confined space with the entry team.

9. Prohibitive Circumstances

a. Hot work will be prohibited if any of the following conditions exist:

- Oxygen levels greater than 21%.
- LEL greater than 5%.
- Organic vapor concentration greater than half of the Permissible Exposure Limits depending on contaminant (ventilation may reduce this hazard).
- Confined space entry will not be permitted if oxygen levels are below 19.5% or if the LEL is >10%. Individual hazardous constituents will be monitored and appropriate levels of respiratory protection will be issued.

10. Conditions of Permit Validity

a. A permit is not valid unless all necessary inspections and air monitoring (if required) have been performed and all required signatures appear on the permit.

b. Work permits will be judged as valid for the following time durations:

- Work Shift or when until a significant change in personnel occur.
- Duration of the hot work.
- When atmospheric changes dictate ceasing the operation, abate the hazard and re-inspect the work area before completing another permit.

c. Permits are valid up to one day and new permits must be completed each day or whenever the permit conditions change.

d. The local Fire Department or client emergency services will be contacted prior to entry into confined spaces. They will be notified of the reason for entry and be requested to be available for rescue and administrating first aid. If emergency rescue cannot be provided within three minutes **CONTRACTOR** will not conduct the entry. The permit program will be reviewed to determine if it is adequate for the projects conducted. Incident reports will be reviewed, employee issues raised and entries reviewed. The permit program will be evaluated to determine if all

hazards were adequately identified and evaluated. Additional protective equipment will be purchased, if necessary, for future entries if the review process shows that all hazards were not properly controlled. This review will be part of annual confined space training.

e. **CONTRACTOR** will coordinate the entry with client and/or other contractors present at the job site. Work will be evaluated to determine the impact by non-**CONTRACTOR** staff on the work being conducted.

f. If conditions change and **CONTRACTOR** employees are at risk the permit will be considered invalid.

g. The permit will be canceled once the project is complete or conditions change that warrant leaving the site. A new permit will be issued for future entries once a permit has been canceled.

11. Training and Program Review

All workers involved with confined space entry will receive training relative to their role on the project. Since **CONTRACTOR** conducts confined space entry infrequently training will be conducted prior to each project in order to refresh **CONTRACTOR** employees on the use of the equipment, monitoring procedures and the confined space entry program. The program will be reviewed annually or when new equipment is acquired. All completed permits will be reviewed and critiqued at the completion of each entry. The entrants and attendants will be interviewed after entry to determine if there were significant problems or concerns.

ATTACHMENT A

CONFINED SPACE PERMIT

CONTRACTOR

Confined Space Entry Permit

- Location of Confined Space _____ Date/time _____
  Purpose of entry _____ Duration _____
  Authorized by _____ ***Expires on*** _____

Attendant _____
Authorized Entrants _____

Measures for Isolating Equipment	**YES**	**NO**	Measures for Isolating Equipment	**YES**	**NO**
LOTO			Protective clothing		
Lines capped			Communications equipment		
Purging			Hot work permit needed		
Ventilation			Other PPE		
Secure area			**Special conditions**		
Harness and retrieval system			Pump out standing water		
Fire extinguishers			Excessive Heat		
Air line system/5-minute escape bottle			Low overhead		
SCBAs			Slippery surfaces		
Other Respirators			Unsecured ladder		

Atmospheric Monitoring

Tests to be Taken	yes	no	Acceptable Entry Conditions	Test # Date: Time:	1	2	3	4	5	6	7	8	9	10
Oxygen			19.5-23.5%											
LEL			<10%											
CO			<25 ppm											
H_2S			<5 ppm											
Other														

Individual conducting test:_____
Supervisor authorizing entry_____

Instruments used:

Instrument(s) name	Type	Serial #

Authorized Entrants within Space

Entrant's Name	Time In	Time Out	Authorized site Attendants

Emergency and rescue contact:_____

Entry supervisor approval to conduct entry_____ Date/time_____

APPENDIX J

INCIDENT REPORTING

1.0 ACCIDENT AND INCIDENT REPORTING

It is important that all accidents and incidents that result in injury, illness, or medical treatment be reported within 24 hours. If an accident occurs, the Contractor will call their Human Resources Director and Corporate Environmental Safety Manager (CESM) to provide information on the injury. The CESM will complete the first report of injury and file it accordingly. Copies will be sent to the Project Manager (PM) and Site Safety Officer (SSO). Supervisors are required to complete the Supervisor's Report of Accident included in this section. It is **CONTRACTOR'S** responsibility to investigate each incident, file appropriate paperwork, and conduct a follow-up analysis of each incident to develop information about the cause of the accident.

2.0 REPORTING PHONE NUMBERS

GEI Accident/ Incident Contact Information (For GEI Employees)
Corporate Environmental Safety Manager: Robin DeHate (813) 323-6220
Human Resources Director: Linda Penkes (860) 368-5376

3.0 FIRST AID AND MEDICAL TREATMENT

The **CONTRACTOR** provides a First Aid Kit on each site and in each Company vehicle. It is there for use in the treatment of minor scratches, burns, headaches, nausea, etc. Each employee should verify the location of the nearest first aid kit and should make use of it whenever needed. Each kit is fully stocked and restocked monthly by an outside vendor. The kit includes bandages, over the counter medications, disinfecting supplies and topical ointments. The user of each kit is responsible for contacting the vendor to replace items used or submitting the kit to **CONTRACTOR** for replacement. Kits are to be inventoried by the Project Manager before being sent in the field. Only completely stocked kits are to be brought into the field. The kits are maintained in a weatherproof container and in accordance with ANSI Standard Z308.1-1998. The first aid supplies in each kit are included in Attachment A.

Any work related injury or illnesses that requires professional medical assistance should be reported immediately. Failure to promptly notify of a work related injury could make the claim questionable and subject to stricter review. The nearest medical center or hospital will be identified for each project. The phone number and location for this center will be determined before commencing field activities and be included in the Health and Safety Plan. The phone numbers will be posted by Site Safety Officer (SSO) or the Project Manager (PM) and available to all employees in order to provide prompt response to all injuries. The SSO or the PM will contact the nearest medical facility to determine the facility's capabilities and verify that the facility is willing to provide emergency medical services. The following actions for medical treatment scenarios is presented below:

1. Minor First Aid Treatment

   First aid kits are stored in each company vehicle. If an injury is sustained or results in minor first aid treatment:

   a. Inform your supervisor.
   b. Administer first aid treatment to the injury or wound.
   c. If a first aid kit is used, indicate usage on the accident investigation report.

d. Access to a first aid kit is not intended to be a substitute for medical attention.
e. Provide details for the completion of the accident investigation report.

2. Non-Emergency Medical Treatment

For non-emergency work-related injuries requiring professional medical assistance, management must first authorize treatment. If you sustain an injury requiring treatment other than first aid:

a. Inform your supervisor.

b. Proceed to the posted medical facility. Your supervisor will assist with transportation, if necessary.

c. Provide details for the completion of the accident investigation report.

3. Emergency Medical Treatment

If you sustain a severe injury requiring emergency treatment:

a. Call for help and seek assistance from a co-worker.

b. Use the emergency telephone numbers and instructions posted next to the telephone in your work area to request assistance and transportation to the local hospital emergency room.

c. Provide details for the completion of the accident investigation report.

d. The Project Manager will identify an ER provider for each long-term project for emergency medical services. The phone number will be posted at each job site.

4. First Aid Training

Each employee will receive training and instructions from his or her supervisor on our first aid procedures.

5. Wounds

a. Minor - Cuts, lacerations, abrasions, or punctures

- Wash the wound using soap and water; rinse it well.
- Cover the wound using clean dressing.

b. Major - Large, deep and bleeding

- Stop the bleeding by pressing directly on the wound, using a bandage or cloth.
- Keep pressure on the wound until medical help arrives.

6. Broken Bones

   a. Do not move the victim unless it is absolutely necessary.

   b. If the victim must be moved, “splint” the injured area. Use a board, cardboard, or rolled newspaper as a splint.

7. Burns

   a. Thermal (Heat)

      - Rinse the burned area, without scrubbing it, and immerse it in cold water; do not use ice water.

      - Blot dry the area and cover it using sterile gauze or a clean cloth.

   c. Chemical

      - Flush the exposed area with cool water immediately for 15 to 20 minutes.

8. Eye Injury

   a. Small particles

      - Do not rub your eyes.

      - Use the corner of a soft clean cloth to draw particles out, or hold the eyelids open and flush the eyes continuously with water.

   b. Large or stuck particles

      - If a particle is stuck in the eye, do not attempt to remove it.
      - Cover both eyes with bandage.

   c. Chemical

      - Immediately irrigate the eyes and under the eyelids, with water, for 30 minutes.

9. Neck And Spine Injury

   If the victim appears to have injured his or her neck or spine, or is unable to move his or her arm or leg, do not attempt to move the victim unless it is absolutely necessary.

10. Heat Exhaustion

    a. Loosen the victim’s tight clothing.
    b. Give the victim “sips” of cool water.

Make the victim lie down in a cooler place with the feet raised.

4.0 FIRST AID/CPR Certification

Each **CONTRACTOR** project will identify individuals that are certified CPR/first aid. First aid training sponsored by the American Red Cross is acceptable and must be renewed every three years. CPR training must be renewed annually. Other first aid training will be reviewed to see if it is comparable to the Red Cross training.

5.0 SAFETY RESPONSIBILITIES

The Contractor and Subcontractor employees also have some important responsibilities concerning safety. They are:

a. The responsibility of reporting all injuries and illnesses to your supervisor, no matter how small.

b. The responsibility of always following the safety rules for every task performed.

c. The responsibility of reporting any hazards seen.

d. The responsibility of helping co-workers recognize unsafe actions or conditions.

e. The responsibility of asking about the safety rules.

It is impossible to list or include all safety rules for all the possible tasks. But the following rules have been prepared to help the employee avoid hazards, which may cause injury while doing some of the more common tasks. Failure to follow safety rules and /or safe practices will result in disciplinary action, up to and including termination.

Supervisor's Report of Accident

Supervisor's Name: _____

Basic Rules for Accident Investigation

- Find the cause to prevent future accidents - Use an unbiased approach during investigation
- Interview witnesses & injured employees at the scene - conduct a walkthrough of the accident.
- Conduct interviews in private - Interview one witness at a time.
- Get signed statements from all involved.
- Take photos or make a sketch of the accident scene.
- What hazards are present - what unsafe acts contributed to accident
- Ensure hazardous conditions are corrected immediately.

Date & Time		**Location**	
Tasks performed		**Witnesses**	
Resulted in	**__ Injury __ Fatality** **__Property Damage**	**Property Damage**	
Injured		**Injured**	
Describe Accident Facts & Events			

Supervisor's Root Cause Analysis	*Check ALL that apply to this accident*		
Unsafe Acts		**Unsafe Conditions**	
Improper work technique		Poor Workstation design	
Safety rule violation		Unsafe Operation Method	
Improper PPE or PPE not used		Improper Maintenance	
Operating without authority		Lack of direct supervision	
Failure to warn or secure		Insufficient Training	
Operating at improper speeds		Lack of experience	
By-passing safety devices		Insufficient knowledge of job	
Protective equipment not in use		Slippery conditions	
Improper loading or placement		Excessive noise	
Improper lifting		Inadequate guarding of hazards	
Servicing machinery in motion		Defective tools/equipment	
Horseplay		Poor housekeeping	
Drug or alcohol use		Insufficient lighting	
Unsafe Acts require a written warning and re-training <u>before</u> the Employee resumes work			

Date		Date	
Re-Training Assigned		Unsafe Condition Guarded	
Re-Training Completed		Unsafe Condition Corrected	
Supervisor Signature		**Supervisor Signature**	

Accident Report Review

Supervisor _____ Date _____

Department Superintendent _____ Date _____

Safety Manager _____ Date _____

Plant Manager _____ Date _____

ATTACHMENT A

First Aid Kits

Each first aid kit is in a weather proof container and contains the following:

Item	Amount
Ear Plugs	2 pair
Band-aids	2 boxes
Sterile pads	5 2”x2”
Oval eye pads	2
Tylenol	10
Burn cream	1 tube
Tweezers	1 each
Scissors	1 each
Triangular bandage	1
Antiseptic wipes	1 box
Ammonia inhalants	1 box
Flexible gauze	1 roll
First aid guide	
Latex gloves	2 pair

APPENDIX K

ADDENDUM

Community Air Monitoring Plan
Oyster Bay Hortonsphere
Site Characterization
Oyster Bay , New York

In accordance with NYSDEC and NYSDOH requirements for a Community Air Monitoring Plan (CAMP), a perimeter air-monitoring plan, will be implemented at the site during each phase of the field activities. The objective of the perimeter air-monitoring plan is to provide a measure of protection for the downwind community (i.e., off-site receptors, including residences and businesses and on-site workers not involved with the site field activities) from potential airborne contaminant releases as a direct result of field activities. The perimeter air-monitoring plan is a stand-alone document and will be available on site. The VOC Monitoring, Response Levels, and Actions are presented as follows.

Air Monitoring Response Levels and Actions

VOCs	
Response Level	**Actions**
>5 ppm above background for 15-minute average	▪ Temporarily halt work activities ▪ Continue monitoring ▪ If VOC levels decrease (per instantaneous readings) below 5 ppm over background, work activities can resume
Persistent levels >5 ppm over background <25 ppm	▪ Halt work activities ▪ Identify source of vapors ▪ Corrective action to abate emissions ▪ Continue monitoring ▪ Resume work activities if VOC levels 200 feet downwind of the property boundary or half the distance to the nearest potential receptor is <5 ppm for a 15-minute average ▪ If VOC levels are >25 ppm at the perimeter of the work area, activities must be shutdown
Particulate	
>100 mcg/m3 above background for 15-minute average or visual dust observed leaving the site	▪ Apply dust suppression ▪ Continue monitoring ▪ Continue work if downwind PM-10 particulate levels are <150 mcg/m3 above upwind levels and no visual dust leaving site
>150 mcg/m3 above background for 15-minute average	▪ Stop work ▪ Re-evaluate activities ▪ Continue monitoring ▪ Continue work if downwind PM-10 particulate levels are <150 mcg/m3 above upwind levels and no visual dust leaving site

Sources:

New York State Department of Health Community Air Monitoring Plan, June 20, 2000.

New York State Department of Environmental Conservation Division Technical and Administrative Guidance Memorandum - Fugitive Dust Suppression and Particulate Monitoring Program at Inactive Hazardous Waste Sites, October 27, 1989.

During excavating and materials handling operations, the air in work areas will also be sampled periodically for the presence of contaminants. A portable photoionization detector (PID) will be utilized to periodically monitor the levels of organic vapors in the ambient air and a Mini RAM™ PM-10 (or equivalent) particle detector will be used to count inhalable particles (0.1-10 micrometer range) of dust during the field work. PID and Mini RAM readings will be taken hourly during excavation or more frequently if air quality measurements approach action levels as defined herein. Measurements will be monitored from the breathing zone (4 to 5 feet above ground level) at worker locations to determine working conditions (and whether there is a need to change levels of worker protection).

In addition to VOCs and particulates, cyanide will be monitored in the work zone and at the perimeter of the work area. The cyanide monitoring methods will be determined prior to mobilization, but at a minimum, will include Drager® tube sampling.

In order to make a conservative assessment of when different levels of respiratory protection are needed during the field work, it will be assumed that the organic vapors detected by the air monitoring instruments consist of the most toxic volatile compounds expected to be found on the site. Preliminary evaluation of the risks expected at the site indicates that the most toxic volatiles that are probably present are VOCs (particularly BTEX). Based on data published by the Occupational Safety and Health Administration (OSHA) and the American Conference of Government Industrial Hygienists (ACGIH), and GEI's experience with MGP wastes, the following PPE will be employed when the given concentrations of organic vapor are detected in the breathing zone.

Compound of Concern	**Level D**	**Level C**	**Level B**
Chemical Name	M<X	X<M<Y	M>Y
BTEX and other photoionizable VOCs	M <5 ppm	5 ppm <M <50 ppm	M >50 ppm
Where: M = concentration of organic vapor measured in the field X,Y= concentrations at which different levels of respiratory protection are necessary.			

The PPE requirements may be modified based on compound-specific monitoring results information, with the written approval of the Corporate Health and Safety Specialist (CHSS).

Respiratory protection from dusts will be required when inhalable particulate concentrations from potentially contaminated sources exceed 150 µg/$m^{3.}$

Odors or dusts derived from site contaminants may cause nausea in some site workers, even though the contaminants are at levels well below the safety limits as defined above. Workers may use dust masks or respirators to mitigate nuisance odors with the approval of the SSO.

Whenever practical, work areas should be positioned upwind of organic vapor and dust sources to reduce the potential for worker exposure.