O&R 93B MAPLE AVENUE, HAVERSTRAW FORMER MGP SITE

OPERABLE UNIT 2: FORMER STREAM CHANNEL & OFF-SITE BUILDING AREA

VILLAGE OF HAVERSTRAW, ROCKLAND COUNTY, NEW YORK

SITE MANAGEMENT PLAN

NYSDEC Site Number: 3-44-044

AOC Index Number: D3-0001-99-01

Prepared for:

Orange and Rockland Utilities, Inc.

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Revisions to Final Approved Site Management Plan:

Revision No.	Date Submitted	Summary of Revision	NYSDEC Approval Date

SEPTEMBER 2020

CERTIFICATION STATEMENT

I, MATTHEW J. O'NEIL certify that I am currently a NYS Registered Professional Engineer as in defined in 6 NYCRR Part 375, and that this Site Management Plan was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the NYSDEC DER Technical Guidance for Site Investigation and Remediation (DER-10).

_____ _____

Date

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It is a violation of Article 145 of New York State Education Law for any person to alter this document in any way without the express written verification of adoption by any New York State licensed engineer in accordance with Section 7209(2), Article 145, New York State Education Law.

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SITE MANAGEMENT PLAN

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List of Acronyms

AOC	Administrative Order on Consent
ASP	Analytical Services Protocol
Bgs	Below ground surface
BTEX	Benzene, Toluene, Ethylbenzene, Xylene
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CAMP	Community Air Monitoring Plan
CFR	Code of Federal Regulation
CLP	Contract Laboratory Program
COC	Certificate of Completion
COC	Constituents of Concern
CP	Commissioner Policy
DER	Division of Environmental Remediation
DNAPL	Dense Non-Aqueous Phase Liquid
EC	Engineering Control
ECL	Environmental Conservation Law
ELAP	Environmental Laboratory Approval Program
ERP	Environmental Restoration Program
EWP	Excavation Work Plan
ft. bgs	feet below ground surface
GEI	GEI Consultants, Inc., P.C.
GHG	Green House Gas
GWE&T	Groundwater Extraction and Treatment
HASP	Health and Safety Plan
IC	Institutional Control
IRM	Interim Remedial Measure
ISCO	In-Situ Chemical Oxidation
mg/kg	milligrams per kilogram
MGP	Manufactured Gas Plant
NAPL	Non-Aqueous Phase Liquid
ND	Non Detect
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
NYCRR	New York Codes, Rules and Regulations
NYSWQS	New York State Groundwater Quality Standards
O&M	Operation and Maintenance
OM&M	Operation, Maintenance and Monitoring
O&R	Orange and Rockland Utilities, Inc.
OSHA	Occupational Safety and Health Administration
OU	Operable Unit
PAH	Polycyclic Aromatic Hydrocarbon
PID	Photoionization Detector
ppb	parts per billion
PRR	Periodic Review Report

PSA	Preliminary Site Assessment
QA/QC	Quality Assurance/Quality Control
QAPP	Quality Assurance Project Plan
RAO	Remedial Action Objective
RAWP	Remedial Action Work Plan
RCDOH	Rockland County Department of Health
RCRA	Resource Conservation and Recovery Act
RETEC	Remediation Technologies, Inc.
RI	Remedial Investigation
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
ROW	Right of Way
RP	Remedial Party
RSCO	Recommended Soil Clean-up Objective
RSO	Remedial System Optimization
SAC	State Assistance Contract
SCG	Standards, Criteria and Guidelines
SCO	Soil Cleanup Objective
SMP	Site Management Plan
SOP	Standard Operating Procedures
SOW	Statement of Work
SPDES	State Pollutant Discharge Elimination System
SSD	Sub-slab Depressurization
SVE	Soil Vapor Extraction
SVI	Soil Vapor Intrusion
SVOC	Semi-volatile Organic Compound
TAL	Target Analyte List
TCL	Target Compound List
TCLP	Toxicity Characteristic Leachate Procedure
USEPA	United States Environmental Protection Agency
UST	Underground Storage Tank
VCA	Voluntary Cleanup Agreement
VCP	Voluntary Cleanup Program
VOC	Volatile Organic Compound
µg/kg	micrograms per kilogram

ES EXECUTIVE SUMMARY

The following provides a brief summary of the controls implemented for the Site, as well as the inspections, monitoring, maintenance and reporting activities required by this Site Management Plan (SMP). This includes the monitoring required prior to Site building re-occupancy. For this SMP, the "Site" is defined as two areas within Operable Unit 2 (OU2) of the larger Haverstraw former MGP site including: Tax Map Parcel Lot 77 [93B Maple Avenue], and a small portion of Tax Map Parcel Lot 75 [95 Maple Avenue]. Based on the NYSDEC Record of Decision for OU2 of the Site, an SMP is required for these two areas only because contamination remains under a garage building on Lot 77 that borders Lot 75 and a small portion of Lot 75 following implementation of the remedy . The NYSDEC has not required further action for adjacent remedial areas of OU2 because the impacts in the adjacent areas have sufficiently been addressed by the implementation of the identified site remedy. Adjacent remedial areas are discussed in this SMP to provide required background information.

Site Identification: **O&R 93B Maple Avenue, Haverstraw Former MGP Site, Operable Unit 2: Former Stream Channel & Off-Site Building Area, Village of Haverstraw, Rockland County, New York**

Tax Map Parcel Lot 77 [93B Maple Avenue]

Tax Map Parcel Lot 75 [95 Maple Avenue]

NYSDEC Site # 3-44-044

Institutional Controls:	1. Site Parcel Lot 77 [93B Maple Avenue] may continue to be used for Commercial Use. Site Parcel Lot 75 [95 Maple Avenue] may continue to be used for Residential Use. 2. The following ICs are required: • Certification of adherence to the Site Management Plan. • Monitoring, inspections, notifications, and reporting according to this Site Management Plan.	
Engineering Controls:	No ECs were required for the Site.	
Inspections:		Frequency
1. Inspect Site conditions to monitor the remedy and ensure it continues to remain effective in the future.		Annually or upon changed conditions.

Site Identification: **O&R 93B Maple Avenue, Haverstraw Former MGP Site, Operable Unit 2: Former Stream Channel & Off-Site Building Area, Village of Haverstraw, Rockland County, New York**

Tax Map Parcel Lot 77 [93B Maple Avenue]

Tax Map Parcel Lot 75 [95 Maple Avenue]

NYSDEC Site # 3-44-044

Monitoring:	
1. Monitor - Soil Vapor Intrusion Evaluation prior to re-occupancy of Site building. 2. Monitor – Community Air Monitoring (CAMP) and soil monitoring for management and disposal should any subsurface invasive work be performed in the future at the Site.	1) Prior to occupancy of garage building at Lot 77 [93B Maple Avenue]. 2) During any invasive work performed in the areas identified by this SMP.
Maintenance:	
1. No Engineering Controls required so not necessary	1) Not Required
Reporting:	
1. Periodic Review Report 2. Following required monitoring (including SVI Evaluation) 3. Following subsurface intrusive work.	1) Annually, or following changed conditions 2) To be Determined 3) To be Determined

Further descriptions of the above requirements are provided in detail in the latter sections of this Site Management Plan.

1.0 INTRODUCTION

1.1 General

This Site Management Plan (SMP) is a required element of the remedial program for the Orange and Rockland Utilities, Inc. (O&R) 93B Maple Avenue Former Manufactured Gas Plant (MGP) site located in Haverstraw, New York (the "Site"). The location of the Site is shown in Figure 1. The Site is currently in the New York State (NYS) Inactive Hazardous Waste Disposal Remedial Program which is administered by New York State Department of Environmental Conservation (NYSDEC), Division of Environmental Remediation (DER).

The site is being managed in accordance with the Administrative Order on Consent (AOC; Index No. D3-0001-99-01) which was executed on March 3, 1999. The NYSDEC DER identified the Selected Remedy for the Site in the document entitled "*Record of Decision, O&R 93B Maple Avenue, Haverstraw MGP Site, Operable Unit No. 2: Former Stream Channel and Off-Site Building Area, Village of Haverstraw, Rockland County, New York, Site Number 3-44-004,*" dated March 2006 (ROD). The ROD is included in Appendix J.

For this Site Management Plan (SMP), the "Site" is further defined as two areas within Operable Unit 2 (OU2) of the larger Haverstraw former MGP site including: Tax Map Parcel Lot 77 [93B Maple Avenue], and a small portion of Tax Map Parcel Lot 75 [95 Maple Avenue] (Figure 2).

Adjacent remedial areas are discussed in this SMP to provide required background information; however, the NYSDEC has indicated that only Tax Map Parcel Lot 77 [93B Maple Avenue], and a small portion of Tax Map Parcel Lot 75 [95 Maple Avenue] will require the implementation of an SMP to address the remaining contamination at these areas, because the implementation of the remedy (In-Situ Chemical Oxidation (ISCO) under the garage building located on Lot 77 was not successful at obtaining remedial action objectives (RAOs).

Figure 2 shows Operable Unit 1 (OU1) and Operable Unit 2 (OU2) of the Haverstraw MGP site (Site Plan). The boundaries of these areas and the adjacent parcels

are described in Section 2.1. The locations of Site parcels and the surrounding features are shown in Figure 2 (Site Plan).

In accordance with the Administrative Order on Consent (AOC) between O&R and the NYSDEC, O&R performed investigations and subsequent remediations in all areas defined by OU1 and OU2. After completion of the remedial work described in Phase I and Phase II Interim Remedial Measure (IRM) work plans, some contamination was left in the subsurface at the Site under the garage building on Lot 77 that borders Lot 75, and a small portion of Lot 75 which is hereafter referred to as "remaining contamination." Because remaining contamination is present at the Site, Institutional Controls are required at Lot 77 [93B Maple Avenue] and Lot 75 [95 Maple Avenue] to fulfill the remedial objectives for the Site to ensure protection of public health and the environment.

This SMP was prepared to identify and manage remaining contamination at the Site. All reports associated with the Site can be viewed by contacting the NYSDEC or by viewing the documents which are located in the Document Repository identified for the Site. A list of contacts for persons involved with the Site is provided in Appendix A of this SMP.

This SMP was prepared by GEI Consultants, Inc., P.C. (GEI) on behalf of O&R in accordance with the factors set forth in Title 6 of the New York Code of Rules and Regulations Part 375 (6 NYCRR Part 375), NYSDEC's DER-10 ("*Technical Guidance for Site Investigation and Remediation*"), dated May 3, 2010, and the Administrative Order on Consent (AOC) between O&R and the NYSDEC for the Site.

The Site contains remaining contamination left after completion of the remedial measures (ISCO soil treatment) performed at Lot 77 [93B Maple Avenue) and Lot 75 [95 Maple Avenue], as shown in Figures 3 and 4.

The ROD stipulates that the current building at Lot 77 [93B Maple Avenue) will remain in place and that no intrusive activities will be conducted under or around the building. The SMP details the requirements for the removal of the remaining contamination, should the building on Lot 77 [93B Maple Avenue] be demolished in the future, or subsurface invasive work be performed within the identified area (Figure 3). The SMP details the requirements for the removal of the remaining contamination, should

subsurface invasive work be performed in the eastern portion (identified area) of Lot 75 [95 Maple Avenue] (Figure 4).

The Institutional Controls place restrictions on Site use, and mandate monitoring and reporting measures. This SMP specifies the methods necessary to ensure compliance with all Institutional Controls required by the ROD for contamination that remains at the Site. Compliance with this plan is required by the property owners - Owner of Lot 77 [93B Maple Avenue], and Owner - Lot 75 [95 Maple Avenue] and their respective successors and assigns.

This SMP provides a detailed description of all procedures required to manage remaining contamination at the Site, including: (1) implementation and management of Institutional Controls, (2) required monitoring prior to building re-occupancy or during subsurface invasive work, and (3) performance of periodic inspections, certification of results, and submittal of Periodic Review Reports to the NYSDEC.

To address these needs, this SMP includes three plans: (1) an Institutional Control Plan for implementation and management of Institutional Controls, (2) Excavation Plan should any invasive work be required, and (3) Monitoring Plan for implementation of Site Monitoring for the required Soil Vapor Intrusion (SVI) Evaluation, or the management of any impacted soil activities.

1.2 Revisions

Revisions to this SMP will be proposed in writing to the NYSDEC Division of Environmental Remediation (DER's) Project Manager (Appendix A). Revisions will be necessary upon, but not limited to the following occurring: a change in media monitoring requirements, post-remedial intrusive work including the removal of soil or the installation of utilities, or other significant change to Site conditions. The NYSDEC will provide a notice of any approved changes to the SMP, and append these notices to the SMP that is retained in its files.

1.3 Notifications

Notifications will be submitted to the NYSDEC, as needed, in accordance with NYSDEC's DER-10 for the following reasons:

- As required in the ROD and SMP, the parcel owners of Lot 77 [93B Maple Avenue] and Lot 75 [95 Maple Avenue], the parcel owners will notify O&R of any proposed work in the identified areas of the parcels.
- O&R will then provide the NYSDEC with a 60-day advance notice of any proposed changes in Site use that are required under the terms of the Order on Consent, 6NYCRR Part 375 and/or Environmental Conservation Law.
- 7-day advance notice of any field activity associated with the remedial program including sampling of any identified media.
- 15-day advance notice of any proposed ground-intrusive activity pursuant to the Excavation Work Plan.
- Notice within 48-hours of any damage or defect to the Site building foundation at Lot 77 [93B Maple Avenue].
- Verbal notice by noon of the following day of any emergency, such as a fire; flood; or earthquake that reduces or has the potential to reduce the effectiveness of Institutional Controls for the Site.
- Follow-up status reports on actions taken to respond to any emergency event requiring ongoing responsive action submitted to the NYSDEC within 45 days describing and documenting actions taken to restore the effectiveness of the Institutional Controls or Monitoring Plan.

Any change in the ownership of the parcels that comprise the Site or the responsibility for implementing this SMP will include the following notifications:

- At least 60 days prior to the change, the NYSDEC will be notified in writing of the proposed change. This will include a certification that the prospective purchaser has been provided with a copy of the Order on Consent, Record of Decision, and all approved work plans and reports, including this SMP.
- Within 15 days after the transfer of all or part of the Site, the new owner's name, contact representative, and contact information will be confirmed in writing to the NYSDEC DER.

The table on the following page includes contact information for the above notification. The information on this table will be updated as necessary to provide accurate contact information. A listing of Site-related contact information is provided in Appendix A.

Notifications Table

Name	Contact Information
Manager - MGP Programs Con Edison of New York	877-602-6633
Justin Starr, P.G. NYSDEC DER Project Manager	(518) 402-9662 Justin.Starr@dec.ny.gov derweb@dec.ny.gov

Note: Notifications are subject to change and will be updated as necessary.

2.0 SUMMARY OF PREVIOUS INVESTIGATIONS AND REMEDIAL ACTIONS

As discussed in the sections above, for this SMP the Site is defined as two areas within Operable Unit 2 (OU2) of the larger Haverstraw former MGP site including: Tax Map Parcel Lot 77 [93B Maple Avenue] and Tax Map Parcel Lot 75 [95 Maple Avenue]. To provide required background information, the previous investigation and remedial work at the Site, and also at the adjacent remedial areas is included in the following sections.

2.1 Site Location and Description

This SMP has been prepared to describe the monitoring and controls that will be implemented on a portion of OU2 of the Site, which includes Tax Map Parcel Lot 77 [93B Maple Avenue] and Tax Map Parcel Lot 75 [95 Maple Avenue]. The locations of these parcels are shown in Figures 2 through Figure 6. These parcels are two areas located within the larger area designated as the 93B Maple Avenue Former MGP Site (Figure 2 and ROD – Appendix J). To describe the investigation and remedial action history, and to describe areas with remaining contamination (Lot 77 [93B Maple Avenue] and Lot 75 [95 Maple Avenue]), the background information includes the entire area investigated and remediated for OU1 and OU2.

The 93B Maple Avenue Site is located in the Village of Haverstraw, Rockland County, New York. The former MGP property is bounded on all sides by residential parcels at 91, 93A and 95 Maple Avenue; 2 and 6 Tor Avenues; and 70 and 84 West Streets (Figure 2). The MGP boundaries consist of the former MGP and the adjacent parcels with identified MGP-related impacts.

In accordance with NYSDEC's requirements, the MGP site has been divided into two operable units (OUs):

- **OU1**: The Parcels located at 87, 91, 93A, 93B, and 95 Maple Avenue (excluding the In-Situ Chemical Oxidation [ISCO] work areas at 93B and 95 Maple) (Figure 2).

- **OU2**: The Parcels located at 99, 103, and 104 Maple Avenue, and the 93B and 95 Maple Avenue ISCO work areas) (Figure 2).

The relative locations of the properties and the former MGP are shown in Figure 3. The lot numbers for the properties below are located within Section 27.54, Block 1 on the Village of Haverstraw Tax Assessor's Map.

- The 87 Maple Avenue parcel is identified as Lot No. 80 (with an additional 12-foot right-of-way [ROW] on Lot No. 79) on the Village of Haverstraw Tax Assessor's Map.
- The 91 Maple Avenue parcel is identified as Lot No. 79 (minus the 12-foot ROW) on the Village of Haverstraw Tax Assessor's Map.
- The 93A Maple Avenue parcel is identified as Lot No. 76 on the Village of Haverstraw Tax Assessor's Map.
- The 93B Maple Avenue parcel is a rectangular, flat 0.21-acre back lot property of land which contains a one-story concrete block building and an open yard. The property is identified as Lot Nos. 77 and 78 on the Village of Haverstraw Tax Assessor's Map.
- The 95 Maple Avenue parcel is identified as Lot No. 75 on the Village of Haverstraw Tax Assessor's Map.
- The 99 Maple Avenue parcel is identified as Lot No. 74 on the Village of Haverstraw Tax Assessor's Map.
- The 103 Maple Avenue parcel is identified as Lot No. 73 on the Village of Haverstraw Tax Assessor's Map.
- The 104 Maple Avenue parcel is identified as Lot No. 8 on the Village of Haverstraw Tax Assessor's Map.

2.2 Physical Setting

2.2.1 Land Use

The Site consists of two parcels of land which are predominantly covered by a commercial building (garage). The Site is zoned for light industrial use; however, is used for commercial and residential purposes. A former business operated in the garage at the Site prior to the remedial activities. It appears that the garage owner may seek to re-occupy the garage for continued use for commercial purposes.

The properties adjoining the Site and in the neighborhood surrounding the Site primarily include commercial and residential properties. The properties immediately adjacent to the Site are all residential parcels (Figure 2).

2.2.2 Geology

Based on the borings performed during the Remedial Investigation (RI), three geologic units were encountered including: fill, alluvium, and glacial till.

The fill consisted of miscellaneous soil and demolition debris. It is primarily made up of gravel, loamy soil with some cobbles, brick fragments, cinders, coals, and glass shards. Thickness of the fill unit was found to be irregular and ranged from approximately 15 feet to approximately 8 feet.

Underlying the fill is a heterogeneous mixture of alluvial deposits comprised of discontinuous beds of coarse-grained sands, gravel, fine-grained sands, silts, and various clays. The thickness and composition of the alluvial deposits vary widely throughout the Site and can be generalized into four distinct subunits:

- Coarse-grained sand and gravel with some fine grained material and cobbles.
- Gray and brown clay (designated as clay on the geologic cross sections).
- Clay and fine sand/silt mixtures.
- Fine-grained sands and silts.

The till was encountered in one boring at a depth of 34.5 feet below ground surface (ft bgs). Based on the borings, the till consists of a very dense, cohesive, red-brown silt and clay.

2.2.3 Hydrogeology

Based on measurements from monitoring wells installed during the RI, groundwater at the Site is present within the alluvium. The depth to groundwater is generally 6 to 10 feet below the ground surface. The alluvium is a shallow, un-confined to semi-confined water-bearing unit. Wells installed in a clayey subunit of the alluvial soils exhibited artesian hydraulic heads, thereby demonstrating that the clay unit is behaving as

a semi-confining layer. Groundwater flow for the un-confined portion of the water-bearing unit is to the southeast.

2.3 Investigation and Remedial History

The former MGP was operated by O&R's predecessor for approximately 35 years between 1859 and 1894. The MGP was constructed and began initial operation in 1859. Historic documents from 1876 and 1884 show the presence of a gas plant and gas holder. The plant was located on the northeastern side of the 93B Maple Avenue parcel along a railroad line, and the holder was located along a stream at the southwestern side of the parcel. An 1887 Sanborn Fire Insurance map references a gas plant, but the plant itself is not mapped. In 1894, the MGP was acquired by Haverstraw Light and Fuel Company. The MGP was likely shutdown in 1893 or 1894.when operations were likely shifted to the Clove and Maple Avenue MGP, an off-site area located to the south (Figure 2).

The MGP was operated as a coal gasification plant using coal as a feedstock. The byproduct of this process was coal tar. The features for the MGP are shown in Figure 3; however, as indicated above, the location of the MGP Building was shown on the historic maps.

The following narrative provides a remedial history timeline and a brief summary of the available project records to document key investigative and remedial milestones for the Site. Full titles for each of the reports referenced below are provided in Section 8.0 - References.

A series of investigations and remedial measures were conducted at the Haverstraw MGP site between 1996 and 2005. The following sections provide a summary of this work and the findings. Comprehensive summaries are presented in the following reports:

- Initial Hazard Investigation and Assessment (Remediation Technologies, Inc. [RETEC] of Concord, Massachusetts, 1996).
- Preliminary Site Assessment (PSA) Report for Two Manufactured Gas Plants (RETEC, 1997).
- Draft Remedial Investigation (RI) Report, 93B Maple Avenue Former MGP Site (GEI, 2002).

- IRM Work Plan, 93B Maple Avenue Former MGP Site (GEI, 2002).
- Phase II IRM Work Plan, 93B Maple Avenue Former MGP Site (GEI, 2004). Inclusive of a supplemental RI at 99, 103, and 104 Maple Avenue.
- IRM Certification Report, Operable Unit 1, Phase I IRM, 93B Maple Avenue Former MGP Site (GEI, 2005).
- IRM Certification Report, Operable Unit 2, Phase II IRM, 93B Maple Avenue Former MGP Site (GEI, 2006).

2.3.1 Summary of RI Findings (Pre-Remedial Conditions)

The RI and a Supplemental RI evaluated the nature and extent of MGP-residuals prior to any remedial measures. The results of the studies and investigations discussed above were reported in the RI Report (GEI, 2002) and are summarized below.

Nature and Extent of Contamination in Soil

Based on the RI, including soil, groundwater, and air sampling, the subsurface of the Site had been impacted by MGP-related residuals. Coal tar is the major type of residual present at the Site. The main categories of constituents of concern (COC) were volatile organic compounds (VOCs), and semi-volatile organic compounds (SVOCs). Benzene, toluene, ethylbenzene, and xylene (BTEX) and polyaromatic hydrocarbon (PAH) compounds exceed the Recommended Soil Clean-up Objectives (RSCOs). Cyanide has also been detected on the Site. The most significant impacts were in the former gas holder area, and on the parcels southwest of the former MGP where trace amounts of tar-impacted soil was observed.

Source Materials

Non-aqueous phase liquid (NAPL) observed during the RI was limited in extent. NAPL was also observed as dense non-aqueous phase liquid (DNAPL). It appeared to have a consistency of used motor oil. DNAPL was present in the former holder structure and adjacent subsurface soil. A second area of NAPL-impacted soil was identified between the concrete block building at 93B Maple Avenue and 93A Maple Avenue. This area appears to be associated with a former stream channel that contained DNAPL-impacted soil and debris. The stream itself was relocated into the culvert to the immediate east of the Site, sometime after the MGP ceased to operate.

The clay unit at the Site appears to have effectively limited the NAPL's downward migration. Laterally, the NAPL migrated as fingers through the porous fill and sand lenses at the Site. This migration was limited and appeared to have followed geologic features, such as the irregular surface of the clay.

The NAPL under the 93B Maple Avenue building was limited to the southern half of the building and appears to have originated from the former holder structure. The stream flowed to the south and discharged to a former ice pond located immediately to the southeast of 103 Maple Avenue.

Surface Soils

Numerous surface soil samples were collected during the RI from 0 to 2 inches in depth to define surface soil conditions on the Site, off-site, and in the general area (background). Except for a single surface soil sample in which xylene was detected, BTEX was not detected in surface soil samples. PAH concentrations in surface soil samples ranged from 3.7 milligrams per kilogram (mg/kg) to 117 mg/kg.

The COC in the surface soil samples at the Site are attributed to the historic fill prevalent at the Site and in the surrounding neighborhood, as well as more recent anthropogenic activities. The fill materials on and around the Site were observed to contain ash, coal, clinker, and other anthropogenic materials which contain PAHs. Based on the topography and soil stratigraphy, it appears that the Site and adjacent Lots are covered by several feet of fill which was placed after the MGP ceased to operate.

Subsurface Soils

BTEX and PAHs were identified as COCs in the subsurface soils. Generally, the distribution of these compounds in the subsurface soils coincided with the presence of DNAPL or fill materials. The subsurface soils on the Site contained PAHs that ranged from non-detect (ND) to 11,790 parts per million (ppm).

Groundwater

BTEX, PAHs, and cyanide were identified as COCs in the Site groundwater. The groundwater impacts were limited to the area where the NAPL impacts were observed.

The RI identified groundwater COC in concentrations exceeding New York State Water Quality Standards (NYSWQS). However, the impacted groundwater plume was generally limited to the area with identified MGP-related residuals, and did not appear to have impacted down gradient areas.

2.3.2 Summary of Remedial Action: Interim Remedial Measures (IRM)

The Site was remediated as two operable units, OU1 and OU2; Phase I IRM and Phase II IRM, respectively.

Phase I IRM (OU1)

Based on the results of the RI, it was determined that the removal of the former gas holder would be a highly effective IRM. The Phase I IRM, was conducted at OU-1 in accordance with NYSDEC-approved (Phase I) IRM Work Plan (GEI, 2002), and modifications approved by the NYSDEC.

The specific goals of the Phase I IRM were to:

- Remove the former gas holder and foundation, and other subsurface MGP structure that may be encountered.
- Remove visible coal tar, if present, and soils visually-impacted by coal tar.
- Remove soils containing total PAHs above 25 ppm.
- Remove soils impacted with total cyanide.

PAHs attributable to ash in soil on adjacent properties were not considered to be MGP-related, and thus, were excluded from the IRM.

O&R performed the IRM with the NYSDEC present during most of the field activities to monitor compliance with the Phase I IRM Work Plan. Two contractors, Clean Earth, Inc. (CEES a.k.a. Integrated Technical Service [ITS]) of Hatboro, Pennsylvania (from November 2002 to June 2003) and Creamer Environmental, Inc. (Creamer) of Hackensack, New Jersey (from June 2003 to November 2003) conducted the general contracting services. GEI provided the Phase I IRM design, construction quality assurance oversight, collection of confirmatory samples, and general consulting services. Air Logics,

Inc. was responsible for the perimeter air monitoring activities. The Phase I IRM was reported in detail in the 2005 IRM Certification Report and is summarized below.

Phase I IRM Remedial Activities

The IRM was conducted between November 2002 and November 2003. The Phase I IRM included the following activities:

- Excavation to depths of up to 23 feet to remove the gas holder on 93B Maple Avenue and MGP-impacted soils on 87, 91, 93A, 93B, and 95 Maple Avenue. The locations of the remedial areas are shown in Figure 3.
- Continuous real-time perimeter air monitoring for VOCs and dust for the duration of the project.
- Confirmatory samples collected from the excavation bottoms for laboratory analysis.
- Visual inspections to verify the excavation effectively removed all the NAPL and stained soils.
- Off-site treatment and disposal of all excavated material at appropriately permitted disposal facilities.
- On-site treatment of groundwater removed during excavation, and discharge of the water to the local sewer in accordance with appropriate permits.
- Off-site treatment and disposal of groundwater removed during excavation at appropriately permitted disposal facilities.
- Backfilling the excavations with imported soils that met required soil import criteria, as approved by the NYSDEC.
- Property restoration.

Most of the excavation activities were performed within an enclosed temporary structure to minimize potential migration of vapors, odors, and dust to the surrounding neighborhood. For excavations performed outside the temporary structure, potential vapors, odors, and dust were controlled by excavation staging, plastic tarps, and foaming, as required. Based on the results of the perimeter air monitoring, the project vapor and dust control measures met the requirements of the New York State Department of Health (NYSDOH).

All of the confirmatory samples results were below the 25 parts per million (ppm) total PAH site remedial action objective for Unrestricted Residential Use. Approximately 12,907 tons of MGP-impacted materials were excavated and properly disposed of off-site.

In addition, approximately 2,680,000 gallons of dewatering effluent were either treated on-site and discharged to a local sewer under permit, or transported for off-site treatment.

Phase I IRM Results

The Phase I IRM removed the MGP-impacted soils to a concentration of 25 ppm for total PAHs from 87 (Lots 80 and 85), 91 (Lot 79), and 93A (Lot 76) Maple Avenue. MGP-impacted soils were also removed from a portion of 93B (Lot 78) and 95 (Lot 75) Maple Avenue.

Based on the results of the remedial activities:

- The Phase I IRM was performed in accordance with the NYSDEC- and NYSDOH-approved work plan and modifications approved by the NYSDEC.
- The Phase I IRM achieved the cleanup objectives required to achieve Unrestricted Use within OU1.
- Because the IRM achieved the cleanup objectives for Unrestricted Use within OU1, neither an Operation, Maintenance, and Monitoring (OMM) Plan nor Institutional Controls are required for OU1.
- No additional investigation or remedial activities are required for OU1.

In March 2005 the NYSDEC issued a Record of Decision (ROD) stating that no further measures or land use restrictions were necessary for OU1.

2.3.3 Phase II IRM (OU2 IRM)

During implementation of the Phase I IRM, additional NAPL-impacted soil was observed underneath a portion of the concrete block building at 93B Maple Avenue. Additional investigations were conducted to evaluate the extent of the impacted soil. The Phase II IRM, was conducted to address the identified area of impact in accordance with NYSDEC-approved Phase II IRM Work Plan (GEI, 2004) and the ISCO work plans (GEI, 2004).

The standards, criteria and guidelines (SCGs) and Site-specific soil cleanup objective (SCO) were the same as the criteria used for the Phase I IRM Work Plan. The specific goals of the Phase II IRM were to:

- Remove visible coal tar, if present, and soils visually impacted by tar.
- Remove soils containing MGP-related total PAHs above 25 ppm.
- Treat MGP-impacted soils located beneath or near the building on 93B Maple Avenue which could not be excavated, due to the presence of the building.
- Remove soils containing total cyanide in elevated concentrations.

O&R implemented the Phase II IRM activities with the NYSDEC present during most of the field activities to monitor compliance with the Phase II IRM Work Plan, and the ISCO Work Plan. Creamer was retained as the Remedial Contractor. GEI provided the Phase II IRM design, construction quality assurance oversight, collected the confirmatory samples, and provided general consulting services. Xpert Design and Diagnostics, LLC (XDD) of Allentown, Pennsylvania was subcontracted by GEI to perform the ISCO treatment. Air Logics, Inc. (Air Logics) of Hammonton, New York performed perimeter air monitoring activities. The Phase II IRM is summarized below.

Phase II IRM Remedial Activities

The IRM was conducted between March 2004 and June 2005. The Phase II IRM included the following activities:

- Excavation to depths of up to 19 feet to remove MGP-contaminated soils on 99, 103, and 104 Maple Avenue. The locations of the remedial areas are shown in Figure 3.
- ISCO treatment on portions of the 93B and 95 Maple Avenue located beneath or around the existing building at 93B. ISCO treatment consisted of three rounds of oxidant and activator injection into soil via 18 injection wells. The oxidant used was sodium persulfate, and the activator was iron chelate.
- Continuous real-time Community Air Monitoring (CAMP) monitoring for VOCs and dust for the duration of the project.
- Confirmatory samples collected from the excavation bottoms for laboratory testing.

- Visual inspections to verify the excavation effectively removed all the NAPL and stained soils.

- Off-site treatment and disposal of all excavated material at appropriately permitted disposal facilities.

- On-site treatment of groundwater removed during excavation, and discharge to the local sewer in accordance with approved permits.

- The removal and/or abandonment of the ISCO injection wells and a passive recovery trench.

- Backfilling the excavations with imported soils that met required soil criteria, as approved by the NYSDEC.

- Property restoration.

Approximately 9,214 tons of MGP-impacted materials were excavated and properly disposed of off site.

In addition, approximately 1,110,400 gallons of dewatering effluent was treated on site and discharged to a local sewer under an approved discharge permit.

In March 2006, the NYSDEC issued a ROD stating that no further remedial measures or land use restrictions were necessary for the 99, 103, and 104 Maple Avenue parcels of OU2. However, since the ISCO did not achieve the remedial goals at the Lot 77 [93B Maple Avenue] and Lot 75 [95 Maple Avenue] area of OU2 and excavation is not possible because of the presence of the building, an SMP identifying controls and monitoring is required.

The ROD also requires no future water supply wells be installed at the Site without the review and approval of the Rockland County Health Department. The installation of additional wells is not anticipated based on the ROD and the known Site conditions.

Phase II IRM Results

Based on the results of the remedial activities:

- The Phase II IRM was performed in accordance with the NYSDEC- and NYSDOH-approved work plans, and field modifications approved by the NYSDEC.

- The Phase II remedial excavation achieved the cleanup objectives required to achieve Unrestricted Use at 99, 103, and 104 Maple Avenue.

- Because the Phase II remedial excavation achieved the cleanup objectives for Unrestricted Use, neither an OMM Plan nor Institutional Controls are required at 99, 103, and 104 Maple Avenue.

- No additional investigation or remedial activities are required at 99, 103, and 104 Maple Avenue.

- The ISCO activities achieved some reduction of total mass of total PAH within the treated areas, but did not achieve the cleanup objective required to achieve unrestricted land use at the OU2 portions of 93B and 95 Maple Avenue.

- Additional remedial activities at the OU2 portions of 93B and 95 Maple Avenue are not feasible due to the presence of the building at the Site.

- Institutional Controls (inspections and monitoring) are required for the portions of Lot 77 [93B Maple Avenue] and Lot 75 [95 Maple Avenue] where soils with COC that exceed the remedial action objectives.

2.4 Remedial Action Objectives

The Remedial Action Objectives (RAOs) for the remedial program have been established through the remedy selection process stated in 6 NYCRR Part 375-1.10, and are listed in the NYSDEC-issued Record of Decision of March 2006. The remedy selected by the NYSDEC will eliminate or mitigate significant threats to public health and/or the environment presented by the contamination remaining at the Site through the proper application of the controls implemented by this SMP.

The proposed future use of the parcels is expected to continue to be residential for Lot 75. Tax parcel Lot 77 is expected to remain commercial. Prior to the completion of the IRMs described in Section 2.3.2, the remedial goals for this site were to eliminate or reduce to the extent practicable:

- Exposures of persons at or around the Site to BTEX and PAHs in subsurface soils, and former structures.

- The potential release of contaminants from subsurface soil and former plant structures into groundwater.

The NYSDEC has indicated that the IRM has accomplished these remediation goals by the complete excavation and off-site treatment and disposal of contaminants from this operable unit of the site, specifically tax parcels 73, 74 and the majority of tax parcel 75, and the placement of institutional controls on the residual contaminants that remain after the in situ chemical oxidation for Lot 77 [93B Maple Avenue] and Lot 75 [95 Maple Avenue].

As indicated in the NYSDEC-issued ROD, the main SCGs applicable to this Site are as follows:

- Ambient groundwater quality standards are being met as the sources of groundwater contamination have been removed from the Site, the primary groundwater contaminants of BTEX are readily biodegradable, and several volumes of contaminated groundwater were removed from the impacted area as part of the IRM dewatering efforts;

- No future wells will be installed at the site without the review and approval of the Rockland County Health Department, this existing institutional control will assure appropriate review of future groundwater use at the operable unit;

- Soil quality has been restored to conditions that will provide for Unrestricted Residential Use as all of the contaminated site soils and contaminated structures have been removed and replaced with backfill that meets NYSDEC generic soil cleanup objectives for tax parcels 73, 74 and a majority of parcel 75;

- Soil quality has been improved by multiple treatments of in situ chemical oxidation for a small portion of Lot 77 [93B Maple Avenue] and Lot 75 [95 Maple Avenue]; and

- Soil vapor intrusion may be a concern for the existing garage building and a Soil Vapor Intrusion Evaluation will be performed prior to the re-occupation of the building at Lot 77.

As indicated in the NYSDEC-issued ROD (Appendix J), the following elements of the IRM have achieved the remediation goals and satisfy SCGs for the site:

- For tax parcels 73, 74, and 75 with the exception of the limited area noted in Figure 3, the excavation and off-site disposal of structures and contaminated soil above the 25 ppm total PAHs remedial goal. Based upon the achievement of the remedial goal, no site use restrictions are required.

- For Lot 77 [93B Maple Avenue] and Lot 75 [95 Maple Avenue] in the areas identified in Figures 3, 4, and 5, the multiple treatments via in situ chemical

oxidation of those soils and NAPL where excavation was not possible. The treatment was not able to fully achieve the 25 ppm goal. However, since excavation in this area is precluded by the building's presence and the area of contamination is at least 8 feet below ground surface, as well as below the groundwater table, the potential for exposure to the remaining contamination is addressed and the current use of the site may continue.

Based on the results of the investigations at the site, the IRMs that have been performed, the NYSDEC has selected No Further Action as the preferred alternative for the site.

The basis for this selection is the NYSDEC's conclusion that No Further Action will be protective of human health and the environment and will satisfy all SCGs, identified. Overall protectiveness is achieved through meeting the remediation goals listed above.

1. Since the Site remedial cleanup goals were achieved or exposure to areas beneath the building on Lot 77 and the area of parcel Lot 75 identified in Figure 3 is addressed, for tax parcels 73, 74, 75 and Lot 77 no use restrictions will be required.

2. This SMP has been developed and will be implemented to: (a) require Orange and Rockland seek, at such time in the future that the building on Lot 77 is to be demolished by the property owner, agreements with the owners of Lot 77 [93B Maple Avenue] and Lot 75 [95 Maple Avenue] to allow the removal of the remaining contamination, identified by Figures 4, 5, and 6, in coordination with such demolition; and (b) require Orange and Rockland provide a certification, based on observations from a publicly accessible area such as the public right-of-way, that the conditions of the SMP are apparently being complied with, on a periodic basis, until such time as the Lot 77 building is demolished by the property owner and remaining contamination is removed from parcels Lot 77 [93B Maple Avenue] and Lot 75 [95 Maple Avenue].

Therefore, the NYSDEC has indicated that No Further Action is needed with the provisions, inspections, and monitoring identified in this SMP for Lot 77 [93B Maple Avenue] and Lot 75 [95 Maple Avenue].

2.5 Remaining Contamination

Soil

Based on the results of the Phase I and Phase II IRMs, the remedial excavations achieved the cleanup objectives required to achieve Unrestricted Use at OU1 (87 and 91,

93A Maple Avenue, and the OU1 portions of 93B and 95 Maple Avenue) and a portion of OU2 (99, 103, and 104 Maple Avenue).

Two sets of confirmatory samples were collected to assess the effectiveness of the ISCO treatment. The first set was collected after the first injection round, and the second set was collected after the third injection round. The results of the second set of confirmatory samples, which reflect the most recent conditions, ranged from 41 to 9,774 ppm of total PAHs. Therefore, the final confirmatory concentrations all exceeded 25 ppm objective for total PAHs. The results of the confirmatory soil samples (remaining contamination) are presented on Table 1.

The confirmatory samples for the excavation on 99, 103, and 104 Maple Avenue were effectively below the 25 ppm total PAH Site remedial action objective for Unrestricted Residential Use. Of the 36 confirmatory samples collected, 34 were below 25 ppm, and 2 were slightly above the objective at 29 and 31 ppm of total PAHs. Both of the samples that were over the cleanup objectives were collected at the bottom of the deep cofferdam excavation (approximately 15 feet below grade).

Therefore ISCO activities did not achieve the cleanup objectives required to achieve unrestricted land use at the OU2 portions of the 93B and 95 Maple Avenue. The Site's remaining contamination is located beneath the garage building on Lot 77 [93B Maple Avenue] and at varying depths from 8 to 14 ft bgs on portions of Lot 75 [95 Maple Avenue]. The concentrations of polycyclic aromatic hydrocarbons (PAHs) that are present in soil remaining under the building following the ISCO treatment are presented in Table 1. The locations of the borings advanced to assess the concentrations or remaining contamination at Lot 77 [93B Maple Avenue] and Lot 75 [95 Maple Avenue] are shown in Figure 6. As shown on Table 1, all total PAH concentrations in soil samples from soil borings C1 – C7 were found to exceed the RAO of 25 ppm for total PAHs. Therefore, the PAH-impacted soil is identified as the "remaining contamination" for the Site. The subsurface soil borings for borings C1-C7 are included in Figure 7, to show soil conditions observed following the ISCO treatment.

Groundwater

As indicated in the ROD (Appendix J), the NYSDEC has indicated that Ambient Groundwater Quality Standards are being met as the sources of groundwater contamination have been removed from the site. The primary groundwater contaminants of BTEX are readily biodegradable. No further action for site groundwater is required [NYSDEC, 2006].

Soil Vapor Intrusion Evaluation

Prior to the re-occupation of the building at Lot 77 [93B Maple Avenue], an SVI evaluation will be performed to determine whether concentrations of COC in vapor and indoor air may potentially pose a threat to occupants of the building. If reasonable notification and access is provided by the property owner, O&R will perform the SVI evaluation outlined in this section. Otherwise, the property owner shall perform the SVI evaluation.

To perform an SVI evaluation, a work plan has been developed. It is included as Appendix D. This work plan has been developed in accordance with the most recent NYSDOH "*Guidance for Evaluating Vapor Intrusion in the State of New York,*" dated October 2006.

Preliminary (un-validated) SVI sampling data will be forwarded to the NYSDEC and NYSDOH for initial review and interpretation. Upon validation, the final data will be transmitted to the agencies, along with a recommendation for follow-up action, such as mitigation. If the SVI evaluation is performed by O&R, validated SVI data will be transmitted to the property owner within 30 days of validation. If the SVI evaluation is performed by the property owner, validated SVI data will be transmitted to O&R within 30 days of validation. If indoor air test results exceed NYSDOH guidelines, relevant information will be provided to the tenants and occupants of the property, if any, within 15 days of receipt of validated data.

SVI sampling results, evaluations, and follow-up actions will be summarized in the next Periodic Review Report.

3.0 INSTITUTIONAL CONTROL PLAN

3.1 General

Since contaminated soil remains at Lot 77 [93B Maple Avenue] and a small portion of Lot 75 [95 Maple Avenue], (i.e., beneath the garage building on Lot 77 and in the adjacent areas on Lot 75), Institutional Controls are required to protect human health and the environment. This Institutional Control Plan describes the procedures for the implementation and management of all Institutional Controls at the Site. The Institutional Control Plan is one component of the SMP and is subject to revision by NYSDEC.

This Plan provides:

- A description of the Institutional Control that will be implemented for the Site.
- The basis of implementation and intended role of the Institutional Control.
- A description of the features to be evaluated during each required inspection and periodic review period.
- A description of plans and procedures to be followed for implementation of the Institutional Control, such as the implementation of the Excavation Work Plan (EWP) for the proper handling of remaining contamination that may be disturbed during maintenance or redevelopment work on the Site.
- A description of the plans and procedures to be followed should the building at the site be re-occupied.
- Any other provisions necessary to identify or establish methods for implementing the Institutional Control required by the Site remedy, as determined by the NYSDEC.

3.2 Institutional Controls

The Institutional Controls identified in the NYSDEC-issued ROD may not be discontinued without prior written approval by NYSDEC. The IC boundaries are shown in Figure [3].

The Institutional Controls include:

- Future use and development constraints for the parcels.

- Worker notification if utility or other intrusive work is planned on Lot 77 [93B Maple Avenue] and Lot 75 [95 Maple Avenue] for any excavations inside the remaining contamination area.

- Prohibiting the use of the groundwater underlying the Site, without approval from the NYSDOH and the Rockland County Department of Health (RCDOH).

- Notification to the NYSDEC of a potential change in Lot 77 [93B Maple Avenue] and Lot 75 [95 Maple Avenue] parcel use prior to any action that could result in an exposure to Site-related COC.

- Adherence to this SMP and development of a Health and Safety Plan (HASP) for the potential excavation or removal of MGP-impacted residual soil from the Site.

- Prior to the occupancy of the building at Lot 77 [93B Maple Avenue], a Soil Vapor Intrusion (SVI) Evaluation will be performed to assess soil vapor and indoor air quality.

- Annual inspection and certification to confirm appropriate use of Lot 77 [93B Maple Avenue] and Lot 75 [95 Maple Avenue], and to ensure that Institutional Controls included in this remedy are in place and remain effective to control the identified potential exposures.

- O&R will submit to NYSDEC a written statement that certifies, based on general observations from the public right-of-way, that: (1) controls employed at Lot 77 [93B Maple Avenue] and Lot 75 [95 Maple Avenue] parcels are apparently unchanged from the previous certification or that any changes to the controls were approved by the NYSDEC; and (2) nothing has occurred that apparently impairs the ability of the controls to protect public health and environment or that constitute a violation or failure to comply with the SMP. NYSDEC retains the right to access Lot 77 [93B Maple Avenue] and Lot 75 [95 Maple Avenue] parcels at any time in order to evaluate the continued maintenance of any and all controls. This certification shall be submitted annually, or an alternate period of time that NYSDEC may allow and will be made by an expert that the NYSDEC finds acceptable.

Project Work Plans

Any additional monitoring or subsurface intrusive work at the Site will be performed using work plans that are approved by the NYSDEC and the NYSDOH, and if applicable by the RCDOH. A Field Sampling Plan for the SVI Evaluation is included in Appendix D. A Quality Assurance Project Plan (QAPP) is included in Appendix E. A site-specific Health and Safety Plan (HASP) is included in Appendix F. Any work performed on the site by O&R will require approval of an O&R EHASP. An example of

the O&R EHASP is included in Appendix G. A NYSDOH / NYSDEC required Community Air Monitoring Plan (CAMP) is included in Appendix H. Note that these general plans will need to be updated or amended prior to any work performed at the site, to describe the proposed field activities, and to present the proposed scope of work to the NYSDEC and the NYSDOH.

4.0 SITE MONITORING PLAN

4.1 General

The Monitoring Plan describes the measures for evaluating the performance and effectiveness of the remedy to reduce or mitigate contamination at the Site, the garage building, and all affected Site media identified below. This Monitoring Plan may only be revised with the approval of NYSDEC. Site Management forms are included in Appendix I.

This Monitoring Plan describes the methods to be used for:

- Evaluating site information periodically to confirm that the remedy continues to be effective in protecting public health and the environment.

To adequately address these issues, this Monitoring Plan provides information on:

- Annual inspection and periodic certification.

Reporting requirements are provided in Section 7.0 of this SMP.

4.2 Site-Wide Inspection

Site-wide inspections will be performed from publicly accessible locations such as the public right-of-way on a regular schedule at a minimum of once a year for Lot 77 [93B Maple Avenue] and Lot 75 [95 Maple Avenue]. During these inspections, an inspection form (Appendix I) will be completed. The form will compile sufficient information based on such observations to assess the following:

- Compliance with all Institutional Controls, including site usage. This would include the continued presence of the building at Lot 77 [93B Maple Avenue].
- General Site conditions at the time of the inspection.
- Compliance with requirements of this SMP.
- If site records are complete and up to date.
- Changes, or needed changes, to the inspection program.

If an emergency, such as a natural disaster or an unforeseen failure or damage to the building occurs, an inspection of the Site from a publicly accessible area such as a public

right-of-way will be conducted within 5 days of the event to verify the effectiveness of the Institutional Controls implemented at the Site by a qualified environmental professional, as determined by NYSDEC. Written confirmation must be provided to the NYSDEC within 7 days of the event that includes a summary of actions taken, or to be taken, and the potential impact to the environment and the public.

4.3 Monitoring Reporting Requirements

Forms and any other information generated during inspections will be kept on file by Consolidated Edison Company of New York, Inc. for O&R. All forms, and other relevant reporting formats used during the inspection events, will be (1) subject to approval by NYSDEC and (2) submitted at the time of the Periodic Review Report, as specified in the Inspection Plan of this SMP.

5.0 OPERATION AND MAINTENANCE PLAN

The Site remedy does not rely on any mechanical systems, therefore, no Operation and Maintenance Plan is required.

6.0 PERIODIC ASSESSMENTS/EVALUATIONS

The Site remedy does not rely on any mechanical systems, therefore, no Periodic Assessments or evaluations (other than the inspections identified above) are required.

7.0 REPORTING REQUIREMENTS

7.1 Site Inspections

Inspection Frequency

All inspections will be conducted at the frequency specified in the schedules provided in the SMP Monitoring Plan. At a minimum, site-wide inspections will be performed from a publicly accessible location such as a public right-of-way once a year. Inspections may also be performed following any changed conditions or if any subsurface invasive work is required.

Inspection Forms

All inspections will be recorded on the inspection form attached in Appendix I and subject to NYSDEC revision. The records generated for the Site during the reporting period will be provided in electronic format in the Periodic Review Report.

Evaluation of Records and Reporting

The results of the inspection will be evaluated as part of the Institutional Control certification to confirm, based on observations apparent at time of site inspection, that:

- The Institutional Controls are in place, are performing properly, and remain effective.
- The Monitoring Plan is being implemented.
- The Site remedy continues to be protective of public health and the environment and is performing as described in the NYSDEC Record of Decision.

7.2 Periodic Review Report

A Periodic Review Report will be submitted to the Department every year for Lot 77 [93B Maple Avenue] and Lot 75 [95 Maple Avenue]. In the event that one of the properties is subdivided into separate parcels with different ownership, a single Periodic Review Report will be prepared that addresses the properties shown in Appendix C (for Lot 77 [93B Maple Avenue] and Lot 75 [95 Maple Avenue]). The report will be prepared in accordance with NYSDEC's DER-10 and this SMP and submitted within 45 days of the end of each certification period. The report will include:

- Identification, assessment, and certification of all Institutional Controls required by the remedy for the Site.

- Results of the required annual Site inspections and severe condition inspections.

- All applicable inspection forms and other records generated for the Site during the reporting period in the NYSDEC-approved electronic format.

The Periodic Review Report will be submitted, in hard-copy format, to the NYSDEC Central Office and Regional Office in which the Site is located, and in electronic format to NYSDEC Central Office, Regional Office, and the NYSDOH Bureau of Environmental Exposure Investigation.

7.2.1 Certification of Institutional Controls

After the last inspection of the reporting period, a qualified environmental professional will prepare the following certification:

"For each institutional control identified for the Site, I certify that all of the following statements are true to my knowledge based on observations during the annual site inspection from the public right-of-way or other publicly accessible location:

- *The institutional control employed at this Site is unchanged from the date the control was put in place, or last approved by the Department;*
- *Nothing has occurred that would impair the ability of the control to protect the public health and environment*;
- *Nothing has occurred that would constitute a violation or failure to comply with any SMP for this control;*
- *Access to the Site will continue to be provided to the Department to evaluate the remedy, including access to evaluate the continued maintenance of this control;*
- *Use of the Site is compliant with the Site Management Plan restrictions;*
- *The information presented in this report is accurate and complete.*

I certify that all information and statements in this certification form are true. I understand that a false statement made herein is punishable as a Class "A" misdemeanor, pursuant to Section 210.45 of the Penal Law. I, [name], of [business address], am certifying as [Owner or Owner's Designated Site Representative] (and if the Site consists of multiple properties): [I have been authorized and designated by all Site owners to sign this certification] for the Site."

The signed certification will be included in the Periodic Review Report described below.

7.3 Corrective Measures Work Plan

If any component of the remedy is found to have failed, or if the periodic certification cannot be provided due to the failure of an Institutional Control, a Corrective Measures Work Plan will be submitted to the NYSDEC for approval. This plan will explain the failure and provide the details and schedule for performing work necessary to correct the failure. Unless an emergency condition exists, no work will be performed pursuant to the Corrective Measures Work Plan until it is approved by the NYSDEC.

8.0 REFERENCES

6NYCRR Part 375, Environmental Remediation Programs. December 14, 2006.

GEI, 2002. "Draft Remedial Investigation Report, 93B Maple Avenue Former MGP Site, Haverstraw, New York, AOC Index No. D3-0001-99-01, Site No. 3-44-044," March 29.

GEI, 2002. "Interim Remedial Measure Work Plan, 93B Maple Avenue Former MGP Site, Haverstraw, New York, AOC Index No. D3-0001-99-01, Site No. 3-44-044," August 2.

GEI, 2004. "Letter entitled "Supplemental IRM Work Plan, Orange and Rockland Utilities, Inc., In-Situ Chemical Oxidation, 93B Maple Avenue Haverstraw, New York," January 7.

GEI, 2004. "Phase II IRM, OU-2, Interim Remedial Measure Work Plant, 93B Maple Avenue Former MGP Site, Haverstraw, New York, AOC Index No. D3-0001-99-01, Site No. 3-44-044," December 20.

GEI, 2005. "Phase I IRM, OU-1, Interim Remedial Measure Certification Report, 93B Maple Avenue Former MGP Site, Haverstraw, New York, AOC Index No. D3-0001-99-01, Site No. 3-44-044," February 28.

GEI, 2006. "Phase II IRM, OU-2, Interim Remedial Measure Certification Report, 93B Maple Avenue Former MGP Site, Haverstraw, New York, AOC Index No. D3-0001-99-01, Site No. 3-44-044," March 31.

NYSDEC, 1998. Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations Division of Water Technical and Operational Guidance Series (TOGS) 1.1.1. June 1998 (April 2000 addendum).

NYSDEC, 2006. "Superfund/Brownfield Regulation, 6 NYCRR Part 375 -Environmental Remediation Programs." http://www.dec.ny.gov/docs/remediation_hudson_pdf/part375.pdf.

NYSDEC, 2009. "CP-43 Groundwater Monitoring Well Decommissioning."

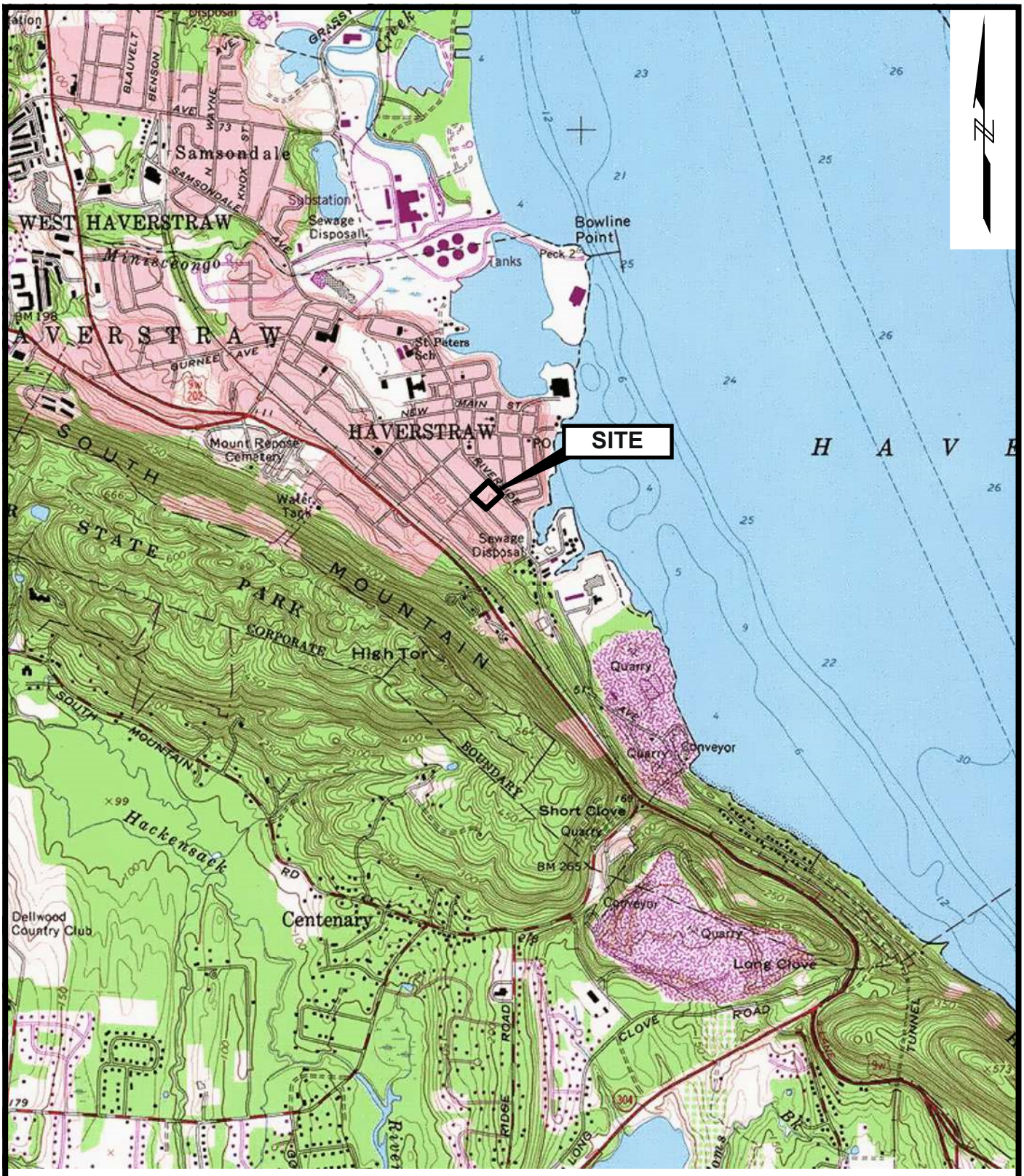
NYSDEC, 2010. "Remedial Guidance, DER-10 Technical Guidance for Site Investigation and Remediation." http://www.dec.ny.gov/docs/remediation_hudson_pdf/der10.pdf.

NYSDOH SVI Guidance

RETEC, 1996. Initial Hazard Investigation and Assessment (Remediation Technologies, Inc. [RETEC] of Concord, Massachusetts.

RETEC, 1997. Preliminary Site Assessment (PSA) Report for Two Manufactured Gas Plants.

FIGURES



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

0 2000 4000

SCALE, FEET

SITE MANAGEMENT PLAN 93B MAPLE AVENUE MGP SITE HAVERSTRAW, NEW YORK	GEI Consultants	**SITE LOCATION MAP**
ORANGE & ROCKLAND UTILITIES, INC SPRING VALLEY, NEW YORK	Project 1903111	September 2020 Figure 1

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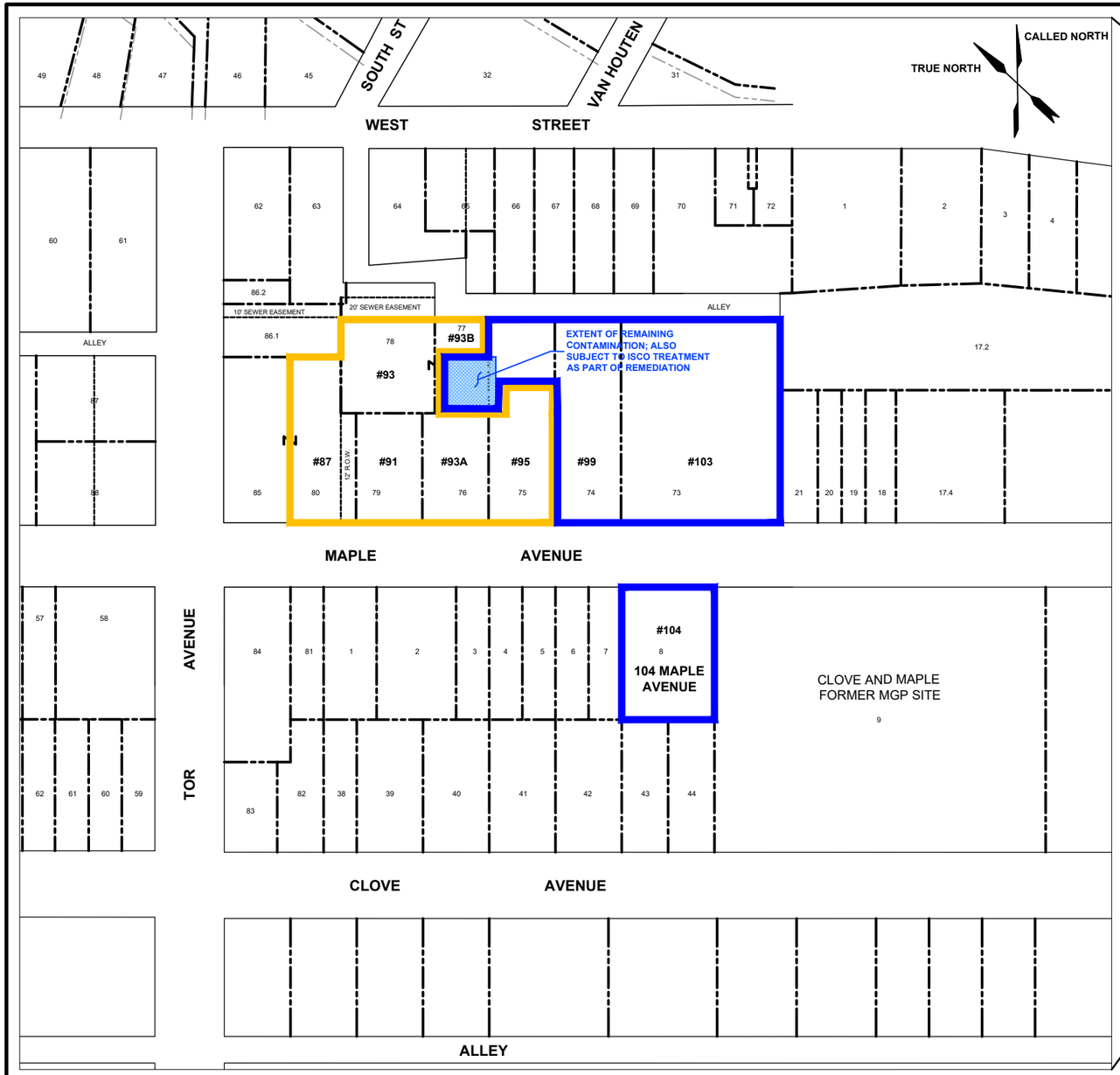

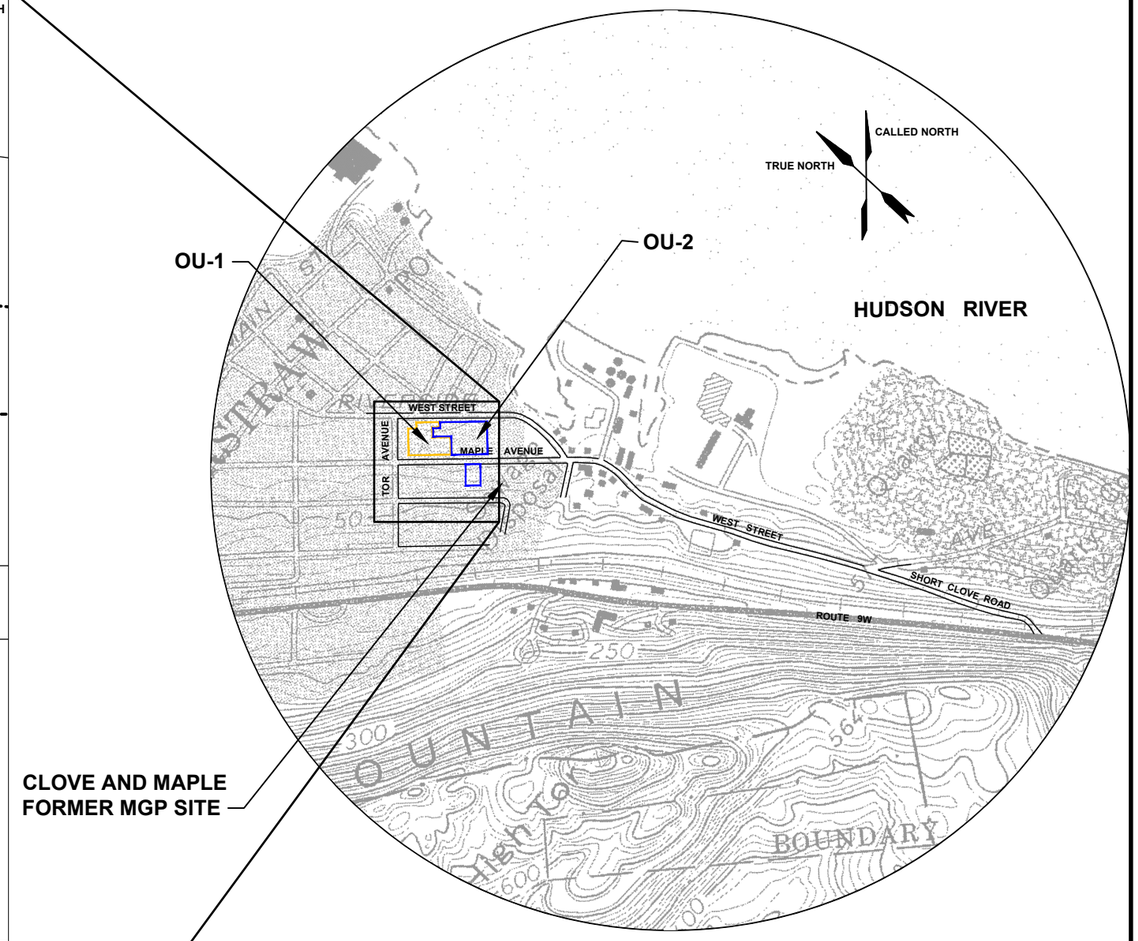

INDEX MAP

0 500 1000

SCALE, FEET

LEGEND:

- PROPERTY BOUNDARY
- 8 — ASSESSOR'S LOT NUMBER
- #104 — STREET ADDRESS (MAPLE AVENUE)
- OU-1
- OU-2

NOTES:
1. ISCO: IN-SITU CHEMICAL OXIDATION.

0 50 100

SCALE, FEET

SITE MANAGEMENT PLAN
93B MAPLE AVENUE MGP SITE
HAVERSTRAW, NEW YORK

ORANGE & ROCKLAND UTILITIES, INC
SPRING VALLEY, NEW YORK

GEI Consultants

SITE PLAN

Project 1903111 | **September 2020** | **Figure 2**

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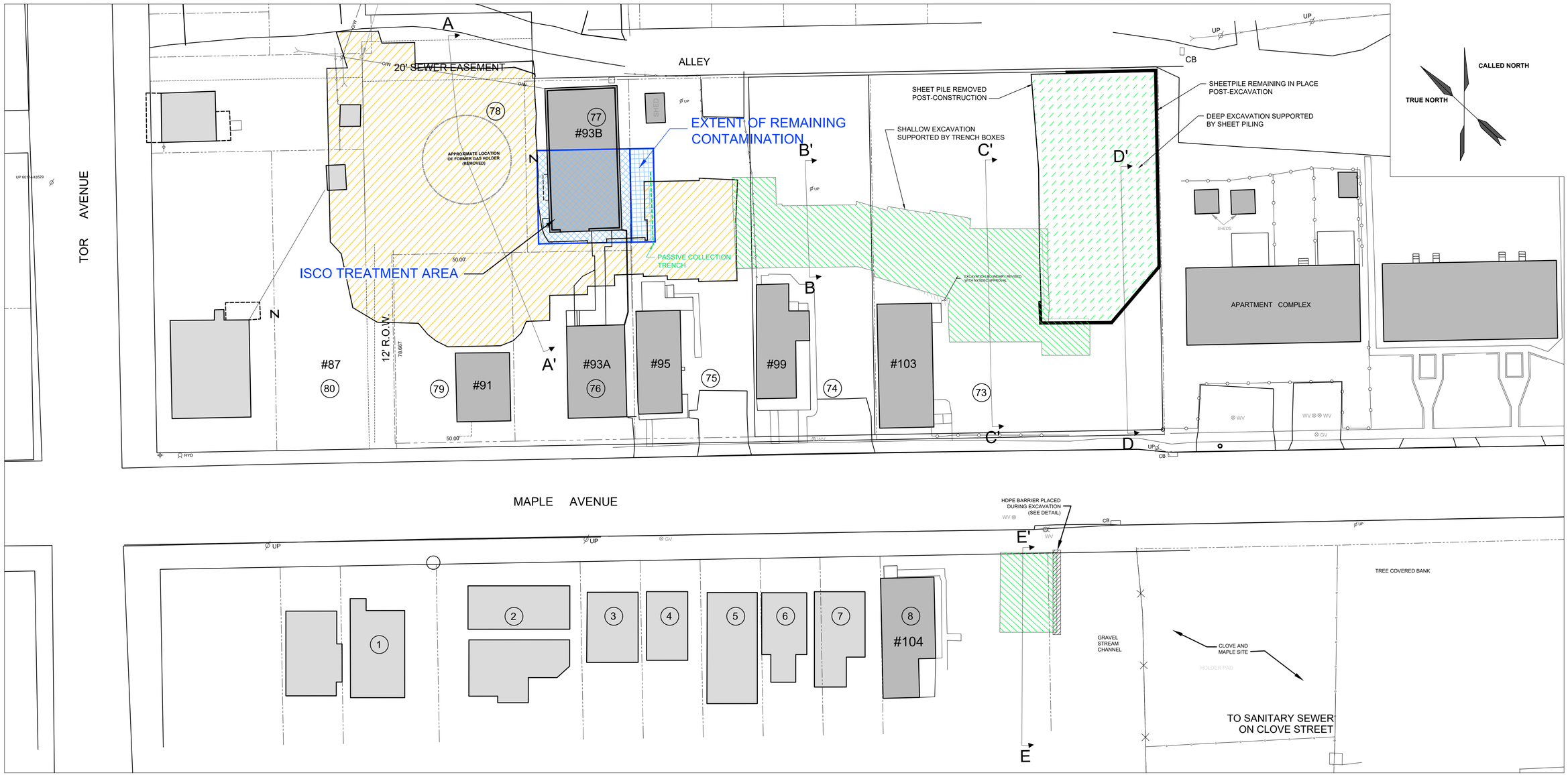

LEGEND:

- PROPERTY LINE
- PASSIVE COLLECTION TRENCH
- FINAL PHASE 1 EXCAVATION LIMITS
- FINAL PHASE 2 SHALLOW EXCAVATION LIMITS
- FINAL PHASE 2 DEEP EXCAVATION LIMITS
- SHEETPILE REMAINING IN PLACE
- ISCO TREATMENT AREA ON 93B MAPLE AVENUE (REMAINING CONTAMINATION)
- ISCO TREATMENT AREA ON 95 MAPLE AVENUE (REMAINING CONTAMINATION)
- GEOLOGIC CROSS SECTION

NOTE:
1. ISCO: IN-SITU CHEMICAL OXIDATION

0 20 40
SCALE, FEET

SITE MANAGEMENT PLAN 93B MAPLE AVENUE MGP SITE HAVERSTRAW, NEW YORK	GEI Consultants 455 WINDING BROOK DRIVE SUITE 201 GLASTONBURY, CONNECTICUT 06033	REMEDIAL SUMMARY AND EXTENT OF REMAINING CONTAMINATION
ORANGE & ROCKLAND UTILITIES, INC SPRING VALLEY, NEW YORK		
PROJECT 1903111	September 2020	Figure 3

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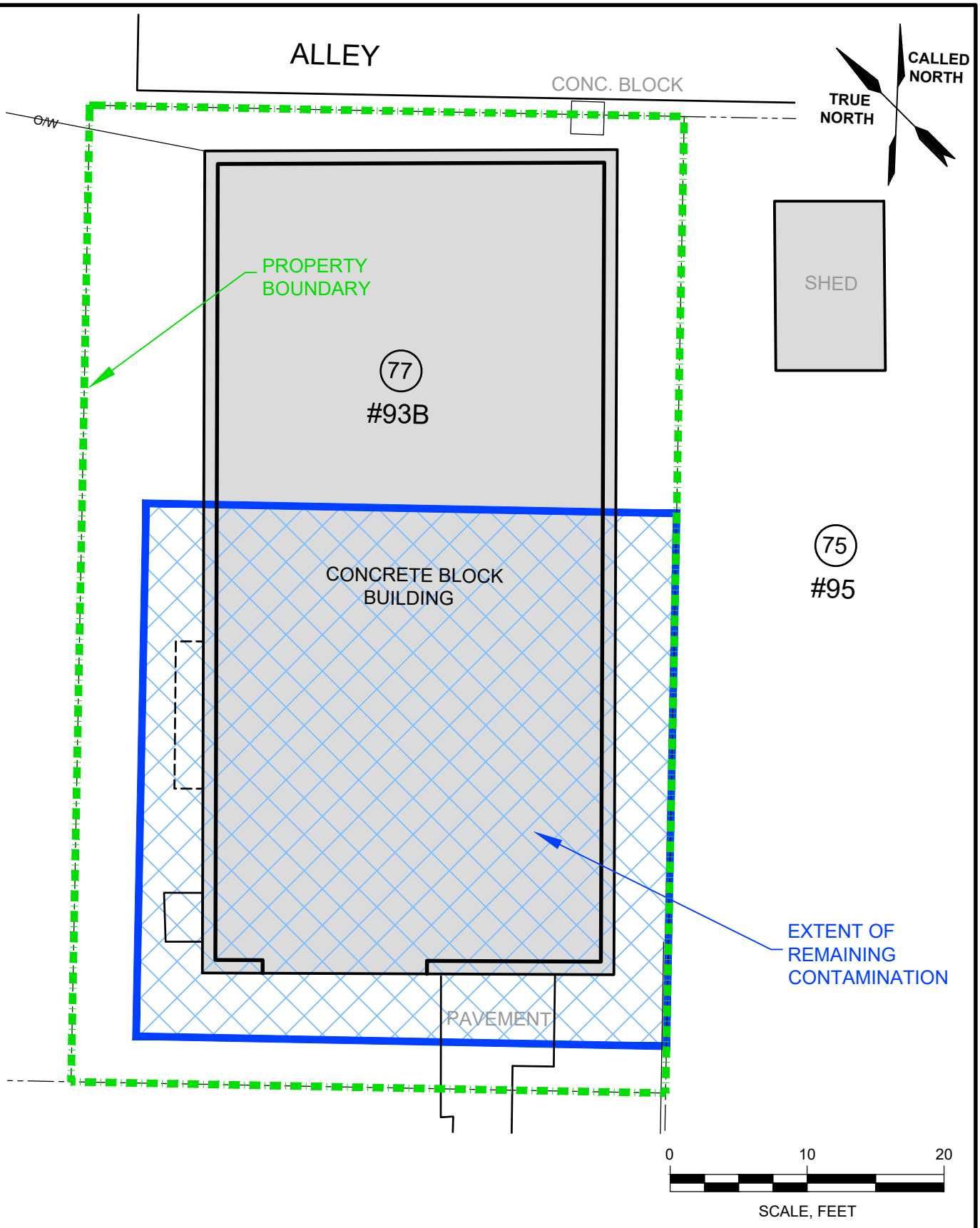

SITE MANAGEMENT PLAN **93B MAPLE AVENUE MGP SITE** **HAVERSTRAW, NEW YORK**	GEI Consultants	**REMAINING CONTAMINTATION:** **93B MAPLE AVE.**
ORANGE & ROCKLAND UTILITIES, INC SPRING VALLEY, NEW YORK	**Project 1903111**	**September 2020** **Figure 4**

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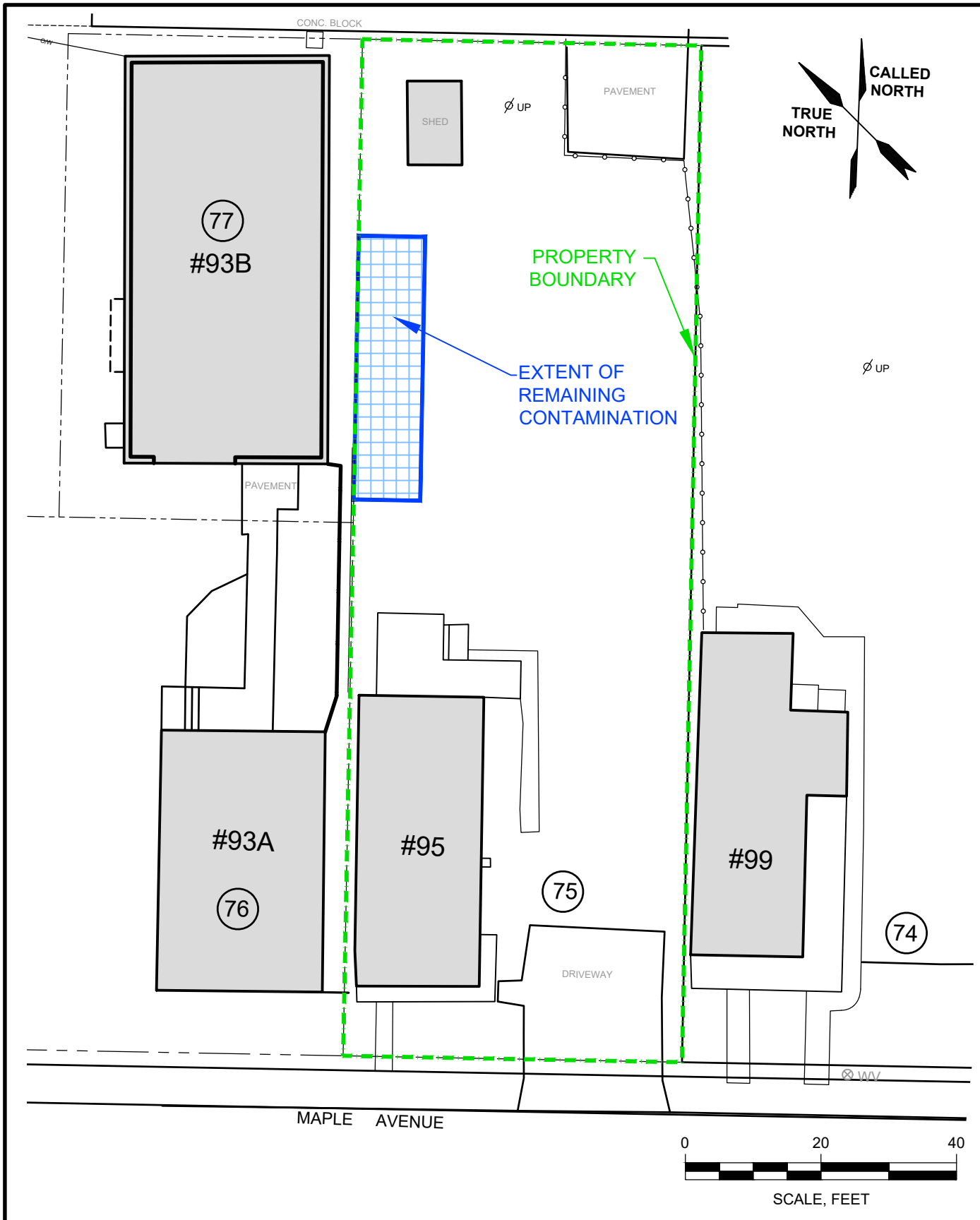

SITE MANAGEMENT PLAN **93B MAPLE AVENUE MGP SITE** **HAVERSTRAW, NEW YORK**	GEI Consultants	**REMAINING CONTAMINTATION:** **95 MAPLE AVE.**
ORANGE & ROCKLAND UTILITIES, INC SPRING VALLEY, NEW YORK	**Project 1903111**	**September 2020** **Figure 5**

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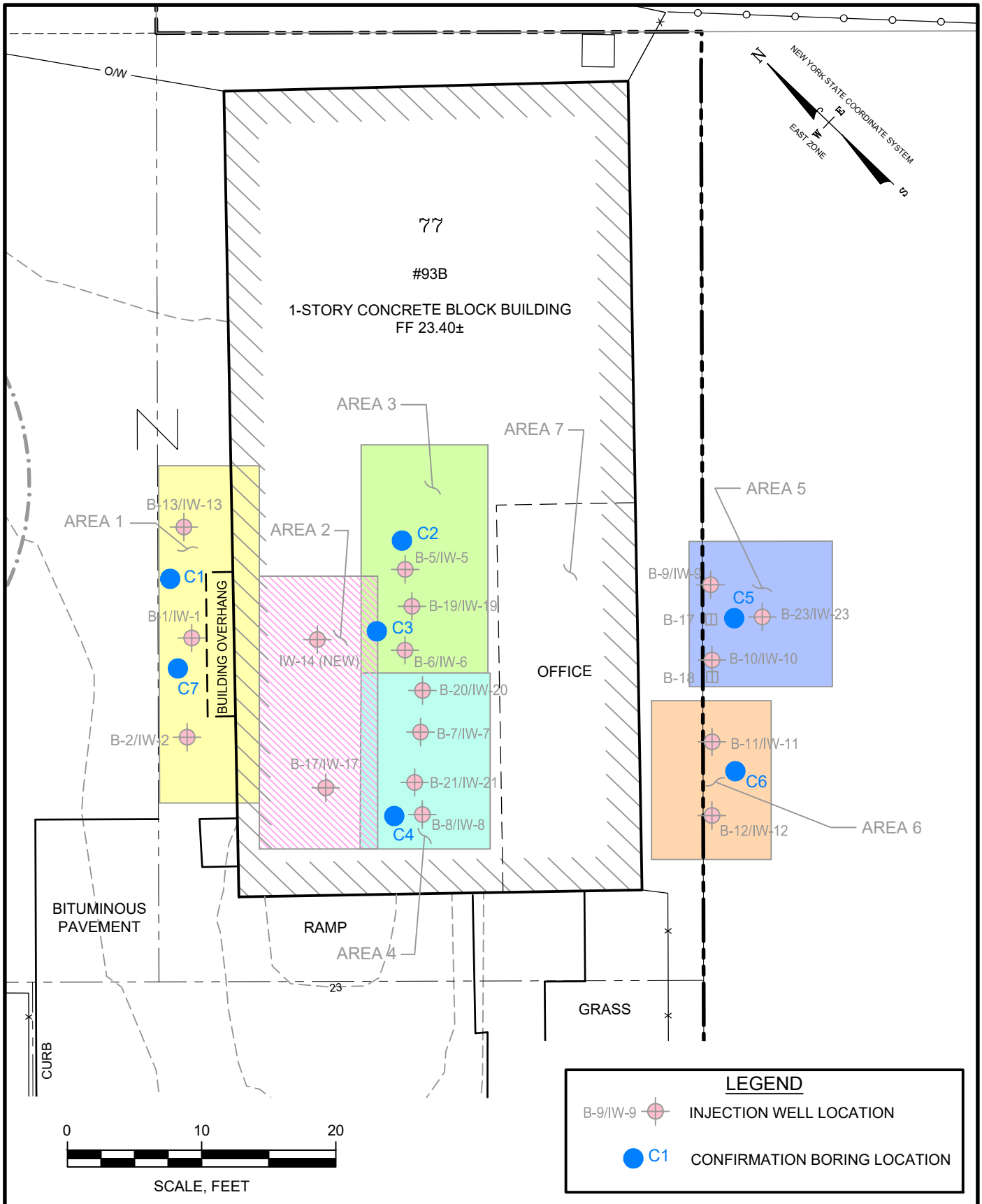

SITE MANAGEMENT PLAN
93B MAPLE AVENUE MGP SITE
HAVERSTRAW, NEW YORK

ORANGE & ROCKLAND UTILITIES, INC
SPRING VALLEY, NEW YORK

GEI Consultants

Project 1903111

CONFIRMATION BORING LOCATIONS - EVENTS 2 AND 3

September 2020 Figure 6

OR&ROCK\HAVERSTRAW\040600-ISCO RPT\93B-BORINGS.dwg

BORING LOG (C-01)

Boring/Well ID:	C-01	**Client:**	Orange & Rockland Utilities, Inc.
Project Number:	040600-1008	**Project Name:**	ISCO, 93B Maple Avenue Parcel
Logged By:	Melissa Felter	**Location:**	Haverstraw, NY
Date Started:	4/26/04	**Contractor:**	Earth Technology Inc
Date Completed:	4/26/04	**Driller:**	Walt and Tim
Total Depth:	16 feet	**Drilling Method:**	Direct Push – GeoProbe®

Ground Surface Elevation:	Well Construction:	Notes:
Measuring Point Elevation: NA / NA	NA	

Depth (feet)	Blow Counts	Recovery (feet)	PID (ppm)	Soil Description
0 – 4	NA	2.3	0.0, 0.0 0.0, 0.0	0' – 4': Moist, brown FILL, fine to coarse-grained SAND, some silt and clay, trace fine to coarse gravel, dense, non-cohesive, poorly-sorted, no odors or visual impacts.
4 – 8	NA	1.8	0.0, 0.0 0.0, 0.0	4' – 8': Moist to wet at 7', brown FILL, fine to medium SAND, some silt and clay, trace gravel, moderately dense, non-cohesive, poorly-sorted, no odors or visual impacts.
8 - 12	NA	2.0	0.0, 0.0 0.0 0.3 0.1	8' – 11.5': Wet, brown, medium to coarse-grained SAND, little silt and clay, loose, non-cohesive, well-sorted, no odors or visual impacts. 11.5' – 11.6': Wet, brown CLAY, soft, cohesive, plastic, no odors or visual impacts. 11.6'-11.8': Wet, brown, medium to coarse-grained SAND, little silt and clay, loose, non-cohesive, well-sorted, no odors or visual impacts. 11.8' – 12': Wet, gray CLAY, some reddish-brown silt layers, dense, cohesive, plastic, no odor or visual impacts.
12 - 16	NA	0.0		12' – 16': No recovery. EOB *(Sample Collected: C-1 11.5'-12')*

BORELOGS

Figure 7

Page 1 of 1

BORING LOG (C-02)

Boring/Well ID:	C-02	**Client:**	Orange & Rockland Utilities, Inc.
Project Number:	040600-1008	**Project Name:**	ISCO, 93B Maple Avenue Parcel
Logged By:	Melissa Felter	**Location:**	Haverstraw, NY
Date Started:	4/26/04	**Contractor:**	Earth Technology Inc
Date Completed:	4/26/04	**Driller:**	Walt and Tim
Total Depth:	12 feet	**Drilling Method:**	Direct Push – GeoProbe®

Ground Surface Elevation:	Well Construction:	Notes:
Measuring Point Elevation: NA / NA	NA	

Depth (feet)	Blow Counts	Recovery (feet)	PID (ppm)	Soil Description
0 – 4	NA	2.17	0.0, 0.0 0.0 0.0	0' – 3.5': Dry, brown FILL, fine to medium-grained SAND, some silt and clay, trace fine gravel, loose, non-cohesive, well-sorted, no odors or visual impacts. 3.5' – 4': FILL, concrete and brick fragments.
4 – 8	NA	2.17	0.0, 0.0 0.0 3.4 6.8	4' – 6.5': Dry, brown FILL, fine to coarse SAND, some brick and concrete, trace coal, loose, non-cohesive, poorly-sorted, no odors or visual impacts. 6.5' – 8': Wet, dark brown, fine SAND, some fines, trace coarse sand, trace coal, dense, slightly cohesive, no odors or visual impacts.
8 - 12	NA	1.75	3.4 1.7, 0.7 14.0	8' – 9.5': Wet, gray, medium to coarse-grained SAND, some fine to coarse gravel, loose, non-cohesive, poorly-sorted, slight persulfate odor, no visual impacts. 9.5' – 11.25': Wet, gray, fine to medium SAND, loose, non-cohesive, well-sorted, no odors or visual impacts. 11.25' – 11.75': Wet, gray, fine to medium SAND, loose, non-cohesive, well-sorted, moderate tar odor, tar stained. 11.75' – 12': Wet, gray, CLAY, some brown silt layers, dense, cohesive, plastic, no odors or visual impacts. EOB *(Sample Collected: C-2 11.25'-11.75')*

BORELOGS

Figure 7

Page 1 of 1

BORING LOG (C-03)

Boring/Well ID:	C-03	**Client:**	Orange & Rockland Utilities, Inc.
Project Number:	040600-1008	**Project Name:**	ISCO, 93B Maple Avenue Parcel
Logged By:	Melissa Felter	**Location:**	Haverstraw, NY
Date Started:	4/26/04	**Contractor:**	Earth Technology Inc
Date Completed:	4/26/04	**Driller:**	Walt and Tim
Total Depth:	16 feet	**Drilling Method:**	Direct Push – GeoProbe®

Ground Surface Elevation:	Well Construction:	Notes:
Measuring Point Elevation: NA / NA	NA	

Depth (feet)	Blow Counts	Recovery (feet)	PID (ppm)	Soil Description
0 – 4	NA	2.33	0.0, 0.0 0.0, 0.0	0' – 4': Dry, light to dark brown FILL, fine to coarse-grained SAND, some silt and clay, some gravel, trace brick glass and concrete, loose, non-cohesive, poorly-sorted, no odors or visual impacts.
4 – 8	NA	2.08	0.0 0.0 0.0 2.8 0.9	4' – 5' Dry, light to dark brown FILL, fine to coarse-grained SAND, some silt and clay, some gravel, trace brick glass and concrete, loose, non-cohesive, poorly-sorted, no odors or visual impacts. 5' – 5.5': Moist, brown SILT and fine SAND, dense, cohesive, no odors or visual impacts. 5.5' – 6.5' Dry, light to dark brown FILL, fine to coarse-grained SAND, some silt and clay, some gravel, some brick, trace glass, loose, non-cohesive, poorly-sorted, no odors or visual impacts. 6.5' – 8': Moist, black, fine SAND and SILT, some wood, dense, non-cohesive, well-sorted, no odors or visual impacts.
8 - 12	NA	2.42	3.5 0.0 1.8	8' – 12': Wet, gray, fine-grained SAND, some coarse sand, loose, non-cohesive, well-sorted, no odors or visual impacts.
12 - 16	NA	4.0	1.5 70.0 9.0, 1.0 0.4, 0.4	12' – 12.5': Wet, gray, fine SAND, trace medium to coarse sand, loose, non-cohesive, well-sorted, no odors or visual impacts. 12.5' – 13': Wet, gray, fine SAND, trace, medium to coarse sand, loose, non-cohesive, well-sorted, modcrate tar odor, tar stained. 13' – 16': Wet, gray CLAY, some red silt layers, dense, cohesive, plastic, no odors or visual impacts. EOB *(Sample Collected: C-3 12.5'-13')*

BORELOGS

Figure 7

Page 1 of 1

BORING LOG (C-04)

Boring/Well ID:	C-04	**Client:**	Orange & Rockland Utilities, Inc.
Project Number:	040600-1008	**Project Name:**	ISCO, 93B Maple Avenue Parcel
Logged By:	Melissa Felter	**Location:**	Haverstraw, NY
Date Started:	4/26/04	**Contractor:**	Earth Technology Inc
Date Completed:	4/26/04	**Driller:**	Walt and Tim
Total Depth:	16 feet	**Drilling Method:**	Direct Push – GeoProbe®

Ground Surface Elevation:	Well Construction:	Notes:
Measuring Point Elevation: NA / NA	NA	

Depth (feet)	Blow Counts	Recovery (feet)	PID (ppm)	Soil Description
0 – 4	NA	1.33	0.0, 0.0 0.0	0' – 4': Dry, brown FILL, fine to medium-grained SAND and CONCRETE, trace silt and clay, trace fine to medium gravel, loose, non-cohesive, well-sorted, no odors or visual impacts.
4 – 8	NA	1.83	0.0 0.0 0.0	4' – 6.5' Dry, brown to dark brown FILL, fine to medium SAND, some brick, coal and concrete, loose, non-cohesive, poorly-sorted, no odors or visual impacts. 6.5' – 8' Dry, brown to dark brown FILL, fine to medium SAND, some silt, some brick, coal and concrete, loose, non-cohesive, poorly-sorted, no odors or visual impacts.
8 - 12	NA	3.33	0.0 0.0 0.1, 0.1 2.5	8' – 9.5': Dry, brown to dark brown FILL, fine to medium SAND, some silt, some brick, coal and concrete, loose, non-cohesive, poorly-sorted, no odors or visual impacts. 9.5' – 11.5': Wet, gray, medium to coarse SAND, loose, non-cohesive, well-sorted, no odors or visual impacts. 11.5' – 12': Wet, brown fine SAND, trace fines, loose, non-cohesive, well-sorted, no odors or visual impacts.
12 - 16	NA	4.0	0.0, 2.5 7.3 302 0.7, 2.9	12' – 14.25': Wet, gray, fine SAND, trace coarse sand, loose, non-cohesive, well-sorted, no odors or visual impacts. 14.25' – 14.5': Wet, gray, fine SAND, trace coarse sand, loose, non-cohesive, well-sorted, moderate tar odor, heavily coated with tar. 14.5' – 16': Wet, brown to gray CLAY, dense, cohesive, plastic, no odors or visual impacts. EOB *(Sample Collected: C-4 14'-14.5')*

BORELOGS

Figure 7

Page 1 of 1

BORING LOG (C-05)

Boring/Well ID:	C-05	**Client:**	Orange & Rockland Utilities, Inc.
Project Number:	040600-1008	**Project Name:**	ISCO, 93B Maple Avenue Parcel
Logged By:	Melissa Felter	**Location:**	Haverstraw, NY
Date Started:	4/26/04	**Contractor:**	Earth Technology Inc
Date Completed:	4/26/04	**Driller:**	Walt and Tim
Total Depth:	8 feet	**Drilling Method:**	Direct Push – GeoProbe®

Ground Surface Elevation:	Well Construction:	Notes:
Measuring Point Elevation: NA / NA	NA	

Depth (feet)	Blow Counts	Recovery (feet)	PID (ppm)	Soil Description
0 – 4	NA	2.0	0.0, 0.0 0.0 0.0	0' – 3.5': Dry, brown FILL, fine to coarse-grained SAND, trace silt and clay, trace fine gravel, loose, non-cohesive, poorly-sorted, no odors or visual impacts. 3.5' – 4': Wet, gray fine SAND, trace fines, loose, non-cohesive, well-sorted, slight persulfate odor, no visual impacts.
4 – 8	NA	4.0	0.0, 0.0 4.4, 2.2 34.1 0.8, 0.3	4' – 6' Wet, gray fine SAND, trace fines, loose, non-cohesive, well-sorted, no odors or visual impacts. 6' – 7' Wet, gray fine SAND, trace fines, loose, non-cohesive, well-sorted, moderate naphthalene odor, no visual impacts. 7' – 8': Wet, gray CLAY, dense, cohesive, plastic, no odors or visual impacts. EOB *(Sample Collected: C-5 6'-7')*

BORELOGS

Figure 7

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BORING LOG (C-06)

Boring/Well ID:	C-06	**Client:**	Orange & Rockland Utilities, Inc.
Project Number:	040600-1008	**Project Name:**	ISCO, 93B Maple Avenue Parcel
Logged By:	Melissa Felter	**Location:**	Haverstraw, NY
Date Started:	4/26/04	**Contractor:**	Earth Technology Inc
Date Completed:	4/26/04	**Driller:**	Walt and Tim
Total Depth:	12 feet	**Drilling Method:**	Direct Push – GeoProbe®

Ground Surface Elevation:	Well Construction:	Notes:
Measuring Point Elevation: NA / NA	NA	

Depth (feet)	Blow Counts	Recovery (feet)	PID (ppm)	Soil Description
0 – 4	NA	2.33	0.0, 0.0 0.0, 0.0	0' – 4': Dry, brown FILL, fine to coarse-grained SAND, some silt and clay, some brick and coal, loose, non-cohesive, well-sorted, no odors or visual impacts.
4 – 8	NA	3.25	0.0, 0.0 1.5 4.9 20.0	4' – 7.75': Wet, brownish gray fine SAND, trace fines and fine gravel, loose, non-cohesive, well-sorted, no odors or visual impacts. 7.75' – 8': Wet, brownish gray fine SAND, trace fines and fine gravel, loose, non-cohesive, well-sorted, moderate naphthalene odor, trace sheen, tar coated vein in shoe.
8 – 12	NA	4.0	1.4, 0.0 8.2 2.5 1.0 0.5	8' – 10': Wet brownish gray fine SAND, trace fines, loose, non-cohesive, well-sorted, no odors or visual impacts. 10' – 10.5': Wet brownish gray fine SAND, trace fines, loose, non-cohesive, well-sorted, strong persulfate odor, no visual impacts. 10.5' – 11.5': Wet, brown CLAY, dense, cohesive, plastic, no odors or visual impacts. 11.5' – 12': Wet, gray CLAY, dense, cohesive, plastic, no odors or visual impacts. EOB *(Sample Collected: C-6 9'-10.5')*

BORELOGS

Figure 7

Page 1 of 1

BORING LOG (C-07)

Boring/Well ID:	C-07	**Client:**	Orange & Rockland Utilities, Inc.
Project Number:	040600-1008	**Project Name:**	ISCO, 93B Maple Avenue Parcel
Logged By:	Melissa Felter	**Location:**	Haverstraw, NY
Date Started:	4/26/04	**Contractor:**	Earth Technology Inc
Date Completed:	4/26/04	**Driller:**	Walt and Tim
Total Depth:	20 feet	**Drilling Method:**	Direct Push – GeoProbe®

Ground Surface Elevation:	Well Construction:	Notes:
Measuring Point Elevation: NA / NA	NA	

Depth (feet)	Blow Counts	Recovery (feet)	PID (ppm)	Soil Description
0 – 4	NA	2.25	0.0, 0.0 0.0, 0.0	0' – 4': Moist, brown FILL, fine to coarse-grained SAND, some silt and clay, some fine to medium gravel, some organics, loose, non-cohesive, poorly-sorted, no odors or visual impacts.
4 – 8	NA	1.25	0.0, 0.0 0.0	4' – 8': Moist, brown fine to medium SAND, trace medium gravel, loose, non-cohesive, well-sorted, no odors or visual impacts.
8 - 12	NA	0.67	0.1 2.5	8' – 12': Wet, brown to gray, fine to coarse-grained SAND, trace silt and clay, loose, non-cohesive, poorly-sorted, slight persulfate odor, no visual impacts.
12 - 16	NA	1.25	2.5 20.4	12' – 13': Wet, brown fine to medium SAND, some fines, loose, non-cohesive, well-sorted, no odors or visual impacts. 13' – 15': Wet, brown fine to medium SAND, some fines, loose, non-cohesive, well-sorted, slight naphthalene odor, sheen. 15' – 16': Wet, brown fine to medium SAND, some fines, loose, non-cohesive, well-sorted, slight naphthalene odor, sheen, trace tar stained lenses.
16 - 20	NA	0.96	0.2 0.3 0.0	16' -18': Wet, brown, fine to coarse-grained SAND, some fine to coarse gravel, loose, non-cohesive, poorly-sorted, no odors or visual impacts. 18' – 18.2': Wet, gray CLAY, some red silt layers, dense, cohesive, plastic, no odors or visual impacts. 18.2' – 20': Wet, brown fine SAND, trace fines, loose, non-cohesive, well-sorted, no odors or visual impacts. EOB *(Sample Collected: C-7 14'-16')*

BORELOGS

Figure 7

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SITE MANAGEMENT PLAN
93B MAPLE AVENUE MGP SITE
HAVERSTRAW, NEW YORK

ORANGE & ROCKLAND UTILITIES, INC
SPRING VALLEY, NEW YORK

PROJECT 1903111

GEI Consultants
455 WINDING BROOK DRIVE
SUITE 201
GLASTONBURY, CONNECTICUT 06033

BORING LOGS

September 2020 **Figure 7**

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TABLES

Table 1. Remaining Contamination Summary, Lot 75 and Lot 77
93B Maple Avenue Former MGP Site Management Plan
Orange and Rockland Utilities
Haverstraw, New York

Location ID: Depth Interval in feet:	C-1 11.5-12	C-2 11.25-11.75	C-3 12.5-13	C-4 14-14.5	C-5 6-7	Duplicate of C-5 6-7 C-10 10-10.5	C-6 9-10.5	C-7 14-16
PAHs, mg/kg								
Naphthalene	2.2 J	72 J	30 J	2300	46	29 J	0.76 J	12 J
2-Methylnaphthalene	1.6 U	62 J	7.8 U	960	4.1 U	4 U	0.21 U	3.9 U
Acenaphthylene	1.2 J	39 J	18 J	120 J	6.6 J	8.7 J	2 J	7.1 J
Acenaphthene	0.47 J	66 J	74 J	480	20 J	13 J	1.6 J	12 J
Fluorene	0.47 J	90	140	560	6	49	4	27 J
Phenanthrene	2.6	220	550	1700	160	160	16	130
Anthracene	1.2	110	58 J	520	40 J	38 J	4	47
Fluoranthene	6.8	270	320	820	100	130	14	140
Pyrene	3.7	180	220	690	67	71	11	110
Benzo(a)anthracene	3.8	110	120	350	42	49	9	59
Chrysene	3.6	120	120	380	38 J	47	10	54
Benzo(b)fluoranthene	2.6	54 J	71 J	140 J	17 J	22 J	6	32 J
Benzo(k)fluoranthene	3.4	87	79	230 J	28 J	34 J	8	35 J
Benzo(a)pyrene	4.7	98	94	250 J	29 J	34 J	8	45
Indeno(123-cd)pyrene	2.2	44 J	47 J	110 J	12 J	17 J	7	22 J
Dibenzo(ah)anthracene	0.99 J	20 J	29 J	54 J	5 J	4 U	3	8.3 J
Benzo(ghi)perylene	1.4 J	37 J	36	110 J	9.1 J	12 J	6	19 J
Total PAHs	**41**	**1679**	**2006**	**9774**	**676**	**718**	**110**	**759**

Notes:
U - Not detected at or above the reporting limit shown
J - Estimated value
Average total PAHs based on all sample results, including duplicate samples
41 Exceedance of RAO of 25 ppm (mg/kg) for Total PAHs Location ID:Depth Interval in feet:

Table 2. Imported Backfill Criteria: Unrestricted Use SCOs
93B Maple Avenue Former MGP Site Management Plan
Orange and Rockland Utilities
Haverstraw, New York

Constituent	CAS Number	Unrestricted Use
Metals		
Arsenic	7440-38-2	13
Barium	7440-39-3	350
Beryllium	7440-41-7	7.2
Cadmium	7440-43-9	2.5
Chromium, hexavalent	18540-29-9	30
Chromium, trivalent	16065-83-1	50
Copper	7440-50-8	50
Total Cyanide		27
Lead	7439-92-1	63
Manganese	7439-96-5	1600
Total Mercury		0.18
Nickel	7440-02-0	30
Selenium	7782-49-2	3.9
Silver	7440-22-4	2
Zinc	7440-66-6	109
Polychlorinated Biphenyls (PCBs)/Pesticides		
TP Acid (Silvex), 2,4,5	93-71-1	3.8
DDD,4,4-	72-54-8	0.0033
DDE,4,4-	72-55-9	0.0033
DDT,4,4-	50-29-3	0.0033
Aldrin	309-00-2	0.005
Alpha-bhc	319-84-6	0.02
Alpha-chlordane	5103-71-9	0.094
Beta-BHC	319-85-7	0.036
Delta-BHC	319-86-8	0.04
Dibenzofuran	132-64-9	7
Dieldrin	60-57-1	0.005
Endosulfan I	959-98-8	2.4
Endosulfan II	33213-65-9	2.4
Endosulfan sulfate	1031-07-8	2.4
Endrin	72-20-8	0.014
Heptachlor	76-44-8	0.042
Lindane	58-89-9	0.1
PCBs	1336-36-3	0.1
Semi-Volatile Organic Compounds (SVOCs)		
Acenaphthene	83-32-9	20
Acenaphthylene	208-96-8	100
Anthracene	120-12-7	100
Benz[a]anthracene	56-55-3	1

Table 2. Imported Backfill Criteria: Unrestricted Use SCOs
93B Maple Avenue Former MGP Site Management Plan
Orange and Rockland Utilities
Haverstraw, New York

Constituent	CAS Number	Unrestricted Use
SVOCs (continued)		
Benzo[a]pyrene	50-32-8	1
Benzo[b]fluoranthene	205-99-2	1
Benzo[g,h,i]perylene	191-24-2	100
Benzo[k]fluoranthene	207-08-9	0.8
Chrysene	218-01-9	1
Dibenz[a,h]anthracene	53-70-3	0.33
Fluoranthene	206-44-0	100
Fluorene	86-73-7	30
Indeno[1,2,3-cd]pyrene	193-39-5	0.5
m-Cresol	108-39-4	0.33
Napthalene	91-20-3	12
o-Cresol	95-48-7	0.33
p-Cresol	106-44-5	0.33
Pentachlorophenol	87-86-5	0.8
Phenanthrene	85-01-8	100
Pyrene	129-00-0	100
Volatile Organic Compounds (VOCs)		
Acetone	67-64-1	0.05
Benzene	71-43-2	0.06
Butylbenzene	104-51-8	12
Butylbenzene, sec-	135-98-8	11
Butylbenzene, tert-	98-06-6	5.9
Carbon tetrachloride	56-23-5	0.76
Chlorobenzene	108-90-7	1.1
Chloroform	67-66-3	0.37
Dichlorobenzene,1,2-	95-50-1	1.1
Dichlorobenzene,1,3-	541-73-1	2.4
Dichlorobenzene,1,4-	106-46-7	1.8
Dichloroethane,1,1-	75-34-3	0.27
Dichloroethane,1,2-	107-06-2	0.02
Dichloroethene, cis-1,2-	156-59-2	0.25
Dichloroethene,1,1-	75-35-4	0.33
Dioxane, 1,4-	123-91-1	0.1
Ethylbenzene	100-41-4	1
Hexachlorobenzene	118-74-1	0.33
Methyl ethyl ketone	78-93-3	0.12
Methyl tert-butyl ether	1634-04-4	0.93
Methylene chloride	75-09-2	0.05
Naphthalene	91-20-3	12

Table 2. Imported Backfill Criteria: Unrestricted Use SCOs
93B Maple Avenue Former MGP Site Management Plan
Orange and Rockland Utilities
Haverstraw, New York

Constituent	CAS Number	Unrestricted Use
VOCs (continued)		
Proplybenzene, n-	103-65-1	3.1
Tetrachloroethene	127-18-4	1.3
Toluene	108-88-3	0.7
Trans-1,2-dichloroethene	156-60-5	0.19
Trichloroethane,1,1,1-	71-55-6	0.68
Trichloroethene	79-01-6	0.47
Trimethylbenzene,1,2,4-	95-63-6	3.6
Trimethylbenzene,1,3,5-	108-67-8	8.4
Vinyl chloride	75-01-4	0.02
Xylene, total	1330-20-7	0.26

General Notes:
1. From Table 375-6.8(a) of 6 New York Code of Rules & Regulations (NYCRR) Part 375.
2. SCO = Soil Cleanup Objective.

APPENDIX A – LIST OF SITE CONTACTS

APPENDIX A – LIST OF SITE CONTACTS

Name	Phone/Email Address
Manager - MGP Programs Consolidated Edison Company of New York, Inc. 3101 20th Avenue – Bldg. 136, 2nd Fl. Long Island City, NY 11105	877-602-6633
Justin Starr, P.G.. NYSDEC Project Manager Remedial Section 3 NYSDEC Division of Environmental Remediation 625 Broadway 11th Fl. Albany, NY 12233-7014	518-402-9662 Justin.Starr@dec.ny.gov derweb@dec.ny.gov
Anthony Perretta NYSDOH Bureau of Environmental Exposure Investigation, 547 River Street Corning Tower, Room 1787 Albany, NY 12237	518-402-7880 acp06@health.state.ny.us

APPENDIX B – EXCAVATION WORK PLAN

APPENDIX B – EXCAVATION WORK PLAN (EWP)

B-1 NOTIFICATION

The site is currently occupied by a garage and a portion of a residential parcel. Invasive work is not anticipated in these areas; however, subsurface work may be required for such activities as utility installations or other similar activities. Should invasive work be planned, at least 15 days prior to the start of any activity that is anticipated to encounter remaining contamination, the site owner or their representative will notify Consolidated Edison Company of New York, Inc. (CECONY) (which is acting on behalf of O&R for purposes of this EWP) who will in turn notify the NYSDEC within 10 days prior to an activity. Currently, this notification will be made to:

Table B-1: Notifications*

Manager – MGP Programs Consolidated Edison Company of New York, Inc. 3101 20th Avenue - Bldg. 136, 2nd Floor Long Island City, NY 11105	877-602-6633
Justin Starr, P.G.NYSDEC Project Manager Remedial Section 3 NYSDEC Division of Environmental Remediation 625 Broadway 11th Floor Albany, NY 12233-7014	(518) 402-9662 Justin.Starr@dec.ny.gov Derweb@dec.ny.gov

* Note: Notifications are subject to change and will be updated as necessary.

This notification will include:

- A detailed description of the work to be performed, including the location and extent, plans for site re-grading, intrusive elements or utilities to be installed, estimated volumes of contaminated soil to be excavated and any work that may impact an Institutional Control or future monitoring or inspection.

- A summary of environmental conditions anticipated in the work areas, including the nature and concentration levels of constituents of potential

concern (COPC), potential presence of grossly contaminated media, and plans for any pre-construction sampling.

- A schedule for the work, detailing the start and completion of all intrusive work.
- A summary of the applicable components of this EWP.
- A statement that the work will be performed in compliance with this EWP and 29 CFR 1910.120.
- A copy of the contractor's health and safety plan (HASP), in electronic format, if it differs from the HASP provided in this Site Management Plan (SMP).
- Identification of disposal facilities for potential waste streams.
- Identification of sources of any anticipated backfill, along with all required chemical testing results (NYSDEC DER-10, Appendix 5).

Subject to obtaining proper notice and cooperation from the site owner, prior to mobilization, O&R or their representative will prepare and submit all required documents identified in this EWP for review and approval by the NYSDEC. Otherwise, such documents shall be prepared by the site owner or its representative who will submit all required documents identified in this EWP for review and approval by the NYSDEC and O&R.

Any work conducted pursuant to the EWP must also be conducted in accordance with the procedures defined in a HASP and a Community Air Monitoring Plan (CAMP) discussed in the SMP.

The preparer of the documents submitted to the NYSDEC, and parties performing this work, are completely responsible for the safe performance of all intrusive work, the structural integrity of excavations, proper disposal of soils and water, control of runoff from open excavations into remaining contamination, and for structures that may be affected by excavations.

B-2 Site Preparation

Prior to performing any intrusive work, the Site preparation features will be implemented and remain in-place throughout the duration of the work.

B-2.1 Stormwater Pollution Prevention-Erosion and Sediment Controls

The stormwater erosion and sediment controls are intended to mitigate erosion and sedimentation from the Site.

All storm water runoff from the exterior of the excavation area will be collected, routed, and discharged into the local drainage structures prior to contact with any impacted materials. Access areas between the excavation area and the adjacent public streets will contain decontamination stations for all trucks and equipment.

Sediment fence will be installed around the entire perimeter of the work area and all areas to be excavated. Decontamination stations will act as anti-tracking pads, thereby, removing all soil and sediment from all trucks/equipment wheels and bodies that are exiting the Site onto public streets. All trucks shall have watertight compartments to prevent seepage from wet soil onto public streets.

Sediment fences will be inspected once a week and after every storm event. Results of inspections will be recorded in a logbook and maintained at the Site and available for inspection by NYSDEC. All necessary repairs shall be made immediately.

Accumulated sediments will be removed as required to keep the barrier and hay bale check functional. All undercutting or erosion of the silt fence toe anchor shall be repaired immediately with appropriate backfill materials. Manufacturer's recommendations will be followed for replacing silt fencing damaged due to weathering.

Erosion and sediment control measures will be observed to ensure that they are operating correctly. Where discharge locations or points are accessible, they will be inspected to ascertain whether erosion control measures are effective in preventing significant impacts to receiving waters.

Additional erosion control measures may be needed due to unforeseen conditions. Upon completion of the work, remove all sediment fencing and restore the surface. All sediment accumulated in the fencing will be removed and transported to a properly licensed disposal facility.

B-2.2 Site Security

The objectives of the Site Security Plan at the Site are to prevent the vandalism/destruction of construction equipment, to prevent access, and minimize health and safety concerns for the surrounding residential neighborhood.

A temporary fence will be erected around the perimeter of the work area. At a minimum, the fence will be 8-feet high, and equipped with a privacy screen. The fence will extend around all work areas to include the excavation area, waste handling equipment, and storage areas, if any. The fence will have two gates that will have the ability to be locked at the end of each working day. If not otherwise lighted (i.e. building floodlights, municipal streetlights, etc.), provide temporary lighting at the gate.

B-3 Soil Screening, Excavation and Transport

Subject to cooperation from the site owner, O&R is responsible for safe execution of all invasive and other work performed under this EWP- whether by employing contractors or under agreement with property owner to require his contractor to follow such measures. Otherwise, the site owner shall solely bear such responsibility. A qualified environmental professional or person under their supervision will oversee all invasive work and the excavation and load-out of all excavated material.

Visual, olfactory, and instrument-based soil screening will be performed by the qualified environmental professional during all remedial and development excavations into known or potentially contaminated material (remaining contamination). Soil screening will be performed regardless of when the invasive work is done and will include all excavation and invasive work performed during development, such as excavations for foundations and utility work, after issuance of the Certificate of Completion (COC).

Soils will be segregated based on previous environmental data and screening results into materials that require off-site disposal, materials that require testing, material that can be returned to the subsurface, and material that can be used as cover soil.

B-3.1 Stockpile Methods

Soil stockpiles will be placed on a liner and continuously encircled with a berm and/or silt fence. Hay bales will be used, as needed, near catch basins, surface waters, and other discharge points. Stockpiles will be inspected, at a minimum, once each week and

after every storm event. Results of inspections will be recorded in a logbook, maintained at the Site, and available for inspection by NYSDEC.

Stockpiles will be kept covered at all times with appropriately anchored tarps. Stockpiles will be routinely inspected and damaged tarp covers will be promptly replaced.

B-3.2 Vehicle Load Out and Off-Site Transport

Loaded vehicles leaving the Site will be appropriately lined, tarped, securely covered, manifested, and placarded in accordance with appropriate Federal, State, local, and New York State Department of Transportation (NYSDOT) requirements (and all other applicable transportation requirements).

If loads contain wet material capable of producing free liquid, the truck will be made watertight with plastic truck liners before loading occurs. Care will be exercised when loading trucks so as not to spill material on the outside of the trucks.

Once a truck is filled with excavated material, spray-on odor suppressing materials such as Rusmar Foam or Biosolve® may be used to reduce potential volatile organic compound (VOC) emissions during transit, if necessary. A plastic tarp will then be used to cover the excavated materials.

The truck will then exit the excavation area and proceed immediately to a decontamination pad. Trucks will be visually inspected (i.e., box sidewalls, box tailgate, and tires, etc.), cleaned with brushes/brooms, and decontaminated with pressure sprayers, if necessary, prior leaving the Site. The qualified environmental professional will be responsible for ensuring that all outbound trucks are decontaminated in accordance with the Decontamination Plan (Section 1.5) before leaving the Site. Truck wash waters will be collected and disposed of off-site in an appropriate manner.

Locations where vehicles enter or exit the Site shall be inspected daily for evidence of off-site soil tracking. Egress points for truck and equipment transport from the Site will be kept clean of dirt and other materials during Site remediation and development. The qualified environmental professional will be responsible for ensuring that all egress points for truck and equipment transport from the Site are clean of dirt and other materials derived from the Site during intrusive activities. Cleaning of the adjacent streets will be performed, as needed, to maintain a clean condition with respect to Site-derived materials.

All transport of materials will be performed by licensed haulers in accordance with appropriate local, State, and Federal regulations, including Title 6 of the New York Code of Rules and Regulations Part 364 (6 NYCRR Part 364). Haulers will be appropriately licensed and trucks properly placarded. A proposed truck route is included in Fig. 11 of the SMP.

B-3.3 Off-Site Disposal of Soils

All soil/fill/solid waste excavated and removed from the Site will be treated as contaminated and regulated material and will be transported and disposed in accordance with all local, State (including 6 NYCRR Part 360) and Federal regulations. If disposal of soil/fill from this Site is proposed for unregulated off-site disposal (i.e. clean soil removed for development purposes), a formal request with an associated plan will be made to the NYSDEC. Unregulated off-site management of materials from this Site will not occur without formal NYSDEC approval.

Soils that contain too high a water content to be transported safely (e.g. without risk of a liquid spill off-site) must be amended on-site prior to shipment off-site. Dewatering activities will be utilized, if necessary, to control water levels within the excavation. All amendments used at the Site will meet NYSDEC requirements.

Off-site disposal locations for excavated soils will be identified in the pre-excavation notification. This will include estimated quantities and a breakdown by class of disposal facility, if appropriate (i.e. hazardous waste disposal facility, solid waste landfill, petroleum treatment facility, C/D recycling facility, etc.)

Non-hazardous historic fill and contaminated soils taken off-site will be handled, at minimum, as a Municipal Solid Waste per 6 NYCRR Part 360-1.2. Material that does not meet Track 1 unrestricted Soil Cleanup Objectives (SCOs) is prohibited from being taken to a New York State recycling facility (6 NYCRR Part 360-16 Registration Facility).

B-3.4 Liquid Management and Disposal

All liquids to be removed from the Site, including excavation dewatering and decontamination water, will be handled, transported, and disposed in accordance with applicable local, State, and Federal regulations. Dewatering, purge, and development fluids will not be recharged back to the land surface or subsurface of the Site, but will be managed off-site.

Contaminated liquids from decontamination of equipment and personnel will be pumped into storage tanks (such as fractionalization (frac) tanks) and disposed of off-site. A licensed liquid waste hauler will remove this liquid from the Site and properly dispose of this material in accordance with all applicable regulations. Solid material collected in the frac tank, as a result of settling, will be bulked with soils and sent to an appropriately licensed disposal facility, as necessary.

B-3.5 Disposal Record Keeping

All manifests and/or bills of lading (BOLs) will be reviewed by the NYSDEC and signed by the O&R's or site owner's designated agent, as applicable.

A log of all shipments and copies of all manifests and/or BOLs will be on-site for reference. Actual disposal quantities and associated documentation will be reported to the NYSDEC in the Periodic Review Report. This documentation will include waste profiles, test results, facility acceptance letters, manifests, BOLs, and facility receipts.

B-4 Backfilling

The qualified environmental professional or person under their supervision will oversee all backfilling operations and review all soil analyses to ensure it meets the required criteria. The soil analytical results will be sent to the NYSDEC for review prior to backfilling operations.

B-4.1 Soil Reuse

Material that meets the Unrestricted SCOs listed in Table 375-6.8(a) of 6 NYCRR Part 375, included in Table 9 of the SMP, meet the chemical criteria for on-site reuse. Prior to reuse, samples will be collected and analyzed by an Environmental Laboratory Approval Program (ELAP)-certified laboratory for total VOCs via U.S. Environmental Protection Agency (EPA) Method 8260C, total semi-volatile organic compounds (SVOCs) via EPA Method 8270D, polychlorinated biphenyls (PCBs) via EPA Method 8082, Total Petroleum Hydrocarbons (TPH) via EPA Method 8015, and total cyanide via EPA Method 9010/9014.

Contaminated on-site material, including historic fill and contaminated soil, that is acceptable for reuse on-site, will be placed below a demarcation layer or impervious

surface, and will not be reused within a cover soil layer, within landscaping berms, or as backfill for subsurface utility lines.

Any demolition material proposed for reuse on-site will be sampled for asbestos and the results will be reported to the NYSDEC for acceptance. Concrete crushing or processing on-site will not be performed without prior NYSDEC approval. Organic matter (wood, roots, stumps, etc.) or other solid waste derived from clearing and grubbing of the Site will not be reused on-site.

Soils proposed for reuse will be segregated in separate stockpiles from soils to be shipped off-site for disposal.

The qualified environmental professional will ensure that procedures defined for materials reuse in this SMP are followed and that unacceptable material does not remain on-site.

B-4.2 Backfill Using Imported Material

All materials proposed for import onto the Site will be approved by the qualified environmental professional and will be in compliance with provisions in this SMP prior to receipt at the Site. A Request to Import/Reuse Fill or Soil form, which can be found at http://www.dec.ny.gov/regulations/67386.html, will be prepared and submitted to the NYSDEC project manager allowing a minimum of five business days for review. Material from industrial sites, spill sites, other environmental remediation sites, or potentially contaminated sites will not be imported to the Site.

All imported soils will meet the backfill and cover soil quality standards established in 6 NYCRR 375-6.7(d). Based on an evaluation of the land use, protection of groundwater and protection of ecological resources criteria, the resulting soil quality standards are the Unrestricted Use SCOs listed in Table 375-6.8(a) of 6 NYCRR Part 375, included in Table 9 of the SMP. Soils that meet 'exempt' fill requirements under 6 NYCRR Part 360, but do not meet backfill or cover soil objectives for this site, will not be imported onto the Site without prior approval by NYSDEC. Solid waste will not be imported onto the Site.

At a minimum, backfill samples will be analyzed for Resource Conservation and Recovery Act (RCRA) 8 Metals, PCBs by EPA Method 8082, VOCs by EPA Method 8260C and SVOCs by EPA Method 8270D.

Trucks entering the Site with imported soils will be securely covered with tight fitting covers. Imported soils will be stockpiled separately from excavated materials and covered to prevent dust releases.

B-4.3 Cover System Restoration

After the completion of soil removal and any other invasive activities, the cover system will be restored in a manner that complies with the Phase I and Phase II Interim Remedial Measure (IRM) work plans. A demarcation layer, consisting of orange snow fencing material or equivalent material will be placed to provide a visual reference to the top of the 'Remaining Contamination Zone', the zone that requires adherence to special conditions for disturbance of remaining contaminated soils defined in the SMP.

If the type of cover system changes from that which exists prior to the excavation (i.e., a soil cover is replaced by asphalt), this will constitute a modification of the cover element of the remedy and the upper surface of the remaining contamination. A figure showing the modified surface will be included in the subsequent Periodic Review Report and in any updates to the SMP.

B-5 Decontamination Plan

The objectives of the Decontamination Plan at the Site are to provide the procedures and equipment necessary to decontaminate personnel and equipment to prevent cross-contamination from the excavation area to public areas (i.e., highways, roads, support trailer, vehicles, etc.). This plan does not replace the decontamination procedures outlined in the HASP.

The Contractor will establish decontamination areas for the following activities:

- Personnel decontamination.
- Equipment decontamination.

B-5.1 Personnel Decontamination Station

A personnel decontamination station where workers can drop equipment and remove personal protective equipment (PPE) will be set up within the work zone. It will be equipped with basins for water and detergent, and trash bags or cans for containing disposable PPE and discarded materials. Once personnel have decontaminated at this

station and taken off their PPE, they will proceed to a sink where they will wash themselves as a secondary means of personal hygiene (e.g., hands, face, etc.).

B-5.2 Equipment Decontamination Station

Heavy equipment decontamination will be performed within the limits of the on-site decontamination pads. Heavy contamination will be brushed off equipment using a broom and/or brushes within the excavation area prior to movement to the decontamination pads to decrease the amount of respirable particulates leaving the remediation area. If necessary, at the decontamination/anti tracking pad, all heavy equipment will be pressure washed before leaving the Site. All equipment leaving the Site will be decontaminated per these guidelines.

In addition, any equipment previously utilized to excavate impacted material will be decontaminated prior to use in backfilling (e.g. excavator bucket).

Decontamination/anti-tracking pads will be located and operated at any point that equipment leaves the Site. The decontamination pad(s) will be sufficiently sized to ensure that the largest piece of equipment can be adequately decontaminated. Provisions will be made to control overspray at the decontamination pad(s).

Wastewater from equipment decontamination will be collected and pumped into the frac tanks. Soils collected from the decontamination pads will be bulked with the excavated material and sent to the properly licensed disposal facility as necessary.

B-6 Contingency Plan

- If underground tanks or other previously unidentified contaminant sources are found during post-remedial subsurface excavations or development-related construction, excavation activities will be suspended until sufficient equipment is mobilized to address the condition.

- Sampling will be performed on product, sediment, and surrounding soils, etc. as necessary to determine the nature of the material and proper disposal method. Chemical analysis will be performed for full a full list of analytes (Target Analyte List [TAL] metals; Target Compound List [TCL] volatiles and semi-volatiles, TCL pesticides and PCBs), unless the Site history and previous sampling results provide

a sufficient justification to limit the list of analytes. In this case, a reduced list of analytes will be proposed to the NYSDEC for approval prior to sampling.

- Identification of unknown or unexpected contaminated media identified by screening during invasive Site work will be promptly communicated by phone to NYSDEC's Project Manager. Reportable quantities of petroleum product will also be reported to the NYSDEC spills hotline. These findings will be also included in the Periodic Review Report.

B-7 Community Air Monitoring Plan

The NYSDEC and NYSDOH require the use of a Community Air Monitoring Plan which identifies the real-time monitoring for volatile organic compounds (VOCs) and particulates (i.e., dust) at the downwind perimeter of each designated work area when certain activities are in progress at the site. The requirements of the CAMP are contained in Appendix 1A of the DER-10 Technical Guidance for the Site Investigations and Remediation. The CAMP is intended to supplement, but be discrete from the air-monitoring program implemented by the Contractor for purposes of evaluating Site worker health and safety. Conditions within the excavation area will be monitored in accordance with the Contractor's HASP. Conditions on the perimeter will be monitored in accordance with the CAMP.

B-7.1 CAMP Summary

A Site-specific CAMP was prepared for the Site as part of the SMP. The CAMP is included in Appendix H of the SMP for reference purposes. The CAMP is in compliance with DER-10 and all other applicable Federal, State, and local regulations. Based on future changes to State and Federal health and safety requirements, and specific methods employed by future contractors, the CAMP will be updated and re-submitted for NYSDEC approval.

The CAMP will be designed to provide monitoring procedures, Alert Limits, Action Limits, and contingency measures if Action Limits are approached. An Alert Limit is a contaminant concentration or odor intensity that triggers contingent measures. An Alert Limit does not suggest the existence of a health hazard, but serves instead as a screening tool to trigger contingent measures if necessary, to assist in minimizing off-site

transport of contaminants and odors during intrusive activities. An Action Limit is a contaminant concentration or odor intensity that triggers work stoppage.

During times of ground intrusive activities, fence line perimeter air monitoring will be conducted using a combination of real-time (continuous and almost instantaneous) air monitoring at fixed locations and walk-around supplemental monitoring using hand-held instruments on an as-needed basis. Contaminants commonly found at former MGP sites will be monitored, including VOCs and dust. The CAMP will include a plan that defines Alert Levels, Action Levels, and specific response activities to be implemented during working hours if an exceedance of an Alert Limit or Action Limit for a measured compound occurs. The response actions, potentially including work stoppage, are intended to prevent or significantly reduce the migration of airborne contaminants from the Site.

Exceedances of action levels listed in the CAMP will be reported to NYSDEC and NYSDOH Project Managers.

B-8 Odor Control Plan

Excavation activities at remediation sites typically generate airborne dust and vapors (VOCs) that have the potential to migrate off-site.

Odor controls will be capable of controlling emissions of nuisance odors off-site and on-site. If nuisance odors are identified at the Site boundary, or if odor complaints are received, work will be halted and the source of odors will be identified and corrected. Work will not resume until all nuisance odors have been abated. NYSDEC and the New York State Department of Health (NYSDOH) will be notified of all odor events and of any other complaints about the project. Implementation of all odor controls, including the halt of work, is the responsibility of the qualified environmental professional, and any measures that are implemented will be discussed in the Periodic Review Report.

All necessary means will be employed to prevent on- and off-site nuisances. At a minimum, these measures will include: (a) limiting the area of open excavations and size of soil stockpiles; (b) shrouding open excavations with tarps and other covers; and (c) using foams to cover exposed odorous soils. If odors develop and cannot be otherwise controlled, additional means to eliminate odor nuisances will include: (d) direct load-out of soils to

trucks for off-site disposal; (e) use of chemical odorants in spray or misting systems; and, (f) use of staff to monitor odors in surrounding neighborhoods.

If nuisance odors develop during intrusive work that cannot be corrected, or where the control of nuisance odors cannot otherwise be achieved due to on-site conditions or close proximity to sensitive receptors, odor control will be achieved by sheltering the excavation and handling areas in a temporary containment structure equipped with appropriate air venting/filtering systems.

Odor suppressant systems consisting of chemical foam (e.g., Rusmar foam, Biosolve®) or other approved methods will be provided to prevent odors, if necessary. Keep sufficient odor suppressant on-site to manage the odors generated from the excavated materials, including, but not limited to open excavations, limited stockpiles, or materials loaded into trucks for transportation and disposal. The odor suppressant system will be stored near the excavation and will be easily mobile. Open excavations will be backfilled or covered at the end of each working day to suppress odors, if necessary.

B-9 Dust Control Plan

A dust suppression plan that addresses dust management during invasive on-site work will include, at a minimum, the items listed below:

- Dust suppression will be achieved through the use of a dedicated on-site water truck for road wetting. The truck will be equipped with a water cannon capable of spraying water directly onto off-road areas including excavations and stockpiles.

B-10 Other Nuisances

A plan will be developed and utilized by the contractor for all work to ensure compliance with local noise control ordinances.

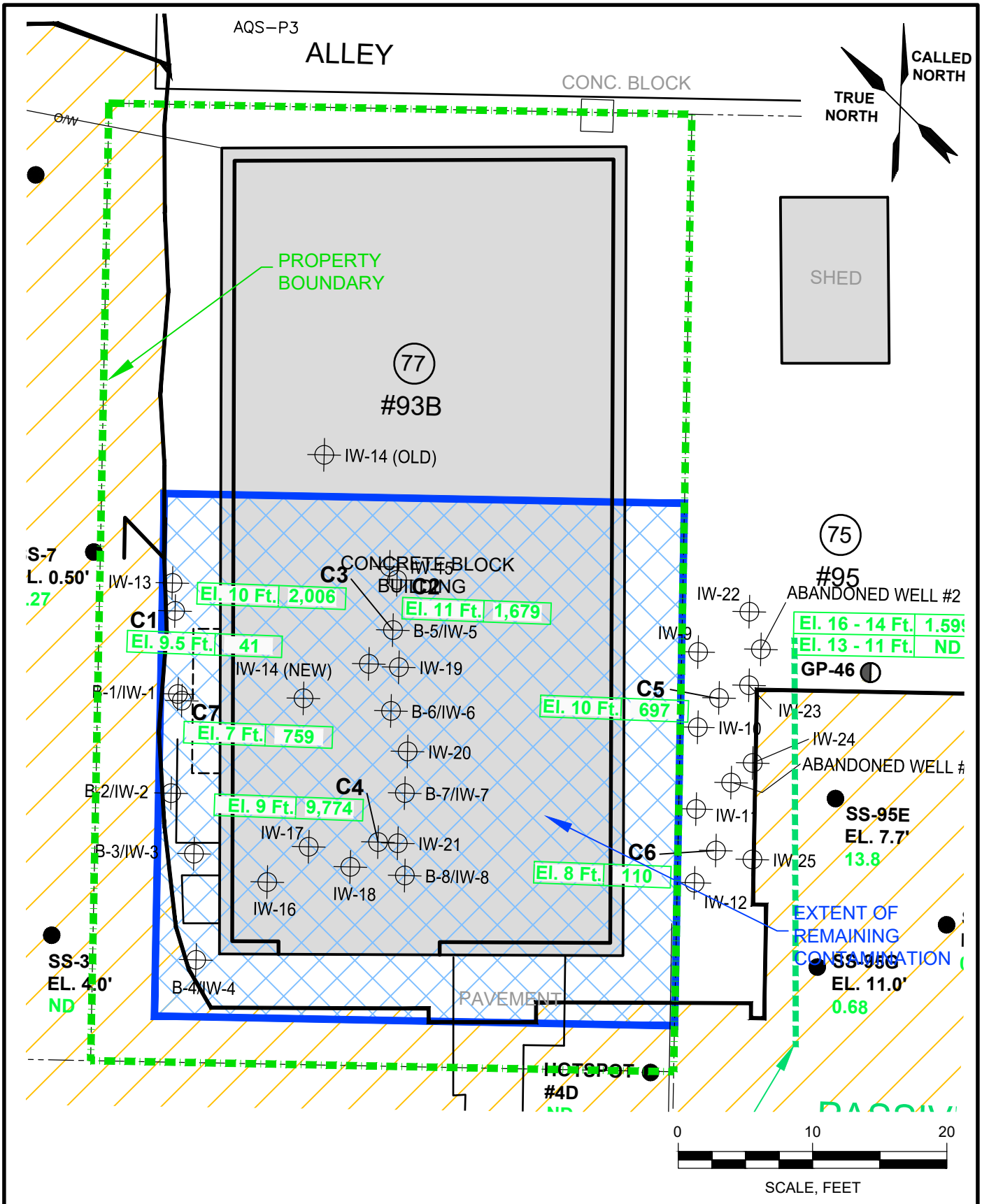
B-11 Reporting

Following the completion of the work, a summation will be included in the Periodic Review Report. The report should include a summary of activities, any changes to the work plan, the final disposal of both solid and hazardous waste, and contain a statement

that the work was performed in accordance with the SMP. Specific components of the report may include:

- Record drawings, specifications, addenda, and approved changes.
- The actual volumes of excavated material and treated/discharged wastewater.
- The results of documentation analyses.
- Other plans and figures (if required), photographs, cross sections, data summary tables, and appendices
- Approved permits.
- Summary of construction work, meetings, and changes in work scope.
- Shipping manifests and BOLs (contaminated soil, clean fill, and construction dewatering liquids).
- Summary of Air Monitoring Data collected during the intrusive activities.
- Certification that material transported off-site was disposed of at a properly licensed disposal facility or Treatment Storage and/or Disposal Facility.

The Periodic Review Report should be submitted to the NYSDEC for review in accordance with the SMP.



SITE MANAGEMENT PLAN 93B MAPLE AVENUE MGP SITE HAVERSTRAW, NEW YORK	GEI Consultants	**REMAINING CONTAMINTATION: 93B MAPLE AVE.**
ORANGE & ROCKLAND SPRING VALLEY, NEW YORK	**Project 1903111**	**September 2020** **Figure 1**

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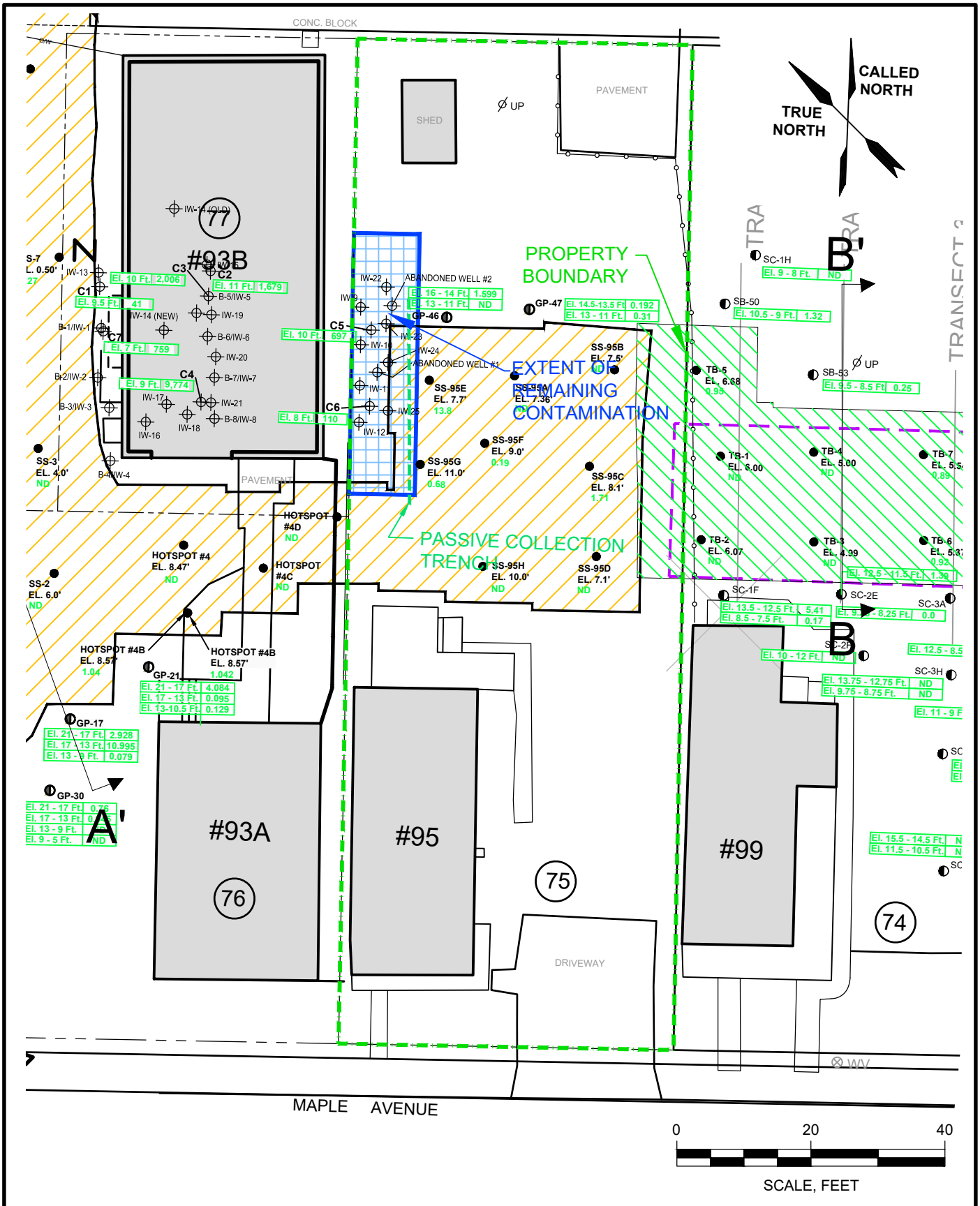

SITE MANAGEMENT PLAN 93B MAPLE AVENUE MGP SITE HAVERSTRAW, NEW YORK	GEI Consultants	**REMAINING CONTAMINTATION: 95 MAPLE AVE.**
ORANGE & ROCKLAND SPRING VALLEY, NEW YORK	**Project 1903111**	**September 2020** **Figure 2**

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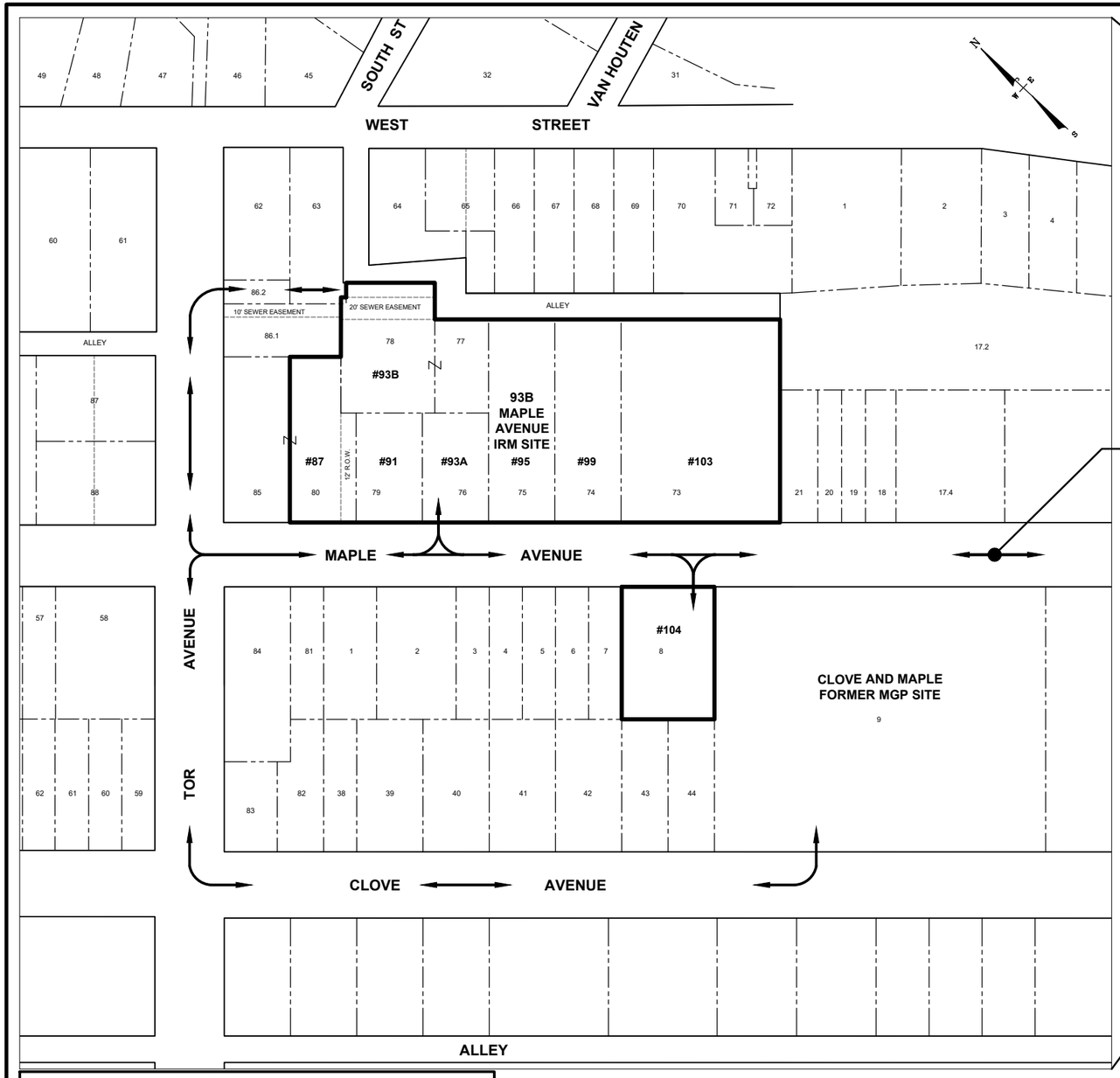

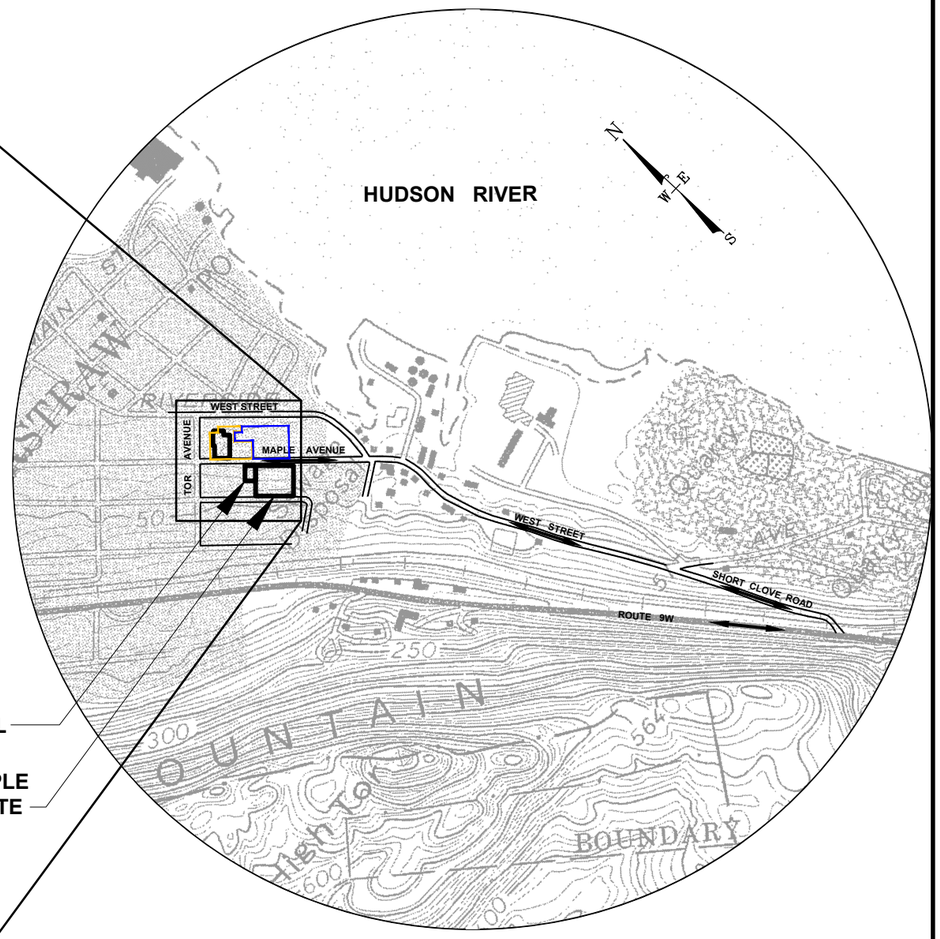

INDEX MAP

SCALE: 1"=500'

TRAFFIC ROUTE (TYP)

104 MAPLE AVENUE PARCEL

CLOVE AND MAPLE FORMER MGP SITE

LEGEND:

- DIRECTION OF TRUCK TRAFFIC ROUTE TO AND FROM THE SITE
- PROPERTY BOUNDARY
- SITE BOUNDARY
- 8 — ASSESSOR'S LOT NUMBER
- #104 — STREET ADDRESS

0 50 100

SCALE, FEET

0 500 1000

SCALE, FEET

SITE MANAGEMENT PLAN
93B MAPLE AVENUE MGP SITE
HAVERSTRAW, NEW YORK

ORANGE & ROCKLAND UTILITIES, INC
SPRING VALLEY, NEW YORK

GEI Consultants

TRUCK TRANSPORT ROUTE

Project 1903111 **September 2020** **Figure 3**

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APPENDIX C – RESPONSIBILITIES OF OWNER AND REMEDIAL PARTY

APPENDIX C

RESPONSIBILITIES of

OWNER and REMEDIAL PARTY

Responsibilities

The responsibilities for implementing the Site Management Plan ("SMP") for the Haverstraw 93B Maple Avenue Former MGP site (the "site"), NYSDEC Number 3-44-044, are divided between the site owner(s) and a Remedial Party, as defined below. The owner(s) is/are currently listed as:

- 93B Maple Avenue (Lot 77) (owner)
- 95 Maple Avenue (Lot 75) (owner).

Solely for the purposes of this document and based upon the facts related to a particular site and the remedial program being carried out, the term Remedial Party ("RP") refers to any of the following: certificate of completion holder, volunteer, applicant, responsible party, and, in the event the New York State Department of Environmental Conservation ("NYSDEC") is carrying out remediation or site management, the NYSDEC and/or an agent acting on its behalf. The RP is:

Orange and Rockland Utilities, Inc.
390 West Route 59
Spring Valley, NY 10977

Nothing on this page shall supersede the provisions of a Consent Order or other legally binding document that affects rights and obligations relating to the site.

Site Owner's Responsibilities

1) The owners shall follow the provisions of the SMP as they relate to future construction and excavation at the site.

2) In accordance with a periodic time frame determined by the NYSDEC, the owners shall periodically certify, in writing, that all controls set forth in the SMP remain in place and continue to be complied with. The owners shall provide a written certification to the RP, upon the RP's request, in order to allow the RP to include the certification in the site's Periodic Review Report (PRR) certification to the NYSDEC. If owner does not provide such certification or grant access, O&R shall prepare the PRR based on conditions observable from a public right-of-way.

3) The owner shall grant access to the site to the RP and the NYSDEC and its agents for the purposes of performing activities required under the SMP and assuring compliance with the SMP. If owner does not provide such access, such shall be deemed non-compliance with this SMP by owner.

4) In the event some action or inaction by the owner adversely impacts the site, the owner must notify the site's RP and the NYSDEC in accordance with the time frame indicated in Section 2.4.2- Notifications and (ii) coordinate the performance of necessary corrective actions with the RP.

5) The owner must notify the RP and the NYSDEC of any change in ownership of the site property (identifying the tax map numbers in any correspondence) and provide contact information for the new owner of the site property. 6 NYCRR Part contains notification requirements applicable to any construction or activity changes and changes in ownership. Among the notification requirements is the following: Sixty days prior written notification must be made to the NYSDEC. Notification is to be submitted to the NYSDEC Division of Environmental Remediation's Site Control Section. Notification requirements for a change in use are detailed in Section 2.4 of the SMP. A 60-Day Advance Notification Form and Instructions are found at http://www.dec.ny.gov/chemical/76250.html.

6) Subject to cooperation and necessary access to the Site from the Site owner, the RP remains ultimately responsible for maintaining the institutional controls, and monitoring and inspecting the Site. Otherwise, such responsibilities shall be borne by the Site owner.

7) The site remedy does not call for a soil vapor mitigation system. Should the NYSDEC require the construction of a mitigation system, then the NYSDEC and the RP will discuss the system operation.

8) The site remedy does not require the installation, operation, and/or maintenance of a drinking water treatment system.

9) In accordance with the tenant notification law, within 15 days of receipt, the owner must supply a copy of any vapor intrusion data, that is produced with respect to structures and that exceeds NYSDOH or OSHA guidelines on the site, whether produced by the NYSDEC, RP, or owner, to the tenants on the property. The owner must otherwise comply with the tenant and occupant notification provisions of Environmental Conservation Law Article 27, Title 24.

Remedial Party Responsibilities

1) The RP must follow the SMP provisions regarding any construction and/or excavation it undertakes at the site.

2) The RP shall report to the NYSDEC all activities required for remediation, monitoring, and reporting. Such reporting includes, but is not limited to, periodic review reports and certifications, electronic data deliverables, corrective action work plans and reports, and updated SMPs.

3) Before accessing the site property to undertake a specific activity, the RP shall provide the owner advance notification that shall include an explanation of the work expected to be completed. The RP shall provide to (i) the owner, upon the owner's request, (ii) the NYSDEC, and (iii) other entities, if required by the SMP, a copy of any data generated during the site visit and/or any final report produced.

4) If the NYSDEC determines that an update of the SMP is necessary, the RP shall update the SMP and obtain final approval from the NYSDEC. Within 5 business days after NYSDEC approval, the RP shall submit a copy of the approved SMP to the owner(s).

5) The RP shall notify the NYSDEC and the owner of any changes in RP ownership. The RP shall provide contact information for the new party/entity. Such activity constitutes a Change of Use pursuant to 375-1.11(d) and requires 60-days prior notice to the NYSDEC. A 60-Day Advance Notification Form and Instructions are found at http://www.dec.ny.gov/chemical/76250.html.

6) Any change in use, change in ownership, change in site classification (*e.g.*, delisting), reduction or expansion of remediation, and other significant changes related to the site may result in a change in responsibilities and, therefore, necessitate an update to the SMP and/or updated legal documents. The RP shall contact the Department to discuss the need to update such documents.

Change in RP ownership and/or control and/or site ownership does not affect the RP's obligations with respect to the site unless a legally binding document executed by the NYSDEC releases the RP of its obligations.

Future site owners and RPs and their successors and assigns are required to carry out the activities set forth above.

APPENDIX D – FIELD SAMPLING PLAN – SVI EVALUATION

January 7, 2016
GEI Project 1512010

Ms. Sarah Saucier, P.E.
Division of Environmental Remediation
New York State Department of Environmental Conservation
625 Broadway
Albany, NY 12233-7014

Consulting Engineers and Scientists

Re: Soil Vapor Intrusion Evaluation Work Plan
Operable Unit 2
Haverstraw 93B Maple Avenue Former MGP Site
Haverstraw, New York
NYSDEC Site # 3-44-044

Dear Ms. Saucier:

GEI Consultants, Inc., P.C. (GEI), on behalf of Orange and Rockland Utilities, Inc. (O&R), has prepared this Work Plan to describe proposed methods for performing soil vapor intrusion (SVI) evaluation sampling at Operable Unit 2 (OU2) of the Haverstraw 93B Maple Avenue Former Manufactured Gas Plant (MGP) site.

Background

O&R executed an Administrative Consent Order (ACO) with the NYSDEC on July 13, 1998 for the 93B Maple Avenue Former MGP site. Interim Remedial Measures (IRMs) were performed for two separate Operable Units (OU1 and OU2) to accomplish the remedial work. The Phase I IRM corresponds to Operable Unit 1 (OU1). NYSDEC issued a Record of Decision (ROD) for OU1 in March 2005 that approved unrestricted land use for the OU1 area.

The Phase II IRM corresponds to Operable Unit 2 (OU2). Remedial excavation was conducted in 2004 and 2005 at 99, 103, and 104 Maple Avenue, and in-situ chemical oxidation (ISCO) activities were performed at 93B and 95 Maple Avenue. Because the excavation portion of the IRM achieved the cleanup objectives for Unrestricted Residential Use, neither an Operation, Maintenance, and Monitoring (OM&M) Plan nor Institutional Controls are required for the 99, 103, and 104 Maple Avenue properties. The NYSDEC issued a ROD for OU2 in March 2006.

For the OU2 portions of 93B and 95 Maple Avenue parcels, the ISCO activities significantly reduced the total mass of total polycyclic aromatic hydrocarbons (TPAH) within the treated areas, but did not achieve the cleanup objectives required to achieve Unrestricted land use. Therefore an Institutional Control and SMP are required for 93B and 95 Maple Avenue parcels. The SMP for this area is currently being updated and will be submitted to the NYSDEC.

The garage at 93B Maple Avenue has not been used since the ISCO remediation was performed. The owner of the garage has been re-located to an off-site area to conduct the business formerly conducted in the building. Before the property owner may re-occupy the garage, the NYSDEC and the NYSDOH have indicated that SVI evaluation sampling will need to be performed to assess the potential for an exposure to constituents in air in this building. A proposed scope of work for performing the SVI evaluation is described below.

SVI Evaluation Scope of Work

Figure 1 shows the garage building at the 93B parcel and the proposed locations for the SVI samples.

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1301 Trumansburg Road, Suite N, Ithaca, NY 14850
607.216.8955 fax: 607.274.7577

Field procedures for the SVI evaluation will be performed in general accordance with the NYSDOH's *"Final Guidance for Evaluating Soil Vapor Intrusion in the State of New York" (October 2006).* The tasks for the evaluation are summarized as follows:

- **Correspondence and Notification** – O&R will contact the property owner to arrange access to the garage. Following approval for access, GEI will then notify the agencies of the planned schedule for the SVI field activities.
- **Initial Site Reconnaissance and Utilities** – GEI will perform an initial reconnaissance prior to the SVI sampling event. A Dig Safely NY stakeout will be called in. A meeting will be requested and GEI will meet with any companies or municipalities involved to mark out and document utilities around the building. GEI will subcontract a utility locating company to further assess whether there may be subsurface utilities present around the building and beneath the concrete floor slab for the garage.
- **NYSDOH Documentation** – During the reconnaissance, if products or chemicals are observed in the garage, they will be documented in a NYSDOH Product Inventory Form. If possible, the products and chemicals will then be moved out of the garage so that the materials will not have the potential to adversely affect the indoor air results.
- **SVI Evaluation Sampling** – GEI will complete a second mobilization to the garage to perform the SVI sampling.
    - Two sub-slab soil vapor sampling points will be located underneath the garage concrete floor. One sample will be located in the former ISCO footprint, and one in the portion of the garage where non-impacted conditions were identified (Figure 1).
    - Once locations clear of utilities have been identified, temporary sub-slab soil vapor points will be installed by drilling holes through the concrete floor slab and advancing the drill bit 2 to 3 inches into the sub-slab material to create an open cavity. Dedicated Teflon® tubing will be used and the inlet will be set just above the bottom of the cavity, or directly below the concrete slab. The sampling port will be sealed with an inert non-shrinking sealant such as inert clay.
    - Sample collection will begin approximately 15 minutes after soil vapor point installation. A chamber will be created above the point. Helium will be used as a tracer gas to evaluate whether the tubing has been sealed from the ambient air above ground. Approximately three implant volumes of air will be purged using a pump set at a flow rate not to exceed 0.2 liters per minute.
    - After purging, a photo-ionization detector will measure volatile organic compound (VOC) concentrations inside the tubing.
    - A 6-liter SUMMA® canister, certified clean by the laboratory, which is calibrated for 4-hour sample duration will then be attached to the tubing and deployed. Time and pressure will be recorded at the start and completion of sampling.
    - A final VOC measurement will be collected after the canister has been disconnected. After sampling is complete, the soil vapor points will be decommissioned by removing the tubing and filling the hole in the slab with quick-setting concrete.
    - One indoor air, one duplicate of indoor air (QA/QC sample), and one ambient (outdoor) air sample will be collected at the same time as the sub-slab samples are collected. The locations are shown on Figure 1.
    - Chemicals or products will be returned to the garage (if needed) and final documentation of building conditions will be performed.

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- **Laboratory Analyses** – Test America Laboratories (Knoxville, TN) will analyze the samples. The samples will be analyzed for VOCs and MGP-indicator compounds, naphthalene, indan, indene, thiophene, styrene, 2-methylpentane, isopentane, 2,3-dimethylpentane, isooctane, and methyl tert-butyl ether (MTBE) by Environmental Protection Agency (EPA) Method TO-15. Soil vapor samples will also be analyzed for helium.
- **Validation** – The analytical data will be validated per Analytical Services Protocol (ASP) Category B Requirements by GEI data validators.
- **Reporting** – A letter report will be prepared to present the results to the NYSDEC and the NYSDOH.
    - Property information for the building will be collected in general accordance with the NYSDOH Center of Environmental Health's Indoor Air Quality Questionnaire and Building Form that is provided as Appendix B of the NYSDOH's "*Final Guidance for Evaluating Soil Vapor Intrusion in the State of New York*" (October 2006).
    - A discussion of the heating system for the garage will be included, including whether the heating system was operational during the period for the sampling, and the significance of the system or operation for the SVI evaluation.
    - The final data will be tabulated in tables with comparisons to NYSDOH background studies.
    - Following approval of the report by the NYSDEC, the SVI data will be submitted to the NYSDEC EMIS website.

Following review and approval by the NYSDEC and the NYSDOH, the report will be provided to the property owner. Any follow-up requirements for the SVI evaluation will be discussed with the agencies.

Schedule

Following approval of this Work Plan, the field activities will be scheduled. It is anticipated that the SVI report will be submitted within 6 weeks following the collection of the laboratory samples.

Please call me at (607) 216-8958 if you have any questions regarding the scope of work described in this letter. Please direct any official correspondence to Ms. Maribeth McCormick, O&R's Project Manager for the Haverstraw 93B site remediation.

Sincerely,

GEI CONSULTANTS, INC., P.C.

James Edwards, C.P.G.
Project Manager

JHE:mlr

Attachments: Figure 1 – SVI Sample Locations

c: Maribeth McCormick – Orange and Rockland Utilities, Inc. (electronic copy)
Anthony Perretta – NYSDOH (electronic copy)
Joe Simone, P.E. – GEI

M:\Tech\Project\Orange and Rockland\Haverstraw 93B\SMP Preparation\SMP 2016\Appendix E - Field Sampling Plan SVI SVI\Source Files\Text\93B Haverstraw SVI Eval WP 9.14.15.docx

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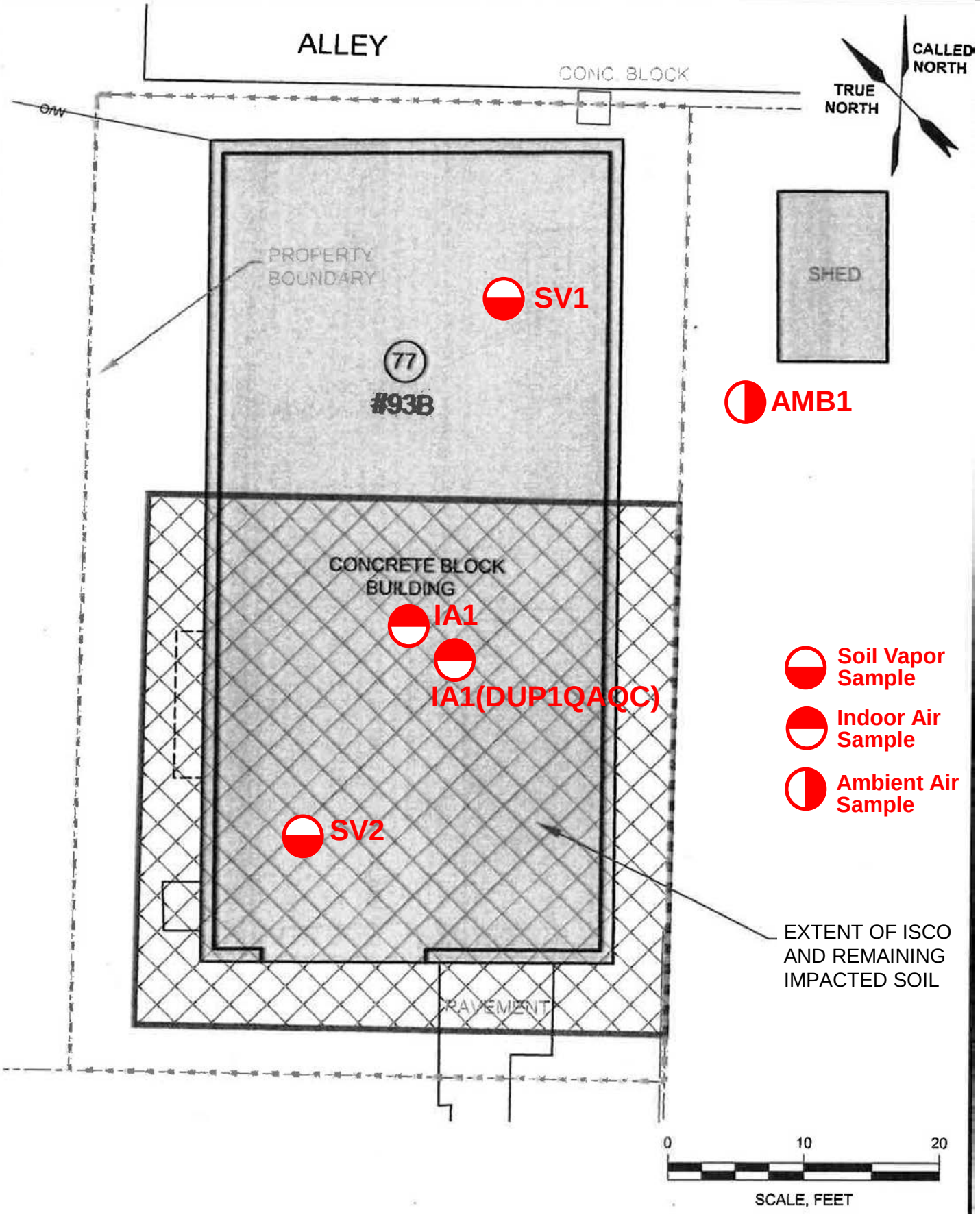


SVI WORK PLAN 93B MAPLE AVENUE MGP SITE HAVERSTRAW, NEW YORK	GEI Consultants	**SOIL VAPOR INTRUSION EVALUATION SAMPLE LOCATIONS**
ORANGE & ROCKLAND GOSHEN, NEW YORK	**Project 1512010**	**September 2015** **Figure 1**

APPENDIX E-1 – NYSDEC APPROVAL LETTER

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

Division of Environmental Remediation, Remedial Bureau C
625 Broadway, 11th Floor, Albany, NY 12233-7014
P: (518) 402-9662 I F: (518) 402-9679
www.dec.ny.gov

December 18, 2015

Ms. Maribeth McCormick
Orange & Rockland Utilities, Inc.
Technical Manager – Environmental Services
3 Old Chester Road
Goshen, New York 10924

Re: Soil Vapor Intrusion Evaluation Work Plan
Operable Unit 2
Haverstraw 93B Maple Avenue Former MGP Site
Haverstraw, Rockland County, New York
Site No. 344044

Dear Ms. McCormick,

The New York State Department of Environmental Conservation (Department) and New York State Department of Health (NYSDOH) have reviewed the Soil Vapor Intrusion Evaluation Work Plan for Operable Unit 2, dated September 15, 2015. The Work Plan is approved with the following modification:

- **SVI Evaluation Sampling, Bullet #4**. It is proposed to collect the sub-slab soil vapor, indoor air, and outdoor air samples over a period of two hours. Based on the potential use of the garage as a shop, it is requested to increase the collection time for all samples to four hours. Additionally, please include text indicating the SUMMA® canister will be certified clean by the laboratory. Therefore, this bullet should be modified to the following, "A 6-liter SUMMA® canister, certified clean by the laboratory, which is calibrated for 4-hour sample duration will then be attached to the tubing and deployed. Time and pressure will be recorded at the start and completion of sampling."

In accordance with the Order on Consent and 6NYCRR 375-1.6(d), please indicate within 15 days whether you will modify the work plan, and submit the modified work plan within 30 days. The modified work plan should be submitted to the parties and in the formats specified in the Order on Consent.

Please contact me at 518-402-9662 if you have any questions.

Sincerely,

Sarah Saucier

Sarah Saucier, P.E.
Environmental Engineer 1
Remedial Section C
Division of Environmental Remediation

Ec: E. Moore, Region 3
J. Edwards, GEI
A. Perretta, DOH
A. Omorogbe, DEC

APPENDIX E-2 – STANDARD OPERATING PROCEDURES

STANDARD OPERATING PROCEDURE

SG-002 Soil Vapor Sample Collection

1. Objective

This procedure outlines the general steps to collect soil vapor samples. The site-specific Sampling and Analysis Work Plan should be consulted for proposed sample locations, sample depths, and sampling duration.

2. Execution

Permanent and temporary soil vapor probes should be installed using the procedures outlined below. All soil vapor probes should be installed using a direct-push drill rig (e.g., Geoprobe® or similar), hand auger, or manually using a slide hammer.

2.1. Document Field Conditions

Document pertinent field conditions prior to installation of any probe points.

- Record weather information (precipitation, temperature, barometric pressure, relative humidity, wind speed, and wind direction) at the beginning of the sampling event. Record substantial changes to these conditions that may occur during the course of sampling. The information may be measured with on-site equipment or obtained from a reliable source of local measurements (e.g., a local airport). Data should be obtained for the past 24 to 48 hours.
- If sampling near a commercial or industrial building, uses of volatile chemicals during normal operations of the facility should be identified.
- Outdoor plot sketches should 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 should be recorded, such as odors and readings from field instrumentation.

2.2. Soil Vapor Point Installation Specifications

Each soil vapor point should be constructed as follows:

- Six-inch stainless steel Geoprobe® AT86 series Permanent Implants (soil vapor screens) or equivalent and threaded to an (expendable) stainless steel anchor point.
- The implants should 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 should be filled with a porous backfill

material (e.g., glass beads or coarse silica sand) to create a sampling zone 1 foot in length.

For temporary points, a hydrated bentonite surface seal should be created at the surface to minimize infiltration. For permanent points, the additional measures described below should be included.

- The soil vapor points should be sealed above the sampling zone with a bentonite slurry for a minimum distance of 3 feet (or to grade, whichever is smaller) to prevent ambient air infiltration.
- If needed, the remainder of the borehole should be backfilled with clean material.
- A protective casing should be set around the top of the point tubing and grouted in place to the top of the bentonite to minimize infiltration of water or ambient air, as well as to prevent accidental damage to the soil vapor point.
- The tubing top should be fitted with a Swagelok® and cap to prevent moisture and foreign material from infiltrating the tubing.

2.3. Soil Vapor Sample Collection

Soil vapor samples should be collected as indicated in the work plan and in accordance with applicable state or federal guidance documents. Specifically, samples from the points should be collected as follows:

- Permanent soil vapor points should not be sampled or purged for a minimum of 24 hours after installation. Temporary points may be purged and sampled immediately following installation.
- Document pertinent field conditions prior to sampling as described above.
- A suction pump should be used to remove a minimum of three implant volumes from the soil vapor points prior to sampling. Include the volume of any additional tubing added to affix sampling equipment and the annular space between the probe and the native material if sand or glass beads were used.
- The purge rate shall not exceed 0.2 liters per minute.
- Samples should be collected for volatile organic compounds (VOCs) in an individually laboratory certified clean 1-liter SUMMA® canister (or equivalent) using a certified flow controller calibrated for the anticipated sample duration (4 minutes). The regulator flow rate should not exceed 0.2 liters per minute.
- A helium tracer gas should be used to identify any potential migration or short circuiting of ambient air during sampling as described below.
- Remove the protective brass plug from the canister. Connect the pre-calibrated flow controller to the canister.
- Record the identification numbers for the canister and flow controller.
- Record the initial canister pressure on the vacuum gauge (check equipment-specific instructions for taking this measurement). A canister with a significantly different pressure than originally recorded by the testing

laboratory should not be used for sampling. Record these numbers and values on the chain-of-custody form for each sample.

- Connect the tubing from the soil vapor probe to the flow controller.
- Open the valve on the canister. Record the time that the valve was opened (beginning of sampling) and the canister pressure on the vacuum gauge.
- Photograph the canister and the area surrounding the canister.
- Monitor the vacuum pressure in the canister routinely during sampling.
- Stop sample collection 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 should be rejected and collected again in a new canister.
- Record the final vacuum pressure and close the canister valve. Record the date and time that sample collection was stopped.
- Remove the flow controller from the canister and replace the protective brass plug.
- Attach labels/tags (sample name, time/date of sampling, etc.) to the canister as directed by the laboratory.
- Place the canister and other laboratory-supplied equipment in the packaging provided by the laboratory.
- Enter the information required for each sample on the chain-of-custody form, making sure to include the identification numbers for the canister and flow controller, and the initial and final canister pressures on the vacuum gauge.
- Samples should be analyzed for VOCs and naphthalene via modified USEPA modified Method TO-15 and helium via ASTM D-1945.
- Include the required copies of the chain-of-custody form in the shipping packaging, as directed by the laboratory. Maintain a copy of the chain-of-custody for the project file.
- Deliver or ship the samples to the laboratory as soon as practical.
- All laboratory analytical data should 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.

2.4. Tracer Gas Evaluation

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

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

the each permanent soil vapor probe during the initial sampling event and a minimum of 10% of the soil vapor probes during subsequent sampling events.

The following tracer gas evaluation procedure uses helium as a tracer gases which can be measured through laboratory analysis or by a portable detector.

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 should 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 should 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 should 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 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 should be analyzed for VOCs and naphthalene via modified USEPA modified Method TO-15 and helium via ASTM D-1945.
- Alternately, a tracer gas detector may be used to verify the presence of the tracer gas in the chamber by affixing it to the valve fitting at the bottom of the chamber. The tracer gas detector may also be used to measure the tracer gas concentration in the pump exhaust during purging. If used, then record the tracer gas concentrations in the chamber and in the soil vapor sample.
- Based on the concentrations of the tracer gas detected during analysis or direct measurement, 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 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 proceed with the soil

vapor sampling. While lower concentrations of tracer gas are acceptable, the impact of the detectable leak on sample results should be evaluated in the sampling report.

3. References

USEPA modified Method TO-15 and helium via ASTM D-1945

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.*

4. Contact

Chris Berotti

STANDARD OPERATING PROCEDURE

SG-003 Sub-slab Soil Vapor Collection

1. Objective

This procedure outlines the general steps to collect sub-slab soil vapor samples. The site-specific Sampling and Analysis Work Plan should be consulted for proposed sample locations, sample depths, and sampling duration.

2. Execution

Permanent and temporary sub-slab soil vapor probes will be installed using the procedures outlined below. All sub-slab soil vapor probes will be installed using a direct-push drill rig (e.g., Geoprobe® or similar), hand auger, or manually using a slide hammer.

2.1. Document Field Conditions

Document pertinent field conditions prior to installation of any probe locations.

- Record weather information (precipitation, temperature, barometric pressure, relative humidity, wind speed, and wind direction) at the beginning of the sampling event. Record substantial changes to these conditions that may occur during the course of sampling. The information may be measured with on-site equipment or obtained from a reliable source of local measurements (e.g., a local airport). Data should be obtained for the past 24 to 48 hours. Record the indoor conditions (temperature, heating/cooling system active, windows open/closed, etc.).
- Measure the differential pressure at the building. Measure the indoor and outdoor barometric pressure using a high resolution device. Where possible, measure the sub-slab barometric pressure at the sampling point.
- If sampling near a commercial or industrial building, uses of volatile chemicals during normal operations of the facility should be identified.
- Indoor floor plan sketches should be drawn that include the floor layout with sampling locations, chemical storage areas, garages, doorways, stairways, location of basement sumps or subsurface drains and utility perforations through building foundations, heating, ventilating and air conditioning (HVAC) system air supply and return registers, compass orientation (North), footings that create separate foundation sections, and any other pertinent information should be completed;
- Outdoor plot sketches should be drawn that include the building site, area streets, outdoor air sampling locations (if applicable), compass orientation (north), and paved areas.
- Any pertinent observations should be recorded, such as odors and readings from field instrumentation.

2.2. Sub-Slab Soil Vapor Point Installation Specifications

Each sub-slab soil vapor point will be constructed as follows:

- Drill an approximately 3/8-inch hole through the slab. If necessary, advance the drill bit 2-3 inches into the sub-slab material to create an open cavity.
- Using dedicated inert Teflon or stainless steel tubing of laboratory or food grade quality, insert the inlet of the tubing to the specified depth below the slab. For permanent installation, only stainless steel tubing and fittings will be used.
- For permanent point installations, the annular space surrounding the vapor probe tip will be filled with a porous backfill material (e.g., glass beads or coarse silica sand) to cover 1-inch of the above the tip of the probe.
- Seal the annular space between the hole and the tubing using an inert non-shrinking sealant such as melted 100% beeswax, permagum grout, putty, etc. For permanent installations, cement may be used.
- For permanent points, a protective casing will be set around the top of the point tubing and grouted in place minimize infiltration of water or ambient air, as well as to prevent accidental damage to he permanent point.
- The tubing top will be fitted with a Swagelok® and cap to prevent moisture and foreign material from infiltrating the tubing.

In cases where sub-slab sampling is impractical or infeasible, a surrogate location (attached garage, concrete patio, asphalt driveway, etc.) may be used if it is representative of sub-slab conditions. In surrogate locations, the vapor sampling point may be installed in accordance with SOP SG-002 Soil Vapor Collection.

2.3. Sub-Slab Soil Vapor Sample Collection

Sub-slab soil vapor samples will be collected as indicated in the site-specific Sampling and Analysis Work Plan and in accordance with state or Federal guidance documents. Specifically, sub-slab samples from the points will be collected as follows:

- Document pertinent field conditions prior to sampling as described above.
- A suction pump will be used to remove one to three implant volumes from the sub-slab soil vapor points prior to sampling. Include the volume of any additional tubing added to affix sampling equipment and the annular space between the probe and the native material if sand or glass beads were used.
- The purge rate shall not exceed 0.2 liters per minute.
- Samples will be collected in an individually laboratory certified clean 1-liter SUMMA® canister (or equivalent) using a certified flow controller calibrated for the anticipated sample duration (4 minutes). The regulator flow rate will not exceed 0.2 liters per minute.
- A helium tracer gas will be used to identify any potential migration or short circuiting of ambient air during sampling as described below.

- Remove the protective brass plug from the canister. Connect the pre-calibrated flow controller to the canister.
- Record the identification numbers for the canister and flow controller.
- Record the initial canister pressure on the vacuum gauge (check equipment-specific instructions for taking this measurement). A canister with a significantly different pressure than originally recorded by the testing laboratory should not be used for sampling. Record these numbers and values on the chain-of-custody form for each sample.
- Connect the tubing from the sub-slab soil vapor probe to the flow controller.
- Open the valve on the canister. Record the time that the valve was opened (beginning of sampling) and the canister pressure on the vacuum gauge.
- Photograph the canister and the area surrounding the canister.
- Monitor the vacuum pressure in the canister routinely during sampling.
- Stop sample collection 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.
- Record the final vacuum pressure and close the canister valve. Record the date and time that sample collection was stopped.
- Remove the flow controller from the canister and replace the protective brass plug.
- Attach labels/tags (sample name, time/date of sampling, etc.) to the canister as directed by the laboratory.
- Place the canister and other laboratory-supplied equipment in the packaging provided by the laboratory.
- Enter the information required for each sample on the chain-of-custody form, making sure to include 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 volatile organic compounds (VOCs) and naphthalene via modified USEPA modified Method TO-15 and helium via ASTM D-1945
- Include the required copies of the chain-of-custody form in the shipping packaging, as directed by the laboratory. Maintain a copy of the chain-of-custody for the project file.
- Deliver or ship the samples 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.

2.4. Tracer Gas Evaluation

The tracer gas evaluation provides a means to evaluate the integrity of the sub-slab soil vapor probe seal and assess the potential for introduction of indoor air into the sub-slab soil vapor sample. A tracer gas evaluation should be conducted on the each temporary sub-slab soil vapor probe to be sampled in a sampling event. A tracer gas evaluation should be conducted on the each permanent sub-slab soil vapor probe during the initial sampling event and a minimum of 10% of the sub-slab soil vapor probes during subsequent sampling events.

The following tracer gas evaluation procedure uses helium as a tracer gases which can be measured through laboratory analysis or by a portable detector.

- Retain the tracer gas around the sub-slab 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 sub-slab 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 sub-slab soil vapor at a rate of no more than 0.2 lpm. Purge the tubing using the pump. Calculate the volume of air in the tubing and purge one to three tubing volumes prior 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.
- Alternately, a tracer gas detector may be used to verify the presence of the tracer gas in the chamber by affixing it to the valve fitting at the bottom of the chamber. The tracer gas detector may also be used to measure the tracer gas concentration in the pump exhaust during purging. If used, then record the tracer gas concentrations in the chamber and in the soil vapor sample.
- Based on the concentrations of the tracer gas detected during analysis or direct measurement, 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 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 proceed with the soil vapor sampling. While lower concentrations of tracer gas are acceptable, the impact of the detectable leak on sample results should be evaluated in the sampling report.

3. References

USEPA modified Method TO-15 and helium via ASTM D-1945.

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.

4. Contact

Chris Berotti

STANDARD OPERATING PROCEDURE

SG-004 Ambient Air Sample Collection

1. Objective

Describe procedures to collect ambient air samples. The site-specific Work Plan should be consulted for proposed sample locations and sampling duration.

2. Execution

2.1. Document Field Conditions

Document pertinent field conditions prior to sample collection:

- Record weather information, if available (such as precipitation, temperature, barometric pressure, relative humidity, wind speed, and wind direction) at the beginning of the sampling event. Record substantial changes to these conditions that may occur during the course of sampling. The information may be measured with on-site equipment or obtained from a reliable source of local measurements (e.g., a local airport). Data should be obtained for at least the past 12 hours.
- If sampling near a commercial or industrial building, uses of volatile chemicals during normal operations of the facility should be identified.
- Outdoor plot sketches should 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 should be recorded, such as odors and readings from field instrumentation.

2.2. Sample Collection

- Samples should be collected in laboratory-certified clean SUMMA® canister (or equivalent) using a flow controller calibrated for the anticipated sample duration (1-hour, 8-hour, etc.). The regulator flow rate should not exceed 0.2 liters per minute.
- Place the canister at the sampling location. If the sample is collected from breathing height (e.g., 3 to 5 feet above ground), then mount the canister on a stable platform such that the sample inlet should be at the proper height.
- Remove the protective brass plug from canister. Connect the pre-calibrated flow controller to the canister.
- Record the identification numbers for the canister and flow controller.
- Record the initial canister pressure on the vacuum gauge (check equipment-specific instructions for taking this measurement). A canister with a significantly different pressure than originally recorded by the testing laboratory should not be used for sampling. Record these numbers and values on the chain-of custody form for each sample.

- Connect the tubing to the flow controller.
- Open the valve on the canister. Record the time that the valve was opened (beginning of sampling) and the canister pressure on the vacuum gauge.
- Photograph the canister and the area surrounding the canister.
- If possible, monitor the vacuum pressure in the canister routinely during sampling. During monitoring, note the vacuum pressure on the gauge.
- Stop sample collection after the scheduled duration of sample collection but make sure that 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, call the laboratory and discuss the sample viability with them. Determine whether another sample will be taken after sharing the laboratory's opinion with your project manager.
- Record the final vacuum pressure and close the canister valves. Record the date and time that sample collection was stopped.
- Remove the flow controller from the canister and replace the protective brass plug.
- Attach labels/tags (sample name, time/date of sampling, etc.) to the canister as directed by the laboratory.
- Place the canister and other laboratory-supplied equipment in the packaging provided by the laboratory.
- Enter the information required for each sample on the chain-of-custody form, making sure to include the identification numbers for the canister and flow controller, and the initial and final canister pressures on the vacuum gauge.
- Include the required copies of the chain-of-custody form in the shipping packaging, as directed by the laboratory. Maintain a copy of the chain-of-custody for the project file.
- Deliver or ship the samples to the laboratory as soon as practical.

3. References

USEPA modified Method TO-15 and helium via ASTM D-1945

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.*

4. Contacts

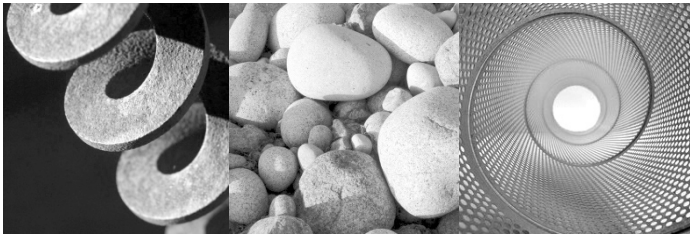
Chris Berotti
Bill Simons

APPENDIX E – QUALITY ASSURANCE PROJECT PLAN

APPENDIX E – QUALITY ASSURANCE PROJECT PLAN

The remedy does not require the maintenance or operation of an Engineering Control or remedial system or the continued sampling of soil or groundwater at the site.

However, conditions may change or invasive work may be required on the parcels. This QAPP describes general methods that will be implemented should these conditions arise; however, specific information will be updated as the work becomes known. This QAPP will then be modified accordingly and this Appendix of the SMP updated. All modifications will be submitted to and approved by the NYSDEC prior to implementation.



GEI Consultants

Consulting
Engineers and
Scientists

Appendix F

Quality Assurance Project Plan

93B Maple Avenue Former MGP Site
Site Management Plan
Haverstraw, New York

NYSDEC Site # 3-44-044

Submitted to:
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390 West Route 59
Spring Valley, NY 10977

Submitted by:
GEI Consultants, Inc., P.C.
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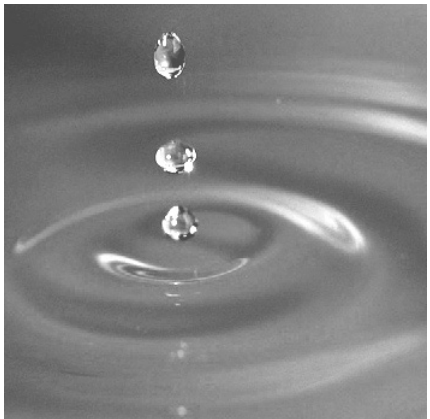
James Edwards, C.P.G.
Senior Geologist



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Abbreviations and Acronyms

ASP	Analytical Service Protocols
CAR	Corrective Action Request
CERCLA	Comprehensive Environmental Response, Compensations and Liability Act
CLP	Contract Laboratory Protocol
C.P.G.	Certified Professional Geologist
CRQL	Contract Required Quantitation Limit
DNAPL	Dense Non-Aqueous Phase Liquid
DQO	Data Quality Objective
DUSR	Data Usability Summary Report
EIMS	Environmental Information Management System
ELAP	Environmental Laboratory Approval Program
EPA	United States Environmental Protection Agency
FSAP	Field Sampling and Analytical Plan
GS/MS	Gas Chromatography/Mass Spectroscopy
GEI	GEI Consultants, Inc., P.C.
HASP	Health and Safety Plan
MDL	Method Detection Limit
MGP	Manufactured Gas Plant
MS	Matrix Spike
MSD	Matrix Spike Duplicate
NIST	National Institute of Standards and Technology
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
PCB	Polychlorinated Biphenyl
PDI	Pre-Design Investigation
PE	Performance Evaluation
PQL	Practical Quantification Limit
QA	Quality Assurance
QAO	Quality Assurance Officer
QAPP	Quality Assurance Project Plan
QC	Quality Control
RPD	Relative Percent Difference
SMP	Site Management Plan
SOP	Standard Operating Procedures
SVOC	Semi-Volatile Organic Compound
TAL	Target Analyte List
TCL	Target Compound List
TCLP	Toxicity Characteristic Leaching Procedure
TIC	Tentatively Identified Compound
VOC	Volatile Organic Compound

Quality Assurance Glossary

"Analytical Services Protocol" or "ASP" means the New York State Department of Environmental Conservation (NYSDEC's) compendium of approved United States Environmental Protection Agency (EPA) and NYSDEC laboratory methods for sample preparation and analysis and data handling procedures.

"Confirmatory sample" means a sample taken after remedial action is expected to be complete to verify that the cleanup requirements have been met. This term has the same meaning as "post remediation sample."

"Contract laboratory program" or "CLP" means a program of chemical analytical services developed by the EPA to support Comprehensive Environmental Response, Compensations and Liability Act (CERCLA).

"Data Usability Summary Report, (DUSR)" is a document that provides a thorough evaluation of the analytical data to determine whether or not the data, as presented, meets the site/project specific criteria for data quality and use.

"Effective solubility" means the theoretical aqueous solubility of an organic constituent in groundwater that is in chemical equilibrium with a separate phase mixed product (product containing several organic chemicals). The effective solubility of a particular organic chemical can be estimated by multiplying its mole fraction in the product mixture by its pure phase solubility.

"Environmental Laboratory Accreditation Program" or "ELAP" means a program conducted by the New York State Department of Health (NYSDOH), which certifies environmental laboratories through on-site inspections and evaluation of principles of credentials and proficiency testing.

"Intermediate sample" means a sample taken during the investigation process that will be followed by another sampling event to confirm that remediation was successful or to confirm that the extent of contamination has been defined to below a level of concern.

"Method detection limit" or "MDL" means the minimum concentration of a substance that can be measured and reported with a 99 percent confidence that the analyte concentration is greater than zero and is determined from the analysis of a sample in a given matrix containing the analyte.

"Non-targeted compound" means a compound detected in a sample using a specific analytical method that is not a targeted compound, a surrogate compound, a system monitoring compound or an internal standard compound.

"Practical quantitation level" or "PQL" means the lowest quantitation level of a given analyte that can be reliably achieved among laboratories within the specified limits of precision and accuracy of a given analytical method during routine laboratory operating conditions.

"Quality assurance" or "QA" means the total integrated program for assuring the reliability of monitoring and measurement data, which includes a system for integrating the quality planning, quality assessment and quality improvement efforts to meet data end-use requirements.

"Quality Assurance Project Plan" or "QAPP" means a document, which presents in specific terms the policies, organization, objectives, functional activities, and specific quality assurance/quality control activities designed to achieve the data quality goals or objectives of a specific project or operation.

"Quality control" or "QC" means the routine application of procedures for attaining prescribed standards of performance in the monitoring and measurement process.

"Semi-volatile organic compound" or "SVOC" means compounds amenable to analysis by extraction of the sample with an organic solvent. For the purposes of this section, semi-volatiles are those target compound list compounds identified in the statement of work in the current version of the EPA Contract Laboratory Program.

"Target analyte list" or "TAL" means the list of inorganic compounds/elements designated for analysis as contained in the version of the EPA Contract Laboratory Program Statement of Work for Inorganics Analysis, Multi-Media, Multi-Concentration in effect as of the date on which the laboratory is performing the analysis. For the purpose of this chapter, a Target Analyte List scan means the analysis of a sample for Target Analyte List compounds/elements.

"Targeted compound" means a hazardous substance, hazardous waste, or pollutant for which a specific analytical method is designed to detect that potential contaminant both qualitatively and quantitatively.

"Tentatively identified compound" or "TIC" means a non-targeted compound detected in a sample using a Gas Chromatography/Mass Spectroscopy (GC/MS) analytical method,

which has been tentatively, identified using a mass spectral library search. An estimated concentration of the TIC is also determined.

"Unknown compound" means a non-targeted compound, which cannot be tentatively identified. Based on the analytical method used, the estimated concentration of the unknown compound may or may not be determined.

"Volatile organics" means organic compounds amenable to analysis by the purge and trap technique. For the purposes of this chapter, analysis of volatile organics means the analysis of a sample for either those priority pollutants listed as amenable for analysis using EPA method 8260B or those target compounds identified as volatiles in the version of the EPA "Contract Laboratory Program Statement of Work for Organics Analysis, Multi-Media, Multi-Concentration" in effect as of the date on which the laboratory is performing the analysis.

1. Project Description

This Quality Assurance Project Plan (QAPP) specifies the quality control and quality assurance procedures to ensure the generation of statistically valid data. All procedures are equivalent to those specified in the *United States Environmental Protection Agency's QA/R-5 "EPA Requirements for Quality Assurance Project Plans for Environmental Data Operations," "Test Methods for Evaluating Solid Waste," EPA SW-846, Third Edition*, and its promulgated updates, and New York State Department of Environmental Conservation (NYSDEC) Analytical Services Protocols (ASP) to be used to ensure that data from the 93B Maple Avenue Manufactured Gas Plant (MGP) site in Haverstraw, New York are precise, accurate, representative, comparable, and complete. An ELAP-certified laboratory will be used for the analysis of the samples.

1.1 Introduction

A description of the 93B Maple Avenue MGP site is included in the Site Management Plan (SMP) (attached). MGP-related residuals are present at the site based on the remedial work performed. Remaining contamination is present at the site parcels including Lot 75 and Lot 77.

1.2 Scope of Work

A soil vapor intrusion evaluation will be performed for the site prior to the parcel owner moving back into the building to resume commercial operations. There are currently no soil or groundwater sampled planned for the site; however samples may be taken should any additional intrusive work be performed at the site. The work will be managed according the specifications of this SMP. These samples will be analyzed using EPA SW-846 Methods with NYSDEC ASP Category B laboratory data deliverables. Waste profiling samples may need to be collected for waste disposal purposes. If samples are submitted for Toxicity Characteristic Leaching Procedure (TCLP) analysis they will be analyzed using *EPA SW-846 "Test Methods for Evaluating Solid Waste," November 1986, 3rd edition* (and subsequent updates).

1.3 Data Quality Objectives

Data Quality Objectives (DQOs) are qualitative and quantitative statements to ensure that data of known and appropriate quality are obtained during sampling and analysis activities. Data developed during the site investigation will be used to fulfill the overall objectives of the program.

1.3.1 Data Quality Levels

There are five analytical levels of data quality which may be used to accomplish these site objectives. They are typically designated as follows:

- **Level I** - field screening or analysis using portable instruments, calibrated to non-compound specific standards
- **Level II** - field analysis using portable instruments, calibrated to specific compounds
- **Level III** - non-Contract Laboratory Program (ASP-CLP) laboratory methods
- **Level IV** - ASP-CLP Routine Analytical Services methods
- **Level V** - non-standard analytical methods

To meet the specific objectives of this project, Level I, and Level IV data quality objectives will be utilized.

Level I - Field Screening Methods

Level I screening will be performed for health and safety purposes according to procedures provided in the site-specific Health and Safety Plan (HASP) as well as to qualitatively assess the presence of volatile organic compounds (VOCs) in soil samples collected at the site.

Level IV - CLP/ASP Methodologies

Soil samples will be analyzed according to the EPA SW-846 Methods following procedures specified in the most recent edition of the NYSDEC ASP [July, 2005]. Analytical reports will be prepared in accordance with NYSDEC ASP Category B laboratory data deliverable specifications. This level of data quality will ensure the generation of legally, and technically defensible data for project use. Level II data will be provided for the hazardous characteristics testing if these analyses are performed.

2. Project Organization

This PDI will be performed for Orange & Rockland Utilities (O&R) by GEI Consultants, Inc., P.C., (Environmental Consultant). GEI will arrange for the drilling and analytical services and provide on-site field representative to perform the soil vapor intrusion sampling and other tasks identified in the SMP. The Environmental Consultant (GEI) will also perform the data interpretation and reporting tasks.

Key contacts for this project are as follows:

O&R Project Manager:

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3. Quality Assurance/Quality Control Objectives for Measurement of Data

3.1 Introduction

The quality assurance and quality control (QA/QC) objectives for all quantitative measurement data include precision, accuracy, representativeness, completeness, and comparability. These objectives are defined in the following subsections. They are formulated to meet the requirements of the NYSDEC ASP and EPA SW-846. The analytical methods and Contract Required Quantitation Limits (CRQLs) are provided in Section 7.

3.2 Precision

Precision is an expression of the reproducibility of measurements of the same parameter under a given set of conditions. Specifically, it is a quantitative measurement of the variability of a group of measurements compared to their average value [EPA, 1987]. Precision is usually stated in terms of standard deviation, but other estimates such as the coefficient of variation (relative standard deviation), range (maximum value minus minimum value), relative range, and relative percent difference (RPD) are common.

For this project, field sampling precision will be determined by analyzing coded duplicate samples (labeled so that the laboratory does not recognize them as duplicates) for the same parameters, and then, during data validation (Section 8), calculating the RPD for duplicate sample results.

Analytical precision will be determined by the laboratory by calculating the RPD for the results of the analysis of internal QC duplicates and matrix spike duplicates. The formula for calculating RPD is as follows:

$$RPD = \frac{|V1 - V2|}{(V1 + V2)/2} \times 100$$

where:

RPD	=	Relative percent difference.
V1, V2	=	The two values to be compared.
|V1 - V2|	=	The absolute value of the difference

between the two values.
(V1 + V2)/2 = The average of the two values.

The DQOs for analytical precision, calculated as the RPD between duplicate analyses, are presented in Table 1.

3.3 Accuracy

Accuracy is a measure of the degree of agreement between a measured value and the true or expected value of the quantity of concern [Taylor, 1987], or the difference between a measured value and the true or accepted reference value. The accuracy of an analytical procedure is best determined by the analysis of a sample containing a known quantity of material, and is expressed as the percent of the known quantity which is recovered or measured. The recovery of a given analyte is dependent upon the sample matrix, method of analysis, and the specific compound or element being determined. The concentration of the analyte relative to the detection limit of the analytical method is also a major factor in determining the accuracy of the measurement. Concentrations of analytes which are close to the detection limits are less accurate because they are more affected by such factors as instrument "noise". Higher concentrations will not be as affected by instrument noise or other variables and thus will be more accurate.

Sampling accuracy may be determined through the assessment of the analytical results of field blanks and trip blanks for each sample set. Analytical accuracy is typically assessed by examining the percent recoveries of surrogate compounds that are added to each sample (organic analyses only), and the percent recoveries of matrix spike compounds added to selected samples and laboratory blanks. Additionally, initial and continuing calibrations must be performed and accomplished within the established method control limits to define the instrument accuracy before analytical accuracy can be determined for any sample set.

Accuracy is normally measured as the percent recovery (%R) of a known amount of analyte, called a spike, added to a sample (matrix spike) or to a blank (blank spike). The %R is calculated as follows:

$$\%R = \frac{SSR - SR}{SA} \times 100$$

where:

%R = Percent recovery.
SSR = Spike sample result: concentration of analyte obtained

by analyzing the sample with the spike added.

SR = Sample result: the background value, i.e., the concentration of the analyte obtained by analyzing the sample.

SA = Spiked analyte: concentration of the analyte spike added to the sample.

The acceptance limits for accuracy for each parameter are presented in Table 1.

3.4 Representativeness

Representativeness expresses the degree to which sample data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, or an environmental condition. Representativeness is a qualitative parameter which is most concerned with the proper design of the sampling program [EPA, 1987]. Samples must be representative of the environmental media being sampled. Selection of sample locations and sampling procedures will incorporate consideration of obtaining the most representative sample possible.

Field and laboratory procedures will be performed in such a manner as to ensure, to the degree that is technically possible, that the data derived represents the in-place quality of the material sampled. Every effort will be made to ensure chemical compounds will not be introduced into the sample via sample containers, handling, and analysis. Decontamination of sampling devices will be performed between samples as outlined in the Field Sampling and Analysis Plan (FSAP). Analysis of field blanks, trip blanks, and method blanks will also be performed to monitor for potential sample contamination from field and laboratory procedures.

The assessment of representativeness also must consider the degree of heterogeneity in the material from which the samples are collected. Sampling heterogeneity will be evaluated during data validation through the analysis of coded field duplicate samples. The analytical laboratory will also follow EPA-approved procedures to assure the samples are adequately homogenized prior to taking aliquots for analysis, so the reported results are representative of the sample received.

Chain-of-custody procedures will be followed to document that contamination of samples has not occurred during container preparation, shipment, and sampling. Details of blank, duplicate, and chain-of-custody procedures are presented in Sections 4 and 5.

3.5 Completeness

Completeness is defined as the percentage of measurements made which are judged to be valid [EPA, 1987]. The QC objective for completeness is generation of valid data for at least 90 percent of the analyses requested. Completeness is defined as follows for all sample measurements:

$$\%C = \frac{V}{T} \times 100$$

where:

%C = Percent completeness.
V = Number of measurements judged valid.
T = Total number of measurements.

3.6 Comparability

Comparability expresses the degree of confidence with which one data set can be compared to another [EPA, 1987]. The comparability of all data collected for this project will be ensured by:

- Using identified standard methods for both sampling and analysis phases of this project.
- Requiring traceability of all analytical standards and/or source materials to the EPA or National Institute of Standards and Technology (NIST).
- Requiring that all calibrations be verified with an independently prepared standard from a source other than that used for calibration (if applicable).
- Using standard reporting units and reporting formats including the reporting of QC data.
- Performing a complete data validation on a representative fraction of the analytical results, including the use of data qualifiers in all cases where appropriate.
- Requiring that all validation qualifiers be used any time an analytical result is used for any purpose.

These steps will ensure all future users of either the data or the conclusions drawn from them will be able to judge the comparability of these data and conclusions.

4. Sampling Program

4.1 Introduction

The sampling program was developed to provide analytical and field data that can be used to satisfy the project objectives (as outlined in Section 1.2). This section presents sample container preparation procedures, sample preservation procedures, sample holding times, and field QC sample requirements.

4.2 Analytical Methods

The laboratory samples for each media and the chemical analyses that may be collected, including the QA/QC samples, are included in Table 2. These analyses are summarized below.

4.2.1 Soil Analyses

The surface soil samples will be collected from 0 – 0.16 feet bgs, and the near-surface (subsurface) soil samples will be collected from 1-2 feet bgs. They will be analyzed for the following parameters:

- Target Compound List (TCL) VOCs by EPA Method 8260C
- TCL SVOCs by EPA Method 8270D
- TAL Metals by EPA Method 6000-7000 Series
- Total Cyanide by EPA Method 9014

4.2.2 Investigation-Derived Waste Sampling and Soil Pre-Characterization Sampling

As determined by the O&R approved waste vendor, samples of IDW may be collected and analyzed for RCRA Hazardous Characteristics testing. The analyses to be performed include the following:

- Toxicity Characteristic Leaching Procedure (TCLP) ZHE Extraction by EPA Method 1311
- TCLP VOC by EPA Method 8260C
- TCLP SVOC by EPA Method 8270D
- TCLP ICP Metals by EPA Method 6010B (Mercury 7470A)

- PCBs by EPA Method 8082A
- Total Cyanide by EPA Method 9012A
- Total Sulfur by Method D129
- Corrosivity by EPA SW-9040B
- Ignitability by EPA SW-846 Method 1010
- Reactive Cyanide by EPA SW-846 Chapter 7
- Reactive Sulfide by EPA SW-846 Chapter 7
- TAL VOC by EPA SW-846 8260C
- TAL SVOC by EPA SW-846 8270D

4.3 Groundwater Analyses

Should groundwater analyses be required at the site, the wells will be analyzed for the following:

- Volatile Organic Compounds (VOCs) – EPA 8260C
- Semi-Volatile Organic Compounds (SVOCs) – EPA 8270D
- Total Cyanide – EPA Method 9014

4.4 Soil Vapor Intrusion Evaluation

Soil vapor intrusion evaluation samples will be analyzed for:

- VOCs and MGP indicator compounds by EPA TO-15. MGP indicator compounds include naphthalene, indan, indene, thiophene, styrene, 2-methylpentane, isopentane, 2,3-dimethylpentane, isooctane, and MTBE.
- Helium by ASTM D-1945.

4.5 Sample Container Preparation and Sample Preservation

Sample containers delivered to the field will be new and certified clean by the vendor. Copies of the sample container QC analyses will be provided by the laboratory for each container lot used to obtain samples. The containers will be tagged, and the appropriate chemical preservatives will be added. The types of containers are shown in Table 3.

Samples shall be preserved according to the preservation techniques listed in Table 3. Preservatives will be added to the sample bottles by the laboratory prior to their shipment in sufficient quantities to ensure that proper sample pH is met. Following sample collection, the sample bottles should be placed on ice in the shipping cooler, cooled to 4° ± 2° C with ice,

and delivered to the laboratory within 48 hours of collection under chain-of-custody. Chain-of-custody procedures are described in Section 5.

4.6 Sample Holding Times

The sample holding times for organic and inorganic parameters are listed in Table 3 and are in accordance with the NYSDEC ASP requirements. Holding times for TCLP samples are given in Table 4. The NYSDEC ASP holding times must be strictly adhered to by the field and laboratory personnel.

4.7 Field Quality Control Samples

Field QC samples will consist of a series of blanks and duplicates that will be collected to assess field sampling and decontamination performance. Two types of blanks to assess the collection of field samples will be collected and submitted to the laboratory for analyses (trip and equipment blanks). In addition, the precision of the laboratory analytical procedures will be assessed by collecting coded field duplicates and matrix spike/matrix spike duplicates (MS/MSDs). The blanks will include:

a. **Trip blanks** - A Trip Blank will be prepared before the sample containers are sent by the laboratory. The trip blank will consist of one or more 40-ml VOA vials containing EPA Type 2 water, that accompanies all water sample bottles into the field and back to the laboratory. A trip blank will be included in each shipping container of water samples for volatiles analysis. The trip blank will be analyzed for VOCs to assess any contamination from sampling, storage, transport, and internal laboratory procedures.

b. **Equipment blanks** - Equipment blanks are collected to determine the effectiveness of the decontamination procedures for sampling equipment. Equipment blanks are collected by passing EPA Type 2 water provided by the laboratory through decontaminated sampling equipment. It is usually collected as a last step in the decontamination procedure, prior to taking an environmental sample. The equipment blank will be analyzed for all of the parameters of interest.

The duplicates will consist of:

a. **Coded field duplicate** - To determine the representativeness of the sampling methods, coded field duplicates will be collected. The samples are termed "coded" because they will be labeled in such a manner that the laboratory will not be able to determine that they are duplicate samples. This will eliminate any possible bias that could arise. The coded field duplicates will be taken at a frequency of one duplicate per 20 field samples.

b. **Matrix spike/matrix spike duplicate** - MS/MSD samples (MS/MSD for organics; MS and laboratory duplicate for inorganics) will be taken at a frequency of one pair per 20 field samples. These samples are used to assess the effect of the sample matrix on the recovery of target compounds or target analytes. The percent recoveries and RPDs are listed in Table 1.

5. Sample Tracking and Custody

5.1 Introduction

This section presents sample custody procedures for both the field and laboratory. Implementation of proper custody procedures for samples generated in the field is the responsibility of field personnel. Both laboratory and field personnel involved in the chain-of-custody and transfer of samples will be trained on the purpose of the chain-of-custody and specific procedures prior to implementation.

Evidence of sample traceability and integrity is developed by implementation of, and adherence to, the chain-of-custody procedures. These procedures document the sample traceability from the selection and preparation of the sample containers by the laboratory, to sample collection, to sample shipment, to laboratory receipt and analysis. The sample custody flowchart is presented in Figure 1. A sample is considered to be in a person's custody if the sample is:

- In a person's possession
- Maintained in view after possession is accepted and documented
- Locked and tagged with Custody Seals so that no one can tamper with it after having been in physical custody
- In a secured area which is restricted to authorized personnel

5.2 Field Sample Custody

A chain-of-custody record (Figure 2 or equivalent) accompanies the sample containers from selection and preparation at the laboratory, during shipment to the field for sample containment and preservation, and during return to the laboratory. Triplicate copies of the chain-of-custody must be completed for each sample set collected.

The chain-of-custody lists the field personnel responsible for taking samples, the project name and number, the name of the analytical laboratory to which the samples are sent, and the method of sample shipment. The chain-of-custody also lists a unique description of every sample bottle in the set. If samples are split and sent to different laboratories, a copy of the chain-of-custody record will be sent with each sample.

The REMARKS space on the chain-of-custody is used to indicate if the sample is an MS/MSD, or any other sample information for the laboratory. Since they are not specific to

any one sample point, trip and equipment blanks are indicated on separate rows. Once all bottles are properly accounted for on the form, a sampler will write his or her signature and the date and time on the first RELINQUISHED BY space. The sampler will also write the method of shipment, the shipping cooler identification number, and the shipper air bill number on the top of the chain-of-custody. Errors will be crossed out with a single line in ink and initialed and dated by the author.

One copy of the chain-of-custody is retained by sampling personnel and the other two copies are put into a sealable plastic bag and taped inside the lid of the shipping cooler. The cooler lid is closed, custody seals provided by the laboratory are affixed to the latch and across the back and front lids of the cooler, and the person relinquishing the samples signs their name across the seal. The seal is taped, and the cooler is wrapped tightly with clear packing tape. It is then relinquished by field personnel to personnel responsible for shipment, typically an overnight carrier. The chain-of-custody seal must be broken to open the container. Breakage of the seals before receipt at the laboratory may indicate tampering. If tampering is apparent, the laboratory will contact the Project Manager, and the sample(s) will not be analyzed.

5.3 Laboratory Sample Custody

The Project Manager or Field Team Leader will notify the laboratory of upcoming field sampling activities, and the subsequent shipment of samples to the laboratory. This notification will include information concerning the number and type of samples to be shipped as well as the anticipated date of arrival.

The following laboratory sample custody procedures will be used:

- The laboratory will designate a sample custodian who will be responsible for maintaining custody of the samples, and for maintaining all associated records documenting that custody.
- Upon receipt of the samples, the custodian will check cooler temperature, and check the original chain-of-custody documents and compare them with the labeled contents of each sample container for correctness and traceability. The sample custodian will sign the chain-of-custody record and record the date and time received.
- Care will be exercised to annotate any labeling or description errors. In the event of discrepant documentation, the laboratory will immediately contact the Project Manager or Field Team Leader as part of the corrective action process. A qualitative assessment of each sample container will be performed to note any anomalies, such as broken or leaking bottles. This assessment will be recorded as part of the incoming chain-of-custody procedure.

- The samples will be stored in a secured area and, if required, stored at a temperature of 4°± 2° C.
- A laboratory tracking record will accompany the sample or sample fraction through final analysis and final storage for control.
- A copy of the tracking record will accompany the laboratory report and will become a permanent part of the project records.

6. Calibration Procedures

6.1 Field Instruments

All field analytical equipment will be calibrated immediately prior to each day's use. The calibration procedures will conform to manufacturer's standard instructions and are described in the FSAP. This calibration will ensure that the equipment is functioning within the allowable tolerances established by the manufacturer and required by the project. Records of all instrument calibration will be maintained by the Field Team Leader in a notebook. Copies of all the instrument manuals will be maintained on site by the Field Team Leader. Calibration procedures for instruments used for monitoring health and safety hazards (e.g., photo-ionization detector and explosimeter) are provided in the Health and Safety Plan. More frequent calibration may be needed depending on conditions encountered in the field.

6.2 Laboratory Instruments

The laboratory will follow all calibration procedures and schedules as specified in the sections of the EPA SW-846 and NYSDEC ASP and subsequent updates as they apply to the instruments used for the analytical methods listed in Section 7.

7. Analytical Procedures

7.1 Introduction

Samples will be analyzed according to methods approved by the NYSDEC Analytical Services Protocol (ASP) program or EPA SW-846 "*Test Methods for Evaluating Solid Waste," November 1986, 3rd edition*," and subsequent updates. The methods to be used for the laboratory analysis of soil samples are listed in Table 2. These methods were selected because they attain the DQOs required for the project, and the quantitation limits that are listed in Tables 5 and 6.

Should an analytical method be required that is outside the scope to the references cited above, the method used will be published by a nationally recognized authority (e.g., EPA, API) and approved for use by the regulatory agency.

The Project Manager shall ensure that laboratories (primary or subcontracted) generating data in support of O&R remediation and investigative projects maintain the relevant state and federal government regulatory accreditations, certifications, and/or registrations to perform the required analyses.

8. Data Reduction, Assessment, and Reporting

8.1 Data Reduction

Data collected during the field investigation will be reduced in accordance with NYSDEC ASP protocols. The procedures for identification and quantification of the analytes will be specified in the NYSDEC ASP or EPA SW-846 *"Test Methods for Evaluating Solid Waste,"* November 1986, 3rd edition and subsequent updates and peer reviewed by laboratory supervising personnel.

8.2 Data Quality Assessment

NYSDEC generally recommends two levels of data review for data collected during site investigations. The basic review is a Data Usability Summary Report (DUSR). Current NYSDEC policy is to require a DUSR for data collected during investigations on most sites. The more rigorous full data validation procedure is called for at sites where the data will be used in litigation. The laboratory deliverables (i.e., NYSDEC ASP Category B) are the same in both cases, and a DUSR can be upgraded to full validation at a later time if necessary. For this investigation, a DUSR will be generated.

Based on the results of data assessment, the validated analytical results reported by the laboratory will be assigned one of the following usability flags by the data validator:

- U The analyte was analyzed for, but was not detected above the level of the reported samples quantitation limit.
- UJ The analyte was analyzed for, but was not detected. The reported quantitation limit is approximated and may be inaccurate or imprecise.
- J The result is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the sample.
- J- (Inorganics) The result is an estimated quantity, likely to be biased low. The associated numerical value is the approximate concentration of the analyte in the sample.
- J+ (Inorganics) The result is an estimated quantity, likely to be biased high. The associated numerical value is the approximate concentration of the analyte in the sample.
- N Tentative identification. Consider present. Special methods may be needed to confirm its presence or absence in future sampling events.

- NJ Qualitative identification questionable due to poor resolution. Presumptively present at approximate quantity.
- R The data are unusable. The sample results are rejected due to serious deficiencies in the ability to meet quality control criteria. The presence or absence of the analyte cannot be verified.

Trained and experienced data assessors, who meet NYSDEC approval criteria, will perform the data assessment. Resumes of people performing data assessments and generating DUSRs will be provided to NYSDEC for review and approval.

8.2.1 Data Usability Summary Report

Data for this investigation will be evaluated in accordance with the "*EPA National Functional Guidelines for Organic Data Review*," October 1999 and "*EPA Validation Functional Guidelines for Inorganic Data Review*," October 2004. A DUSR will be generated in accordance with the NYSDEC guidelines. The data validator will be an independent third party person and will meet the qualification requirements stated in Section 2.0 (b) of Appendix 2B of DER-10. The data validator will not perform the duties of the QAO.

A DUSR will be prepared which will include a review and an evaluation of all the analytical results. To ensure compliance with the analytical method protocols the following will be reviewed:

- Chain-of-custody forms
- Holding times
- Initial and continuing calibrations
- Blanks
- Laboratory control standards and matrix spikes
- Surrogate recoveries
- Matrix interference checks
- Field and laboratory duplicates
- Sample data

The DUSR will contain a description of the samples and parameters reviewed. Any deficiencies identified during the review will be noted and the effect on the generated data will be discussed. Any re-sampling or re-analysis recommendations will then be made to the

investigation's Project Manager. The results of the evaluation will be incorporated into the final investigative report.

8.2.2 Data Validation

The determination to validate data will be made based on the presence of data anomalies, suspect data, or laboratory issues. Unless required to address anomalies, the data will be subject to the DUSR process and will not be subject to full validation. Where necessary, data will be validated in accordance with the "*EPA National Functional Guidelines for Organic Data Review*," October 1999 and "*EPA Validation Functional Guidelines for Inorganic Data Review*," October 2004. If applicable, a data validation report will be prepared and reviewed by the Quality Assurance Officer (QAO) before issuance. A resume for the GEI QAO is attached. The data validation report will present the results of data validation, including a summary assessment of laboratory data packages, sample preservation and chain-of-custody procedures, and a summary assessment of precision, accuracy, representativeness, comparability, and completeness for each analytical method. A detailed assessment of each sample delivery group will follow. For each of the organic analytical methods, the following will be assessed:

- Holding times
- Instrument tuning
- Instrument calibrations
- Blank results
- System monitoring compounds or surrogate recovery compounds (as applicable)
- Internal standard recovery results
- MS and MSD results
- Field duplicate results
- Target compound identification
- Result calculations
- Pesticide cleanup (if applicable)
- Compound quantitation and reported detection limits
- System performance
- Results verification

For each of the inorganic compounds, the following will be assessed:

- Holding times
- Calibrations
- Blank results
- Interference check sample
- Laboratory check samples
- Duplicates
- Matrix spike(s)
- Furnace atomic absorption analysis QC
- ICP serial dilutions
- Results verification and reported detection limits
- Result calculations

8.3 Data Reporting

The data package provided by the laboratory will contain all items discussed above in a "CLP-equivalent" format. Data quality issues will be discussed in a case narrative included with the data report. The completed copies of the chain-of-custody records (both external and internal) accompanying each sample from time of initial bottle preparation to completion of analysis shall be attached to the analytical reports.

One copy of the analytical data packages in an electronic disk deliverable format will be provided by the laboratory approximately 30 days after receipt of a complete sample delivery group. The field and character length information for data disk deliverable are provided in Table 7. The Project Manager will immediately arrange for filing of the package, the data validation, the preparation of the DUSR, and the preparation of the data summary tables. These tables will form the database for the assessment of the extent of the MGP-related impacts at the site.

8.3.1 NYSDEC Data Submittal

The NYSDEC has implemented an Environmental Information Management System (EIMS). The EIMS uses the database software application EQuIS™ from EarthSoft® Inc.

The data submitted to the DER will be in the NYSDEC-approved Electronic Data Deliverable (EDD). New data will be submitted on a continuous basis immediately after data validation occurs but in no event more than 90 days after the data has been submitted to the Consultant. The EDD format will be provided by the NYSDEC.

9. Internal Quality Control Checks and Frequency

9.1 Quality Assurance Batching

Each set of up to 20 samples submitted to the laboratory will be analyzed concurrently with associated calibration standards, method blanks, MS/MSD or laboratory duplicates, and QC check samples (if required by the protocol). Note that the MS/MSD samples will be provided with the field samples and identified by the field personnel.

9.2 Calibration Standards and Surrogates

All organic standard and surrogate compounds are checked by the method of mass spectrometry for correct identification and gas chromatography for degree of purity and concentration. All standards are traceable to a source of known quality certified by the EPA or NIST, or other similar nationally-recognized program. When the compounds pass the identity and purity tests, they are certified for use in standard and surrogate solutions. Concentrations of the solutions are checked for accuracy before release for laboratory use. Standard working solutions are replaced monthly or more frequently, based upon data indicating deterioration. No stock or working standard will be used past the manufacturer's expiration date.

9.3 Organic Blanks and Matrix Spike

Analysis of blank samples verifies that the analytical method does not introduce contaminants or detect "false positives". The blank water can be generated by reverse osmosis and Super-Q filtration systems, or distillation of water containing $KMnO^4$. The matrix spike is generated by addition of analyte and surrogate standards to a designated field sample.

9.4 Trip and Field Blanks

Trip blanks and equipment blanks will be utilized in accordance with the specifications in Section 4. These blanks will be analyzed to provide a check on sample bottle preparation and to evaluate the possibility of atmospheric or cross-contamination of the samples.

10. Quality Assurance Performance Audits and System Audits

10.1 Introduction

Quality assurance audits may be performed by the project quality assurance group under the direction and approval of the project QAO. These audits will be implemented to evaluate the capability and performance of project and subcontractor personnel, items, activities, and documentation of the measurement system(s). Functioning as an independent body and reporting directly to corporate QA management, the QAO may plan, schedule, and approve system and performance audits based upon procedures customized to the project requirements. At times, the QAO may request additional personnel with specific expertise from company and/or project groups to assist in conducting performance audits. However, these personnel will not have responsibility for the project work associated with the performance audit.

10.2 System Audits

System audits may be performed by the QAO or designated auditors, and encompass a qualitative evaluation of measurement system components to ascertain their appropriate selection and application. In addition, field and laboratory QC procedures and associated documentation may be audited. These audits may be performed once during the performance of the project. However, if conditions adverse to quality are detected or if the Project Manager requests, additional audits may occur.

10.3 Performance Audits

The laboratory is required to perform periodic analyses of Performance Evaluation (PE) samples to maintain NELAP accreditation and/or state regulatory certifications. PE samples obtained from an EPA-approved vendor or a state agency must be analyzed by the laboratory at least semi-annually.

10.4 Formal Audits

Formal audits refer to any system or performance audit that is documented and implemented by the QA group. These audits encompass documented activities performed by qualified lead auditors to a written procedure or checklists to objectively verify that QA requirements have been developed, documented, and instituted in accordance with contractual and project criteria. Formal audits may be performed on project and subcontractor work at various locations.

Audit reports will be written by auditors who have performed the site audit after gathering and evaluating all data. Items, activities, and documents determined by lead auditors to be out of compliance shall be identified at exit interviews conducted with the involved management. Compliance deviation will be logged, and documented through audit findings which are attached to and are a part of the integral audit report. These audit finding forms are directed to management to satisfactorily resolve the noncompliance in a specified and timely manner.

The Project Manager has overall responsibility to ensure that all corrective actions necessary to resolve audit findings are acted upon promptly and satisfactorily. Audit reports must be submitted to the Project Manager within 15 days of completion of the audit. Serious deficiencies will be reported to the Project Manager within 24 hours. All audit checklists, audit reports, audit findings, and acceptable resolutions are approved by the QAO prior to issue. Verification of acceptable resolutions may be determined by re-audit or documented surveillance of the item or activity. Upon verification acceptance, the QAO will close out the audit report and findings.

11. Preventive Maintenance Procedures and Schedules

11.1 Preventive Maintenance Procedures

Equipment, instruments, tools, gauges, and other items requiring preventive maintenance will be serviced in accordance with the manufacturer's specified recommendations and written procedure developed by the operators.

A list of critical spare parts will be established by the operator. These spare parts will be available for use in order to reduce downtime, if any. A service contract for rapid instrument repair or backup instruments may be substituted for the spare part inventory.

11.2 Schedules

Written procedures will establish the schedule for servicing critical items in order to minimize the downtime of the measurement system. The laboratory will adhere to the maintenance schedule, and arrange any necessary and prompt service. Required service will be performed by qualified personnel.

11.3 Records

Logs shall be established to record and control maintenance and service procedures and schedules. All maintenance records will be documented and traceable to the specific equipment, instruments, tools, and gauges. Records produced shall be reviewed, maintained, and filed by the operators at the laboratories. The QAO may audit these records to verify complete adherence to these procedures.

12. Corrective Action

12.1 Introduction

The following procedures have been established to ensure that conditions adverse to quality, such as malfunctions, deficiencies, deviations, and errors, are promptly investigated, documented, evaluated, and corrected.

12.2 Procedure Description

When a significant condition adverse to quality is noted at site, laboratory, or subcontractor location, the cause of the condition will be determined and corrective action will be taken to preclude repetition. Condition identification, cause, reference documents, and corrective action planned to be taken will be documented and reported to the QAO, Project Manager, Field Team Leader, and involved contractor management, at a minimum. Implementation of corrective action is verified by documented follow-up action.

All project personnel have the responsibility, as part of the normal work duties, to promptly identify, solicit approved correction, and report conditions adverse to quality. Corrective actions will be initiated as follows:

- When predetermined acceptance standards are not attained
- When procedure or data compiled are determined to be deficient
- When equipment or instrumentation is found to be faulty
- When samples and analytical test results are not clearly traceable
- When QA requirements have been violated
- When designated approvals have been circumvented
- As a result of system and performance audits
- As a result of a management assessment
- As a result of laboratory/field comparison studies
- As required by EPA SW-846, and subsequent updates, or by the NYSDEC ASP

Project management and staff, such as field investigation teams, remedial response planning personnel, and laboratory groups monitor on-going work performance in the normal course of daily responsibilities. Work may be audited at the sites, laboratories, or contractor locations. Activities, or documents ascertained to be noncompliant with QA requirements

will be documented. Corrective actions will be mandated through audit finding sheets attached to the audit report. Audit findings are logged, maintained, and controlled by the Task Manager.

Personnel assigned to QA functions will have the responsibility to issue and control Corrective Action Request (CAR) Forms (Figure 3 or similar). The CAR identifies the out-of-compliance condition, reference document(s), and recommended corrective action(s) to be administered. The CAR is issued to the personnel responsible for the affected item or activity. A copy is also submitted to the Project Manager. The individual to whom the CAR is addressed returns the requested response promptly to the QA personnel, affixing his/her signature and date to the corrective action block, after stating the cause of the conditions and corrective action to be taken. The QA personnel maintain the log for status of CARs, confirms the adequacy of the intended corrective action, and verifies its implementation. CARs will be retained in the project file for the records.

Any project personnel may identify noncompliance issues; however, the designated QA personnel are responsible for documenting, numbering, logging, and verifying the close out action. The Project Manager will be responsible for ensuring that all recommended corrective actions were implemented and effective, documented, and approved.

References

EPA, 1986. SW-846 "Test Method for Evaluating Solid Waste," dated November 1986 and subsequent updates. U.S. Environmental Protection Agency, Washington, D.C.

EPA, 1987. Data Quality Objectives for Remedial Response Actions Activities: Development Process, EPA/540/G-87/003, OSWER Directive 9355.0-7B U.S. Environmental Protection Agency, Washington, D.C.

EPA, 1999. EPA National Functional Guidelines for Organic Data Review, dated October 1999.

EPA, 2001. CLP Organics Data Review and Preliminary Review based on CLP/SOW OLM04.2. SOP No. HW-6, Revision 12 dated September 2005. EPA Region II.

EPA, 2004. EPA Validation Functional Guidelines for Inorganic Data Review, dated October 2004.

EPA, 2005. Evaluation of Metals Data for the Contract Laboratory Program (CLP) based on SOW - ILM05.3. SOP No. HW-2, Revision 13, dated January 1992. EPA Region II.

NYSDEC, 2005. NYSDEC Analytical Services Protocol, July 2005.

Taylor, J. K., 1987. Quality Assurance of Chemical Measurements. Lewis Publishers, Inc., Chelsea, Michigan.

Tables

Table 1
Quality Control Limits for Water Samples

Laboratory Accuracy and Precision							
Analytical Parameters	**Analytical Method[a]**	**Matrix Spike (MS) Compounds**	**MS/MSD[b] % Recovery**	**MS/MSD RPD[c]**	**LCS[d] % Recovery**	**Surrogate Compounds**	**Surrogate % Recovery**
VOCs (e)	8260C	1,1-Dichloroethane	65-142	16	65-142	Toluene-d8	76-122
		Trichloroethene	71-120	16	71-120	p-Bromofluorobenzene	73-120
		Benzene	67-126	13	67-126	1,2-Dichloroethane-d4	72-143
		Toluene	69-120	18	69-120		
		Chlorobenzene	73-120	19	73-120		
SVOCs (f)	8270D	Phenol	30-120	39	30-120	Nitrobenzene-d5	46-120
		2-Chlorophenol	47-120	33	47-120	2-Fluorobiphenyl	44-120
		1,4-Dichlorobenzene	30-120	35	30-120	p-Terphenyl-d14	23-143
		N-Nitroso-di-n-propylamine	56-120	38	56-120	Phenol-d5	10-120
		1,2,4-Trichlorobenzene	38-120	35	38-120	2-Fluorophenol	20-120
		4-Chloro-3-methylphenol	57-126	25	57-126	2,4,6-Tribromophenol	59-136
		Acenaphthene	57-120	23	57-120		
		4-Nitrophenol	30-120	30	30-120		
		2,4-Dinitrotoluene	58-121	20	58-121		
		Pentachlorophenol	34-157	27	34-157		
		Pyrene	58-136	25	58-136		
PCBs	8082A	PCB 1260	52-128		52-128	Decachlorobiphenyl	12-137
		PCB 1016	51-123		51-123	Tetrachloro-m-xylene	35-121
Pesticides	8081A	4,4'-DDD	25 - 139	12	25 - 139	DCB Decachlorobiphenyl	15-139
		4,4'-DDE	49 - 127	14	49 - 127	Tetrachloro-m-xylene	30-159
		4,4'-DDT	47 - 130	17	47 - 130		
		Aldrin	35 - 120	13	35 - 120		
		alpha-BHC	39 - 121	15	39 - 121		
		alpha-Chlordane	40 - 160	12	40 - 160		
		beta-BHC	39 - 138	22	39 - 138		
		delta-BHC	40 - 121	10	40 - 121		
		Dieldrin	41 - 131	12	41 - 131		
		Endosulfan I	41 - 126	10	41 - 126		
		Endosulfan II	32 - 134	11	32 - 134		
		Endosulfan sulfate	46 - 131	18	46 - 131		
		Endrin	43 - 134	13	43 - 134		
		Endrin aldehyde	39 - 128	18	39 - 128		
		Endrin ketone	50 - 150	33	50 - 150		
		gamma-BHC (Lindane)	53 - 120	15	53 - 120		
		gamma-Chlordane	40 - 160	11	40 - 160		
		Heptachlor	52 - 120	10	52 - 120		
		Heptachlor epoxide	53 - 120	11	53 - 120		
		Methoxychlor	52 - 142	10	52 - 142		
		Chlordane (technical)	53 - 120	11	53 - 120		
		Toxaphene	53 - 120	10	53 - 120		
Herbicides	8151A	2,4,5-T	58 - 144	50	58 - 144	2,4-Dichlorophenylacetic acid	52 -139
		2,4-D	49 - 149	50	49 - 149		
		Dalapon	17 - 115	50	17 - 115		
		Dichlorprop	56 - 170	50	56 - 170		
		Dinoseb	18 - 138	50	18 - 138		
		Pentachlorophenol	29 - 127	50	29 - 127		
		Picloram	11 - 152	50	11 - 152		
		Silvex (2,4,5-TP)	29 - 140	50	29 - 140		
Inorganics (i)	6010B/6020 7470A (metals)	Inorganic Analyte	75-125 (j)	20 (k)	80-120	NA	NA
	9012 A (Total Cyanide)		75-125 (j)	20 (k)	80-120	NA	NA
	9016 (Free Cyanide)		75-125 (j)	20 (k)	80-120	NA	NA

(a) Analytical Methods: NYSDEC ASP-CLP Methods with Category B data deliverables, NYSDEC, 2000 and EPA SW-846, 3rd edition, Revision 1, November 1990.
(b) Matrix Spike/Matrix Spike Duplicate
(c) Relative Percent Difference
(d) Laboratory Control Sample
(e) Target Compound List Volatile Organic Compounds
(f) Target Compound List Semi-Volatile Organic Compounds
(g) Limits are advisory only
(i) Target Analyte List Inorganics (metals and cyanide
(j) Matrix spike only
(k) Laboratory duplicate RPD
NA - Not Applicable

Table 2
Quality Control Limits for Soil Samples

Laboratory Accuracy and Precision							
Analytical Parameters	**Analytical Method[a]**	**Matrix Spike (MS) Compounds**	**MS/MSD[b] % Recovery**	**MS/MSD RPD[c]**	**LCS[d] % Recovery**	**Surrogate Compounds**	**Surrogate % Recovery**
VOCs (e)	8260C	1,1-Dichloroethane	70-142	22	70-142	Toluene-d8	71-125
		Trichloroethene	79-121	24	79-121	p-Bromofluorobenzene	72-126
		Benzene	78-122	25	78-122	1,2-Dichloroethane-d4	64-126
		Toluene	74-123	25	74-123		
		Chlorobenzene	79-118	25	79-118		
SVOCs (f)	8270D	Phenol	36-110	25	36-110	Nitrobenzene-d5	35-113
		2-Chlorophenol	38-104	26	38-104	2-Fluorobiphenyl	43-119
		1,4-Dichlorobenzene	34-120	30	34-120	p-Terphenyl-d14	51-125
		N-Nitroso-di-n-propylamine	46-120	20	46-120	Phenol-d5	36-116
		1,2,4-Trichlorobenzene	39-105	24	39-105	2-Fluorophenol	30-107
		4-Chloro-3-methylphenol	49-125	20	49-125	2,4,6-Tribromophenol	46-129
		Acenaphthene	53-119	16	53-119		
		4-Nitrophenol	44-137	25	44-137		
		2,4-Dinitrotoluene	55-125	19	55-125		
		Pentachlorophenol	33-136	27	33-136		
		Pyrene	51-133	25	51-133		
PCBs	8082A	PCB 1016	59-154	50	59-154	Decachlorobiphenyl	34-148
		PCB 1260	51-179	50	51-179	Tetrachloro-m-xylene	35-134
Pesticides	8081A	4,4'-DDD	45 - 129	18	45 - 129	DCB Decachlorobiphenyl	42 - 146
		4,4'-DDE	49 - 120	16	49 - 120	Tetrachloro-m-xylene	37 - 136
		4,4'-DDT	47 - 145	17	47 - 145		
		Aldrin	35 - 120	24	35 - 120		
		alpha-BHC	49 - 120	19	49 - 120		
		alpha-Chlordane	45 - 120	13	45 - 120		
		beta-BHC	46 - 120	17	46 - 120		
		delta-BHC	45 - 123	14	45 - 123		
		Dieldrin	47 - 120	13	47 - 120		
		Endosulfan I	29 - 125	16	29 - 125		
		Endosulfan II	39 - 121	17	39 - 121		
		Endosulfan sulfate	43 - 120	14	43 - 120		
		Endrin	44 - 127	19	44 - 127		
		Endrin aldehyde	33 - 120	23	33 - 120		
		Endrin ketone	50 - 150	14	50 - 150		
		gamma-BHC (Lindane)	50 - 120	20	50 - 120		
		gamma-Chlordane	51 - 120	14	51 - 120		
		Heptachlor	47 - 120	16	47 - 120		
		Heptachlor epoxide	44 - 122	17	44 - 122		
		Methoxychlor	46 - 152	14	46 - 152		
		Chlordane (technical)	51 - 120	14	51 - 120		
		Toxaphene	47 - 120	16	47 - 120		
Inorganics (i)	6010B and 7471A (metals)	Inorganic Analyte	75-125 (j)	20 (k)	80-120	NA	NA
	9012 A (Total Cyanide)		75-125 (j)	20 (k)	80-120	NA	NA
	9016 (Free Cyanide)		75-125 (j)	20 (k)	80-120	NA	NA

(a) Analytical Methods: NYSDEC ASP-CLP Methods with Category B data deliverables, NYSDEC, 2000 and EPA SW-846, 3rd edition, Revision 1, November 1990,
(b) Matrix Spike/Matrix Spike Duplicate
(c) Relative Percent Difference
(d) Laboratory Control Sample
(e) Target Compound List Volatile Organic Compounds
(f) Target Compound List Semi-Volatile Organic Compounds
(g) Limits are advisory only
(h) Target Analyte List Inorganics (metals and cyanide)
(i) Matrix spike only
(j) Laboratory duplicate RPD
NA - Not Applicable

Table 3
Summary of Sampling and Analytical Program

Matrix	Parameter	Analytical Method	Field Samples				QC Blanks		Total
			Field Samples	Field Duplicate	MS/MSD[(a)] (Total)	Sub- Total	Trip Blank	Equip-ment Blank	
Surface Soil Samples	TCL SVOCs	EPA SW 8270D	TBD	TBD	TBD	TBD	TBD	TBD	TBD
	TCL VOCs	EPA SW 8260C	TBD	TBD	TBD	TBD	TBD	TBD	TBD
Subsurface Soil Samples	TCL SVOCs	EPA SW 8270D	TBD	TBD	TBD	TBD	TBD	TBD	TBD
	TCL VOCs	EPA SW 8260C	TBD	TBD	TBD	TBD	TBD	TBD	TBD
Hazardous Characterization (IDW and Pre-Characterization)	Toxicity TCLP/SPLP ZHE Extraction	EPA Method 1311/1312	TBD	TBD	TBD	TBD	TBD	TBD	TBD
	TCLP VOC	EPA Method 8260C	TBD	TBD	TBD	TBD	TBD	TBD	TBD
	TCLP SVOC	EPA Method 1311/8270D	TBD	TBD	TBD	TBD	TBD	TBD	TBD
	TCLP ICP RCRA Metals (Arsenic, Barium, Cadmium, Chromium, Lead, Mercury, Selenium, Silver)	EPA Method 6010B (Mercury 7470A)	TBD	TBD	TBD	TBD	TBD	TBD	TBD
	TCLP Herbicides	Method 1311/8151A	TBD	TBD	TBD	TBD	TBD	TBD	TBD
	TCLP Pesticides	Method 1311/8081A	TBD	TBD	TBD	TBD	TBD	TBD	TBD
	Ignitability	EPA Method 1010/1020A	TBD	TBD	TBD	TBD	TBD	TBD	TBD
	Corrosivity (pH)	EPA Method 9045	TBD	TBD	TBD	TBD	TBD	TBD	TBD
	Reactive Sulfide	EPA Method 7.3.4.1	TBD	TBD	TBD	TBD	TBD	TBD	TBD
	Reactive Cyanide	EPA Method 7.3.3.2	TBD	TBD	TBD	TBD	TBD	TBD	TBD
	TPH	EPA Method 8015 GRO/DRO	TBD	TBD	TBD	TBD	TBD	TBD	TBD
	VOC TCL	EPA Method 8260C	TBD	TBD	TBD	TBD	TBD	TBD	TBD
	SVOC TCL	EPA Method 8270D	TBD	TBD	TBD	TBD	TBD	TBD	TBD
	TAL Metals (23)	EPA Methods 6010B/7471A	TBD	TBD	TBD	TBD	TBD	TBD	TBD
	Total Cyanide	EPA Method 9012B	TBD	TBD	TBD	TBD	TBD	TBD	TBD
	BTU	ASTM D240-87	TBD	TBD	TBD	TBD	TBD	TBD	TBD
	Sulfur	ASTM D129	TBD	TBD	TBD	TBD	TBD	TBD	TBD
Groundwater Monitoring	Volatile Organic Compounds (VOCs)	EPA 8260C	TBD	TBD	TBD	TBD	TBD	TBD	TBD
	Semi-Volatile Organic Compounds (SVOCs)	EPA 8270D	TBD	TBD	TBD	TBD	TBD	TBD	TBD

(a) Matrix spike / matrix spike duplicate for organic analyses; matrix spike and laboratory duplicate for inorganic analysis.

* The number of duplicates, MS/MSD, and field QC samples can be reduced if these samples are obtained in conjunction with the sampling of other media during the sampling event.

\+ Rinse blanks not required if dedicated sampling equipment is used.

TBD To be determined

Table 4
Water Sample Containerization, Preservation, and Holding Times

Analysis [b]	Bottle Type	Preservation [a]	Holding Time [b]
Volatile Organic Compounds (VOCs)	3-40 mL clear glass vial w/ Teflon septum	Cool to 4°C	14 days
Semi-Volatile Organics Compounds (SVOCs)	2-1000 mL amber glass w/ Teflon-lined cap	Cool to 4°C	7 days to extraction 40 days to analysis
PCBs	1-1000 mL amber glass w/ Teflon-lined cap	Cool to 4°C	7 days to extraction 40 days to analysis
Pesticides	1-1000 mL amber glass w/ Teflon-lined cap	Cool to 4°C	7 days to extraction 40 days to analysis
Herbicides	1-1000 mL amber glass w/ Teflon-lined cap	Cool to 4°C	7 days to extraction 40 days to analysis
TAL Metals	1000 mL clear plastic bottle	Nitric Acid to pH < 2 Cool to 4°C	6 months, except mercury (28 days)
Total Cyanide	500 mL clear plastic bottle	NaOH to pH > 12 Cool to 4°C	14 days
Free Cyanide	250 mL amber plastic bottle	NaOH to pH > 12 Cool to 4°C	14 days to extraction 24 hours to analysis

(a) All samples to be cooled during collection and transport.
(b) Days from date of sample collection.

Table 5
Soil and Hazardous Characteristics

Analysis [b]	Bottle Type	Preservation [a]	Holding Time [b]
Volatile Organic Compounds (VOCs)	4 ounce wide-mouth clear glass w/ teflon-lined cap	Cool to 4°±2°C	14 days
Semi-Volatile Organic Compounds (SVOCs)	8 ounce wide-mouth clear glass w/ teflon-lined cap	Cool to 4°±2°C	7 days to extraction 40 days to analysis
PCBs	8 ounce wide-mouth clear glass w/ teflon-lined cap	Cool to 4°+2°C	7 days to extraction 40 days to analysis
Pesticides	8 ounce wide-mouth clear glass jar	Cool to 4°+2°C	7 days to extraction 40 days to analysis
Herbicides	8 ounce wide-mouth clear glass jar	Cool to 4°+2°C	7 days to extraction 40 days to analysis
TAL Metals	4 ounce wide-mouth clear glass jar	Cool to 4°±2°C	6 months, except mercury (28 days)
Total Cyanide	4 ounce wide-mouth clear glass jar	Cool to 4°±2°C	14 days
Free Cyanide	4 ounce wide-mouth amber glass jar	Cool to 4°+2°C	NA
TCLP Organic Compounds	8 ounce wide-mouth clear glass w/ teflon-lined cap	Cool to 4°±2°C	See Table 4
TCLP Metals	4 ounce wide-mouth clear glass	Cool to 4°±2°C	See Table 4
Corrosivity	4 ounce wide-mouth clear glass	Cool to 4°±2°C	2 days
Ignitability	4 ounce wide-mouth clear glass	Cool to 4°±2°C	NA
Reactive Cyanide	4 ounce wide-mouth clear glass	Cool to 4°±2°C	14 days
Reactive Sulfide	4 ounce wide-mouth clear glass	Cool to 4°±2°C	7 days

(a) All samples to be cooled during collection and transport.
(b) Days from date of sample collection.
NA Not Applicable

Table 6
Toxicity Characteristics Leaching Procedure Sample Holding Times

Analytical Parameter	From: Sample Collection To: TCLP Extraction*	From: TCLP Extraction To: Preparative Extraction	From: Preparative Extraction To: Determinative Analysis
Volatiles	14 days	NA	14 days from date of TCLP extraction
Semi-Volatiles	14 days	7 days	40 days
Mercury	28 days	NA	28 days from the date of TCLP extraction
Metals (except Mercury)	180 days	NA	180 days

NA Not Applicable
*Times shown are from verified time of sample receipt.

Table 7A
Project Quantitation Limits
Soil and Groundwater VOCs

		Quantitation Limits		New York State Standard or Guidance Values
Analysis/Compound	**Method**	**Water (ug/L)**	**Soil/Sediment (ug/Kg)**	**Water (ug/L)**
Volatile Organics				
1,1,1-Trichloroethane	8260C	1.0	5	5
1,1,2,2-Tetrachloroethane	8260C	1.0	5	5
1,1,2-Trichloroethane	8260C	1.0	5	1
1,1,2-Trichloro-1,2,2-trifluoroethane	8260C	1.0	5	5
1,1-Dichloroethane	8260C	1.0	5	5
1,1-Dichloroethene	8260C	1.0	5	5
1,2-Dibromoethane	8260C	1.0	5	NL
1,2-Dichlorobenzene	8260C	1.0	5	3
1,2-Dichloroethane	8260C	1.0	5	0.6
1,2-Dichloropropane	8260C	1.0	5	1
1,2-Dibromo-3-chloropropane	8260C	1.0	5	0.04
1,2,4-Trichlorobenzene	8260C	1.0	5	5
1,3-Dichlorobenzene	8260C	1.0	5	3
1,4-Dichlorobenzene	8260C	1.0	5	3
2-Butanone (MEK)	8260C	5.0	5	50
2-Hexanone	8260C	5.0	5	50
4-Methyl-2-pentanone(MIBK)	8260C	5.0	5	NL
Acetone	8260C	5.0	20	50
Benzene	8260C	1.0	5	1
Bromodichloromethane	8260C	1.0	5	50
Bromoform	8260C	1.0	5	50
Bromomethane	8260C	1.0	5	5
Carbon Disulfide	8260C	1.0	5	60
Carbon Tetrachloride	8260C	1.0	5	5
Chlorobenzene	8260C	1.0	5	5
Chloroethane	8260C	1.0	5	5
Chloroform	8260C	1.0	5	7
Chloromethane	8260C	1.0	5	5
Cyclohexane	8260C	1.0	5	NL
cis-1,2-Dichloroethene	8260C	1.0	5	5
cis-1,3-Dichloropropene	8260C	1.0	5	0.4
Dibromochloromethane	8260C	1.0	5	5
Dichlorodifluoromethane	8260C	1.0	5	5
Ethylbenzene	8260C	1.0	5	5
Isopropylbenzene	8260C	1.0	5	5
Methyl acetate	8260C	1.0	5	NL
Methylene Chloride	8260C	1.0	5	5
Methylcyclohexane	8260C	1.0	5	NL
Methyl tert-butyl ether	8260C	1.0	5	10
Styrene	8260C	1.0	5	5
Tetrachloroethene	8260C	1.0	5	5
Toluene	8260C	1.0	5	5
trans-1,2-Dichloroethene	8260C	1.0	5	5
trans-1,3-Dichloropropene	8260C	1.0	5	0.4
Trichloroethene	8260C	1.0	5	5
Trichlorofluoromethane	8260C	1.0	5	5
Vinyl Chloride	8260C	1.0	5	2
Xylenes(total)	8260C	3.0	15	5

NL = Not Listed

Note: RLs and MDLs are subject to change due to % moisture, matrix interference, and dilution factors

Table 7B
Project Quantitation Limits
Soil and Groundwater SVOCs

Analysis/Compound	Method	Quantitation Limits Water (ug/L)	Quantitation Limits Soil (ug/Kg)	New York State Standard or Guidance Values Water (ug/L)
Semi-Volatile Organics				
1,1'-Biphenyl	8270D	10	330	5
2,2'-oxybis(1-chloropropane)	8270D	10	330	5
2,4,5-Trichlorophenol	8270D	10	330	1
2,4,6-Trichlorophenol	8270D	10	330	1
2,4-Dichlorophenol	8270D	10	330	1
2,4-Dimethylphenol	8270D	10	330	1
2,4-Dinitrophenol	8270D	50	1600	1
2,4-Dinitrotoluene	8270D	10	330	5
2,6-Dinitrotoluene	8270D	10	330	5
2-Chloronaphthalene	8270D	10	330	10
2-Chlorophenol	8270D	10	330	1
2-Methylnaphthalene	8270D	10	330	NL
2-Methylphenol	8270D	10	330	1
2-Nitrolaniline	8270D	50	1600	5
2-Nitrophenol	8270D	10	330	1
3,3'-Dichlorobenzidine	8270D	50	1600	5
3-Nitroaniline	8270D	50	1600	5
4-Bromophenyl-phenyl ether	8270D	10	330	NL
4-Chloro-3-methylphenol	8270D	10	330	NL
4-Chloroaniline	8270D	10	330	5
4-Chlorophenyl phenyl ether	8270D	10	330	NL
4-Methylphenol	8270D	10	330	1
4-Nitroaniline	8270D	50	1600	5
4-Nitrophenol	8270D	50	1600	1
4,6-Dinitro-2-methylphenol	8270D	50	1600	NL
Acenaphthene	8270D	10	330	20
Acenaphthylene	8270D	10	330	NL
Acetophenone	8270D	10	330	NL
Anthracene	8270D	10	330	50
Atrazine	8270D	10	330	7.5
Benzo(a)anthracene	8270D	10	330	0.002
Benzo(a)pyrene	8270D	10	330	ND
Benzo(b)fluoranthene	8270D	10	330	0.002
Benzo(g,h,i)perylene	8270D	10	330	NL
Benzo(k)fluoranthene	8270D	10	330	0.002
Benzaldehyde	8270D	10	330	NL
bis(2-Chloroethoxy) methane	8270D	10	330	5
bis(2-Chloroethyl) ether	8270D	10	330	1
bis(2-ethylhexyl)phthalate	8270D	10	330	5
Butyl benzyl phthalate	8270D	10	330	50
Caprolactum	8270D	10	330	NL
Carbazole	8270D	10	330	NL
Chrysene	8270D	10	330	0.002
Di-n-butyl phthalate	8270D	10	330	50
Di-n-octyl phthalate	8270D	10	330	NL
Dibenz(a,h)anthracene	8270D	10	330	NL
Dibenzofuran	8270D	10	330	NL
Diethyl phthalate	8270D	10	330	50
Dimethyl phthalate	8270D	10	330	50
Fluoranthene	8270D	10	330	50
Fluorene	8270D	10	330	50
Hexachlorobenzene	8270D	10	330	0.4
Hexachlorobutadiene	8270D	10	330	0.5
Hexachlorocyclopentadiene	8270D	50	1600	5
Hexachloroethane	8270D	10	330	5
Indeno(1,2,3-cd)pyrene	8270D	10	330	0.002
Isophorone	8270D	10	330	50
N-Nitroso-n-propylamine	8270D	10	330	50
N-nitrosodiphenylamine	8270D	10	330	50
Naphthalene	8270D	10	330	10
Nitrobenzene	8270D	10	330	0.4
Pentachlorophenol	8270D	50	1600	1
Phenanthrene	8270D	10	330	50
Phenol	8270D	10	330	1
Pyrene	8270D	10	330	50

ND = Non-detect
NL = Not Listed
Note: RLs and MDLs are subject to change due to % moisture, matrix interference, and dilution factors

Table 7C
Project Quantitation Limits
Soil and Groundwater PCBs, Metals and Cyanide, Pesticides, and Herbicides

		Quantitation Limits		New York State Standard or Guidance Values
Analysis/Compound	**Method**	**Water (µg/L)**	**Soil (mg/kg)**	**Water (µg/L)**
Metals				
Antimony	6010B	10	1	3
Arsenic	6010B	10	1.0	25
Barium	6010B	200	2.00	1,000
Beryllium	6010B	4	0.40	3
Cadmium	6010B	5	0.50	5
Chromium	6010B	5	0.50	50
Copper	6010B	25	2.5	200
Lead	6010B	3	0.3	25
Mercury	7470A/7471A	0.2	0.037	0.7
Nickel	6010B	40	4.00	100
Selenium	6010B	5	0.5	10
Silver	6010B	5	0.50	50
Thallium	6010B	10	1.0	0.5
Zinc	6010B	20	2.0	2,000
Vanadium	6010B	50	5.00	NL
Cobalt	6010B	50	5.00	NL
Aluminum	6010B	200.00	20	NL
Calcium	6010B	5000.0	500	NL
Iron	6010B	100.00	10	300
Magnesium	6010B	5000.0	500	35,000
Manganese	6010B	15	1.50	300
Potassium	6010B	5000.0	500	NL
Sodium	6010B	5000.0	500	20,000
Cyanide (Total)	9014	10	1.0	200
Free Cyanide	9016	1.1	0.62	NA

Table 8
TCLP
Practical Quantitation Limits (PQLs)

TCLP VOLATILE	SW-846 Analysis	Water (ug/L)
Benzene	8260C	5
Carbon Tetrachloride	8260C	5
Chloroform	8260C	5
1,2-Dichlorethane	8260C	5
1,1-Dichloroethene	8260C	5
2-Butanone	8260C	100
Tetrachloroethene	8260C	5
Trichloroethene	8260C	5
Vinyl Chloride	8260C	100

TCLP SEMI-VOLATILE	SW-846 Analysis	Water (ug/L)
2-Methylphenol	3510 / 8270D	10
3 & 4-Methylphenol	3510 / 8270D	10
1,4-Dichlorobenzene	3510 / 8270D	10
2,4-Dinitrotoluene	3510 / 8270D	10
Hexachlorobutadiene	3510 / 8270D	10
Hexachloroethane	3510 / 8270D	10
Hexachlorobenzene	3510 / 8270D	10
Nitrobenzene	3510 / 8270D	10
Pentachlorophenol	3510 / 8270D	50
Pyridine	3510 / 8270D	ND
2,4,5-Trichlorophenol	3510 / 8270D	10
2,4,6-Trichlorophenol	3510 / 8270D	10

TCLP METALS	SW-846 Analysis	Water (mg/L)
Arsenic	3010 / 6010	0.05
Barium	3010 / 6010	0.002
Cadmium	3010 / 6010	0.004
Chromium	3010 / 6010	0.007
Lead	3010 / 6010	0.04
Selenium	3010 / 6010	0.07
Silver	7760 / 6010	0.007
Mercury	7470	0.0002

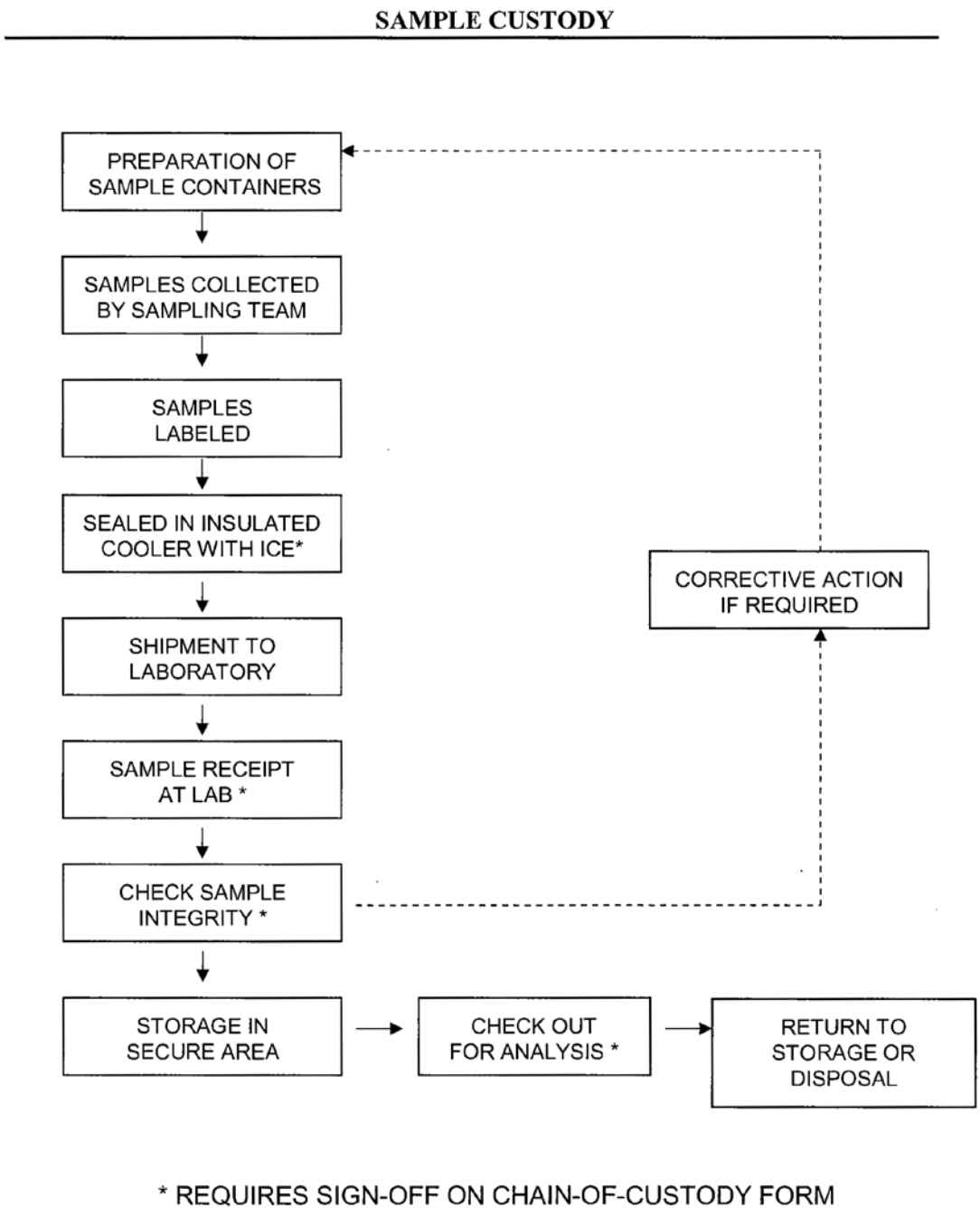
ND - Not Determined

Table 9
Field and Character Lengths for Disk Deliverable

Description	Length	Format
Field Sample ID (as shown on COC)	15	Character
CAS. No. (including -'s)	10	Character
Parameter Name	31	Character
Concentration	13	Numeric
Qualifier	4	Character
Units	8	Character
SDG	8	Character
Lab Sample ID	15	Character
Date Sampled (from COC)	D	Date
Matrix (soil/water/air)	5	Character
Method Detection Limit	13	Numeric
Method Code	8	Character
Lab Code	6	Character

Figures

FIGURE 1


SAMPLE CUSTODY
PREPARATION OF SAMPLE CONTAINERS
SAMPLES COLLECTED BY SAMPLING TEAM
SAMPLES LABELED
SEALED IN INSULATED COOLER WITH ICE*
SHIPMENT TO LABORATORY
SAMPLE RECEIPT AT LAB *
CHECK SAMPLE INTEGRITY *
STORAGE IN SECURE AREA
CHECK OUT FOR ANALYSIS *
RETURN TO STORAGE OR DISPOSAL
CORRECTIVE ACTION IF REQUIRED
* REQUIRES SIGN-OFF ON CHAIN-OF-CUSTODY FORM

Chain-of-Custody Record

Laboratory:

Laboratory Job #
(Lab use only)

GEI Consultants

1301 Trumansburg Road, Suite N
Ithaca, New York
TEL: 607-216-8955

Project Information

Project Name:

Project Number:

Project Location:

Project Manager:

Send Report to:

Send Faxed Results to:

Send EDD to:

Page ____ of ____

Preservative

Analysis

Sample Handling

Sample Field Filtered
YES NO NA

Sampled Shipped With Ice
YES NO

MCP PRESUMPTIVE CERTAINTY REQUIRED -- YES NO

If Yes, Are MCP Analytical Methods Required? YES NO

If Yes, Are Drinking Water Samples Submitted? YES NO

If Yes, Have You Met Minimum Field QC Requirements? YES NO

Lab Sample Number	GEI Sample ID	Collection Date	Collection Time	Matrix	No. of Bottles	Sampler(s) Initials	Sample Specific Remarks

Turnaround Time (Business days):

Normal _____ **Other**_____

10 Day_____ **7 Day**_____

5 Day_____ **3 Day**_____

Before submitting rush turnaround samples, you **must** notify the laboratory to confirm that the TAT can be

MCP Level Needed: GEI requires the most stringent Method 1 MCP standard be met for all analytes whenever possible.

Additional Requirements/Comments/Remarks:

Relinquished by: (signature)	Date :	Time:	Received by: (signature)
Relinquished by: (signature)	Date :	Time:	Received by: (signature)
Relinquished by: (signature)	Date :	Time:	Received by: (signature)

14 MCP Metals = Antimony, Arsenic, Barium, Beryllium, Cadmium, Chromium (total), Lead, Mercury, Nickel, Selenium, Silver, Thallium, Vanadium, Zinc.

Figure 2

FIGURE 3 Corrective Action Request

CORRECTIVE ACTION REQUEST
Number: _____ Date: _____
TO: _____ You are hereby requested to take corrective actions indicated below and as otherwise determined by you to (a) resolve the noted condition and (b) to prevent it from recurring. Your written response is to be returned to the project quality assurance manager by _____
CONDITION:
REFERENCE DOCUMENTS:
RECOMMENDED CORRECTIVE ACTIONS:
_____ _____ _____ _____ _____ _____ Originator Date Approval Date Approval Date
RESPONSE
CAUSE OF CONDITION
CORRECTIVE ACTION (A) RESOLUTION (B) PREVENTION (C) AFFECTED DOCUMENTS
C.A. FOLLOWUP: CORRECTIVE ACTION VERIFIED BY: _____ DATE:_____

GEI Consultants

Figure 4

GEI Resume – QAO

Brian T. Skelly, Environmental Scientist

GEI Consultants

Education
M.S., Natural Resources Management and Engineering, University of Connecticut, 2001
B.S., Natural Resources Management and Engineering, University of Connecticut, 1998

Background

Mr. Skelly is the practice leader for the air monitoring program and manager of the data management and CAD design departments. In those roles he oversees both external client services and internal support services for the Atlantic Region and has been with GEI since 2005.

Prior to working with GEI, Mr. Skelly spent two years at the Connecticut Agricultural Experiment Station developing air dispersion models, and three years as a research scientist at the University of Connecticut studying small-scale turbulence in the lower atmosphere. His work was aimed at improving prediction in particle dispersion modeling. In those roles, Mr. Skelly gained experience in instrumentation, environmental measurement and data analysis, and algorithm development to model the environment for predicting particle dispersion.

Since joining GEI, Mr. Skelly has been involved in a variety of environmental projects. His experience includes perimeter air monitoring programs during remediation of contaminated sites and development of an air emission database to assist in air permitting applications. He is also experienced in environmental sampling and analysis of soil and groundwater contamination mainly at manufactured gas plant (MGP) sites.

As both a professional at GEI and as a research scientist at previous institutions Mr. Skelly has published works in scientific journals and presented his findings at various seminars and international conferences.

Selected Experience

Perimeter Air Monitoring. Mr. Skelly serves as the practice leader for Atlantic Region air monitoring programs. In this role, Mr. Skelly is responsible for developing or reviewing proposals and work plans to manage the risk associated with air inhalation pathways and to comply with state or federal regulations and guidance documents. Mr. Skelly oversees staff training, data collection and reporting, and contingency plan response in GEI's air monitoring program.

Mr. Skelly has air monitoring program experience at fifteen MGP sites in six states.

Air Compliance. Mr. Skelly designed and built a database to track air emissions for a manufacturing facility. The database allowed our client to significantly speed up the material review process for state and federal air emission compliance and permitting.

Environmental Data Visualization. Mr. Skelly developed three-dimensional visualization services for the region to represent and refine site conceptual models. This service has lead to development of many site visualizations to convey the conceptual model to clients and at public meetings, and to facilitate understanding and review of large and complex subsurface datasets.

Models combine information from site investigations, groundwater models, CAD drawings, and historical documents to represent subsurface data in an easily digestible format.

Mr. Skelly built a three-dimensional visualization model using historical data to communicate contaminant plume extents. The model used data collected during a remedial investigation and changes over time during

remedial operations. The product was an interactive demonstration of the model and animation fly-over that GEI used to convey our findings to our client, state regulators, and the local community.

Environmental Data Management. Mr. Skelly leads the data management and CAD departments. He is responsible for managing the flow of environmental data, and standardization of processes for GEI's Atlantic division to support high quality client deliverables.

Some case study examples of Mr. Skelly's work at GEI include support of groundwater flow models, potentiometric surface mapping, calculation of flow gradients, and statistical analyses.

Safety Culture Analysis. Mr. Skelly performs yearly analysis of the in-house safety culture for various divisions of Hamilton-Sundstrand. His analyses determine target areas for safety culture improvement and assess the cultural differences among employee, staff, and management ranks.

VBA Programming. Mr. Skelly occasionally designs business tools for managing consultants at GEI. Some examples include automated analysis of staff scheduling, project budget accounting, and data analysis and reporting tools for finance and environmental measurement.

CAD Manager. As manager of the CAD department Mr. Skelly coordinates staff for graphic production for the Atlantic region and is working to build a cohesive structure of design elements that bridge the gaps between computer assisted design and drafting (CADD). geographic information systems (GIS), data management, boring log programs, survey data, numerical models, three-dimensional visualization models and other programs that are used for modeling and visualization of the data we collect and manage

Sampling Programs. Mr. Skelly gained experience in air monitoring, soil vapor sampling, groundwater sampling, soil sampling and soil logging.

Water Resources. Mr. Skelly defined parameters for bridges, dams, land types, and land use for use with HEC-RAS and HES-HMS to evaluate a reservoir and dam design project.

Energy and Water Analysis. Mr. Skelly worked with our California staff to develop a database to manage and analyze water use and electric and gas energy use data for 150 facilities in the Eastern Municipal Water District to understand with better granularity the daily energy of the district within the tariff system for the district.

Phase 1 Environmental Site Assessment. Mr. Skelly performed research in the three Midwest states of Michigan, Indiana, and Kansas to support potential property transfers for a hotel chain through due diligence.

Professional Presentations

- Ripp, J. and B. Skelly, 2008: "Remediation at Manufactured Gas Plant Sites in the United States". Proc. MGP 2008 Conference. Dresden, Germany, March 2008, p. 160.
- DeHate, R.., B. Skelly, and D. Blicharz, 2008: "Soil Vapor Intrusion Assessment Of Residential And Commercial Properties In The Northeastern United States". Proc. MGP 2008 Conference. Dresden, Germany, March 2008, p. 6.
- Unites, D., R. DeHate, and B. Skelly, 2008: "Air Monitoring In The Vicinity Of MGP Remediation". Proc. MGP 2008 Conference. Dresden, Germany, March 2008, p. 5.
- Marando, M., B. Skelly, and D. Unites, 2007: "Use of an Ultra-Fast Gas Chromatograph to Quantify Odor Intensity". Proc. EPRI 2007 MGP Symposium. Atlanta, GA, January 2007, p. 7.
- Ripp, J., B. McCarthy, and B. Skelly, 2007: "State of Remediation at MGP Sites". Proc. EPRI 2007 MGP Symposium. Atlanta, GA, January 2007, p. 1.

- Miller D.R., and B. Skelly. 'Fine Scale Turbulence Measurements In CASES-99 Using Hot-Film Anemometers'. 25th Conference on Agricultural and Forest Meteorology. Norfolk, VA. May 2002.
- Skelly, B.T., 'Hot-Film Anemometry In The Open Atmosphere'. Seminar. Army Research Laboratory, Adelphi, MD, November 2001.
- Miller, D.R. and B.T. Skelly, 'A Comparison Of Hot-Film And Sonic Anemometers Measurements in CASES-99'. CASES-99 Workshop II. Research Triangle Park, NC, August 2001.
- Skelly, B.T. and D.R. Miller, 'Comparison Of Fine-Scale Flux Measurements From Hot-Film And Sonic Anemometers'. CASES-99 Workshop I. National Center for Atmospheric Research, Boulder, CO, March 2001.

Publications

- Sun, J., D.H. Lenschow, S.P. Burns, R.M. Banta, R.K. Newsom, R. Coulter, S. Frasier, T. Ince, C. Nappo, B. Balsley, M. Jensen, L. Mahrt, D. Miller, and B. Skelly, 2004: Atmospheric Disturbances that Generate Intermittent Turbulence in Nocturnal Boundary Layers. Boundary-Layer Meteorology. 110, 255–279.
- Skelly, B.T., D.R. Miller and T.H. Meyer, 2002: 'Triple-Hot-Film Anemometer Performance In CASES-99 And A Comparison To Sonic Anemometer Measurements'. Boundary-Layer Meteorology. 105 (2). 275–304.
- Skelly, B.T., 2001: Triple-Hot-Film Anemometer Performance In CASES-99 And A Comparison To Sonic Anemometer Measurements'. University of Connecticut. 86 pp.

Affiliations

- American Geophysical Union (AGU)
- American Institute of Physics (AIP)
- American Meteorological Society (AMS)
- Environmental Professionals' Organization of Connecticut (EPOC)
- National Ground Water Association (NGWA)
- Society of Environmental Toxicology and Chemistry (SETAC)

Trainings

- OSHA HAZWOPER 40-hour training, February 2005
- First aid and CPR training, April 2011
- The Groundwater Pollution And Hydrology Course, Princeton Groundwater, February 2006
- Advanced Statistics For Environmental Professionals, EPOC, May 2005
- Evaluating Groundwater Flow And Chemical Transport Modeling: Guidelines For Hydrogeologists Who Don't Model, EPOC, May 2005
- The New MODFLOW Course, NGWA, October 2005
- Vapor Intrusion Seminar, EPOC/USEPA, December 2004

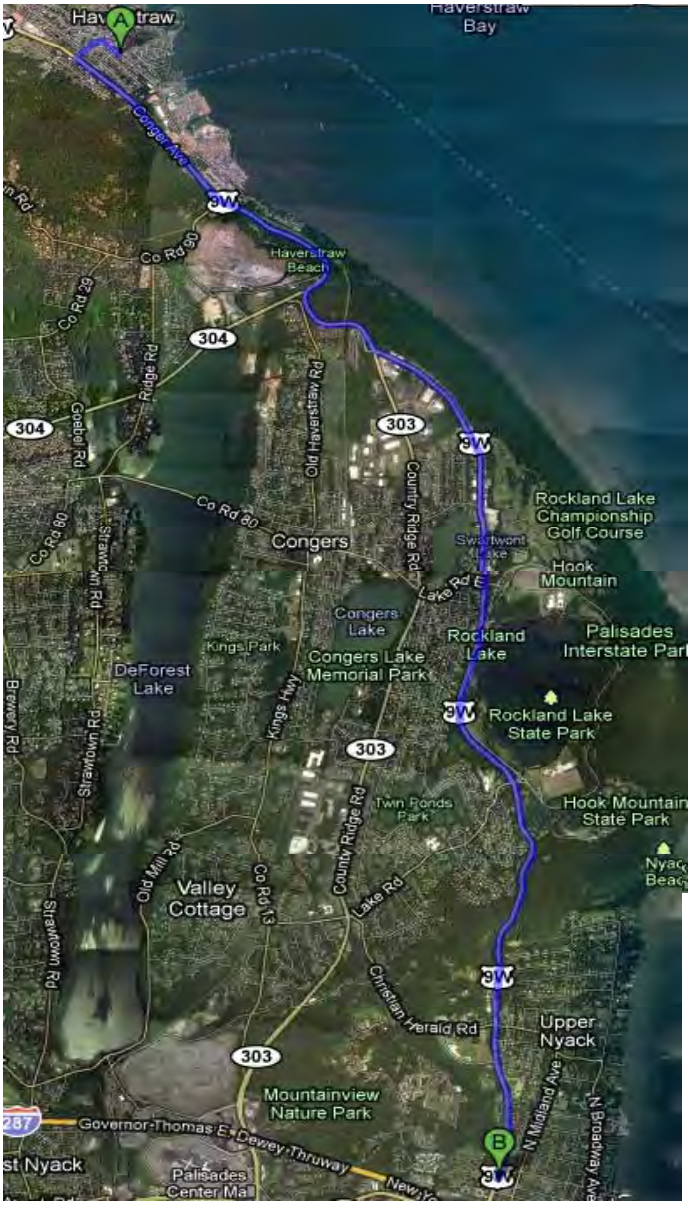
APPENDIX F – HEALTH AND SAFETY PLAN

APPENDIX F – HEALTH AND SAFETY PLAN

This Site-Specific HASP is in compliance with DER-10, and 29 CFR 1910, 29 CFR 1926, and all other applicable Federal, State, and local regulations. It is provided for example only.

Based on changes to State and Federal health and safety requirements, and specific methods employed by future contractors this HASP may need to be updated. The updated HASP should be re-submitted to the NYSDEC for approval.

For any field activities proposed for the site, an Orange and Rockland Utilities, Inc. (ORU) EHASP will also be required for the work. The consultants or contractor HASP will be a companion document for the ORU EHASP. Both documents must be approved by ORU Safety prior to any field work being scheduled. The ORU EHASP is attached as Appendix H of the SMP.



Directions:

Start: 39B Maple Avenue
Haverstraw, New York

1. Head northwest on Maple Ave. towards Fairmont Ave.
2. Take 2nd left on New Main St,
3. Turn left at US-9W/Conger Ave
4. Turn left and stay on US-9W S
5. Turn right and stay on US-9W S

End: Emergency Room
Nyack Hospital
160 North Midland Ave
Nyack, New York

Trip Info:

Total Distance: 5.6 miles
Time: Approximately 14 minutes.

Source: Google Maps

SITE MANAGEMENT PLAN 93B MAPLE AVENUE FORMER MGP HAVERSTRAW, NEW YORK	GEI Consultants	HOSPITAL ROUTE
ORANGE & ROCKLAND UTILITIES, INC. SPRING VALLEY, NEW YORK	Project 1512010	January 2016 Fig. 10

GEI Consultants

Consulting
Engineers and
Scientists

Health and Safety Plan

93B Maple Avenue Former MGP Site,
Haverstraw, New York
AOC Index No. D3-0001-99-01
Site No. 3-44-044

Submitted to:
Orange and Rockland Utilities, Inc.
390 West Route 59
Spring Valley, NY 10977

Submitted by:
GEI Consultants, Inc., P.C.
1301 Trumansburg Road, Suite N
Ithaca, NY 14850
607-216-8955

Project 1512010

James H. Edwards, C.P.G.
Senior Geologist

Joseph M. Simone, P.E.
Project Manager

Table of Contents

Appendices

Abbreviations and Acronyms

AHA	Activity Hazard Analysis
BTEX	Benzene, toluene, ethylbenzene, xylene
CAMP	Community Air Monitoring Plan
CFR	Code of Federal Regulations
CESM	Corporate Environmental and Safety Manager
CGI	Combustible Gas Indicator
CHSO	Corporate Health and Safety Officer
CMS	Chip Measurement System
CNS	Central Nervous System
CRZ	Contamination Reduction Zone
EPA	U.S. Environmental Protection Agency
EZ	Exclusion Zone
FID	Flame ionizing detector
GEI	GEI Consultants, Inc., P.C.
GFCI	Ground Fault Circuit Interrupter
HASP	Health and Safety Plan
HAZCOM	Hazard Communication
HEPA	high-efficiency particulate air
IDLH	Immediate Dangerous to Life and Health
LEL	Lower Explosive Limit
MGP	Manufactured Gas Plant
NAPL	non-aqueous phase liquids
NFPA	National Fire Protection Association
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
O&R	Orange & Rockland Utilities, Inc.
OSHA	Occupational Health and Safety Act
OUs	Operable Units
PAH	Polycyclic Aromatic Hydrocarbons
PCBs	polychlorinated biphenyls
PID	Photoionization Detector
PPE	Personal Protective Equipment
PCB	Polychlorinated Bipenyls
PM	Project Manager
PRCS	Permit Required Confined Space
ROW	Right-of-Way
SCBA	Self-contained Breathing Apparatus

SDS	Safety Data Sheet
SSO	Site Safety Officer
SVOCs	Semivolitile Organic Compounds
SZ	Support Zone
USCG	United States Coast Guard
VOCs	Volatile Organic Compounds
WNV	West Nile Virus

Measurements:

kg	kilogram
L	Liter
ppm	Parts per million
$\mu g/m^3$	Micrograms per cubic meter

1. Introduction

1.1 Statement of Safety and Health Policy

GEI is committed to providing a safe and healthy work environment for its employees. To maintain a safe work environment, GEI has established an organizational structure and a Corporate Health and Safety Program to promote the following objectives:

- Reduce the risk of injury, illness, and loss of life to GEI employees.
- Maintain compliance with federal, state, and other applicable safety regulations; and minimize GEI employees' work exposure to potential physical, chemical, biological, and radiological hazards.

1.2 General

Project Name: 93B Maple Avenue Former MGP Site
Haverstraw, New York

Client: Orange and Rockland Utilities, Inc.
390 West Route 59
Spring Valley, NY 10977
Project Manager: Maribeth McCormick

Consultant: GEI Consultants, Inc., P.C.
1301 Trumansburg Road, Suite N
Ithaca, NY 14850
Project Manager: Joe Simone, P.E.

This Health and Safety Plan (HASP) establishes policies and procedures to protect GEI personnel and their subcontractors from the potential hazards posed by the activities at the 93B Maple Avenue Former Manufactured Gas Plant (MGP) site (the, Site). Reading of the HASP is required of all on-site GEI personnel and GEI subcontractors. The HASP takes into account the specific hazards inherent to the Site, and presents procedures to be followed by on-site GEI personnel, GEI subcontractors, 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 Occupational Health and Safety Act (OSHA) Regulations, primarily 29 Code of Federal Regulations (CFR) Parts 1910 and 1926. 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.

1.3 Site Description

The Site is located in the Village of Haverstraw, Rockland County, New York. The former MGP works is bounded on all sides by residential properties at 91, 93A and 95 Maple Avenue; 2 and 6 Tor Avenues; and 70 and 84 West Streets. The Site boundaries consist of the former MGP works and the nearby properties with MGP impacts. The Clove and Maple Avenue Former MGP site is located southeast of the Site. The area is zoned for light industrial usage; it is predominantly residential with some light industrial use nearby. Haverstraw Bay of the Hudson River is located approximately 800 feet to the east of the Site.

In accordance with the New York State Department of Environmental Conservation's (NYSDEC's) request, the Site has been divided into two operable units (OUs):

- **OU-1**: 87, 91, 93A, 93B, and 95 Maple Avenue (excluding the In-Situ Chemical Oxidation [ISCO] work)
- **OU-2**: 99, 103, 104 Maple Avenue and the 93B and 95 Maple Avenue ISCO work.

The Site contains contamination left after completion of remedial measures. Contamination remains on a portion of the Site at 93B Maple Avenue (Assessors Lot 77) and 95 Maple Avenue (Lot 75). This HASP applies to activities on Lots 93B, 75 and 77.

1.4 Potential Work Activities

This HASP addresses the general activities listed below on Lots 93B, 75 and 77:

- 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:
  - Surface soil sample collection.
  - Subsurface soil boring installation and sample collection.
  - Test Pits installation and sample collection.
  - Temporary groundwater monitoring well installation and sample collection.
  - Soil vapor intrusion investigations and sample collection.
  - Investigation-derived waste handling and storage activities.
- Remediation/Construction Activities:
  - Excavation of impacted materials.
  - Construction oversight.
  - Community air monitoring.
  - Soil sample collection.
  - Water sample collection.
  - Ambient air sample collection.

2. Project Organization and Responsibilities

2.1 Orange and Rockland Utilities, Inc.

Orange and Rockland Utilities, Inc. (O&R) of Spring Valley, New York will have final responsibility and authority for all aspects of the project, and is also responsible for approving all changes to this HASP.

2.2 GEI Consultants, Inc., P.C.

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

- Project Manager (PM) – 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 (SSO) is informed of project changes which require modifications of the Site HASP.
  - Has overall project responsibility for Project Health and Safety.
- 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 (PPE) 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.

- 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 PPE 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 PPE, prior to use.

Lines of Authority will be as follows:

- On Site – GEI will have responsibility for safety of its employees during the work performed at Lots 75 and 77. GEI's field representative will have a cell phone available to contact the appropriate local authorities, in the event of an emergency. GEI's field representative will be available for communication with the GEI PM and with the O&R representative.

2.3 Contractors

Contractors are responsible for all work detailed in the project work plan and/or Contractor Statement of Work. Contractors are also responsible for the health and safety of Contractor and Subcontractor employees, and conduct work zone monitoring for Contractor and Subcontractor workers. GEI requires its Contractors (e.g. drillers, air monitoring equipment vendors, etc.) to work in a responsible and safe manner, and is responsible for work zone monitoring for them. Contractors not under contract by O&R or GEI for this project will be required to develop their own HASP for protection of their employees, and at a minimum must adhere to applicable requirements set forth in this HASP.

2.4 Emergency Contact List

EMERGENCY INFORMATION		
Important Agency	**Phone Numbers**	**Directions to Hospital**
Local Police	911	See attached map for route and directions to hospital. The approximate driving time is 15 minutes.
Fire Department	911	
Ambulance	911	
State Police or County Sheriff	911	
Local Hospital Nyack Hospital	Main: (845) 348-2000	
GEI Project Manager (PM) Joe Simone, P.E.	Mobile: (607) 592-4677	
Corporate Health and Safety Officer (CHSO)/Corporate Environmental Safety Manager (CESM) Robin DeHate, Ph.D	Mobile: (813) 323-6220	
Regional Health and Safety Representative Steve Hawkins, P.E.	Office: (860) 368-5348 Mobile: (860) 916-4167	
Client Contact Maribeth McCormick	Mobile: (914) 557-1361 Spring Valley: (845) 294-1757	
Utility Clearance Permit #	Not Applicable	
Nearest Telephone Location	Onsite Cellular	

A Tentative Project Team Contact Information List is in Appendix A.

3. 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 B, 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 C – Hazard Communication Program
- Appendix D – Cold Stress Program
- Appendix E – Heat Stress Program
- Appendix F – Personal Protective Equipment Program
- Appendix G – Lock Out/Tag Out Program
- Appendix H – Confined Space/Hot Work Permitting Procedure
- Appendix I – Incident Reporting
- Appendix J –Safety Data Sheets

3.1 Evaluation of Potential Chemical Hazards

The potential primary hazards of each contaminant are identified below. Note that the matrices specified for each contaminant are not necessarily exclusive but are based on the best existing information of the Site. This HASP is intended to be sufficiently stringent to ensure personnel protection from all of the potential contaminants listed, regardless of matrix. Chemical characteristics and potential exposure information for the compounds that may be encountered during Site activities are presented in Table 3-1 below.

3.1.1 Volatile Organic Compounds

Volatile organic compounds (VOCs), such as benzene, toluene, ethylbenzene, 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.

3.1.2 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 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 11. 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 6 to minimize airborne exposures.

3.1.3 Heavy Metals

Exposure to arsenic can cause dermatitis, gastrointestinal disturbances, peripheral neuropathy, respiratory irritation, and hyperpigmentation of skin. Chronic exposure to arsenic has resulted in lung cancer in humans.

Exposure to lead may cause acute symptoms such as eye irritation, weakness, weight loss, abdominal pain, and anemia. Chronic exposure to lead may result in kidney disease, effects to the reproductive system, blood forming organs, and CNS damage.

Both lead and arsenic are regulated by specific OSHA standards. They are 29 CFR 1910.1025/1926.52 and 29 CFR 1910.1018/1926.1118, respectively. These standards include specific requirements for air monitoring, signs and labels, training, and medical surveillance.

Exposure to chromium can cause acute symptoms such as irritation of the eyes, nose, and throat; as well as wheezing and coughing. Chronic effects include nosebleeds, nasal congestion, dermatitis, and loss of sight.

Exposure to mercury can cause dizziness, salivation, nausea, vomiting, diarrhea, constipation, emotional disturbance, and kidney injury. Chronic exposure to mercury can cause CNS damage.

Exposure to selenium can cause mucous membrane irritation, coughing, sneezing, shortness of breath, chills, headaches, hypotension, and CNS depression. Chronic exposure to selenium could cause bronchial irritation, gastrointestinal distress, excessive fatigue, and skin discoloration.

As with SVOCs, the primary route of exposure is through inhalation of dust particles when soil is disturbed and becomes airborne.

3.1.4 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, gastrointestinal 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.

3.1.5 Cyanide

Cyanide compounds are common by-products of manufactured gas production. Hydrogen cyanide is toxic because it is a chemical asphyxiant. It replaces the oxygen in the blood and

thereby suffocates the cells. Ferrocyanides are not considered toxic because the hydrogen cyanide ion is bound to tightly to the iron and cannot therefore replace the oxygen. It takes a great amount of heat and/or acid to release cyanide gas from the ferrocyanide molecule, therefore hydrogen cyanide is not a concern at this Site.

3.1.6 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 parts per million [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.

3.1.7 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 VOCs and associated contingency plans for the work zone are discussed within Section 6 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.

Safety Data Sheets (SDS) (as available) and/or Occupational Health Guidelines for contaminants potentially found at the Site (and/or for products that are potentially the source of contamination), and for decontamination chemicals that may be used on site, are included in Appendix J.

Specific chemical hazards information from the SDS and Occupational Health Guidelines are summarized in Section 3.1.10.

3.1.8 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, during demolition work, or during the use of 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 6 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.

3.1.9 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 11 will be worn for all activities where contact with potential contaminated media or materials are expected.

3.1.10 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 SDSs to the SSO for each of the chemicals to be used. The SDSs will be maintained at the Site by the SSO and all Site workers. Visitors, who may potentially be exposed to the chemicals, will be made aware of these hazards and the location of the on-site SDSs during a hazard briefing session by the SSO. SDS of commonly used compounds are located in Appendix J.

CONTAMINANT:	**Volatile Organic Compounds (VOCs, potentially including BTEX)**							
Possible Sources:	Fuels, Oils and Other Petroleum Products							
Form:	Gas	☐	Liquid	☒	Solid (adsorbed)	☒	Other Vapor	
Characteristic:	Corrosive	☐	Ignitable	☒	Radioactive	☐	Volatile	☒

	Toxic	☒	Reactive	☐	Other _____	Unknown	☐
Matrix:	Soils	☒	Debris	☒	Groundwater ☒	Other Airborne Vapor	

CONTAMINANT:	**Polycyclic Aromatic Hydrocarbons (PAHs), including naphthalene**						
Possible Sources:	MGP Tars, Petroleum Products, Products of Incomplete Combustion						
Form:	Gas	☐	Liquid	☒	Solid (adsorbed) ☒	Other _____	
Characteristic:	Corrosive	☐	Ignitable	☐	Radioactive ☐	Volatile	
	Toxic	☒	Reactive	☐	Other _____	Unknown	
Matrix:	Soils	☒	Debris	☒	Groundwater ☐	Other Fugitive Dust	

CONTAMINANT:	**Cyanide Compounds (primarily ferrocyanides of low toxicity)**						
Possible Sources:	Purifier Waste Disposal						
Form:	Gas	☐	Liquid	☐	Solid (adsorbed) ☒	Other HCN Gas	
Characteristic:	Corrosive	☐	Ignitable	☐	Radioactive ☐	Volatile	☒
	Toxic	☒	Reactive	☐	Other _____	Unknown	☐
Matrix:	Soils	☒	Debris	☒	Groundwater ☐	Other Airborne Vapor	

CONTAMINANT:	**Target Analyte List (TAL) Metals**						
Possible Sources:	Site Debris						
Form:	Gas	☐	Liquid	☐	Solid (adsorbed) ☒	Other Dust	
Characteristic:	Corrosive	☐	Ignitable	☐	Radioactive ☐	Volatile	☐
	Toxic	☒	Reactive	☐	Other _____	Unknown	☐
Matrix:	Soils	☒	Debris	☒	Groundwater ☐	Other Fugitive Dust	

CONTAMINANT:	**Asbestos**						
Possible Sources:	Paint chips and dust						
Form:	Gas	☐	Liquid	☐	Solid (adsorbed) ☒	Other Dust	
Characteristic:	Corrosive	☐	Ignitable	☐	Radioactive ☐	Volatile	☐
	Toxic	☒	Reactive	☐	Other _____	Unknown	☐
Matrix:	Soils	☐	Debris	☒	Groundwater ☐	Other Paint Chips	

CONTAMINANT:	**PCBs**							
Possible Sources:	Transformer oil							
Form:	Gas	☐	Liquid	☒	Solid (adsorbed)	☒	Other Dust	
Characteristic:	Corrosive	☐	Ignitable	☐	Radioactive	☐	Volatile	☐
	Toxic	☒	Reactive	☐	Other		Unknown	☐
Matrix:	Soils	☒	Debris	☒	Groundwater	☐	Other Fugitive Dust	

CONTAMINANT:	**Hydrogen Sulfide**							
Possible Sources:	MGP Residue and sewage							
Form:	Gas	☒	Liquid	☐	Solid (adsorbed)	☐	Other Vapor	
Characteristic:	Corrosive	☐	Ignitable	☐	Radioactive	☐	Volatile	☒
	Toxic	☒	Reactive	☐	Other		Unknown	☐
Matrix:	Soils	☐	Debris	☐	Groundwater	☐	Other Airborne Vapor	

SDS (as available) and/or Occupational Health Guidelines for contaminants potentially found at the Site (and/or for products that are potentially the source of contamination), and for decontamination chemicals that may be used on site, are included in Appendix J.

Specific chemical hazards information from the SDS and Occupational Health Guidelines are summarized in Table 3-1 below.

Table 3-1
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 1.0 f/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. 0.5 mg/m^3	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: 12º 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
Ethylbenzene	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: 55º F IP: 8.76 eV LEL: 0.8% UEL:6.7% VP: 7 mm
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

Table 3-1
Chemical Data

Compound	CAS #	ACGIH TLV	OSHA PEL	Route of Exposure	Symptoms of Exposure	Target Organs	Physical Data
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/m^3	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/m^3	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
PAH's as Coal tar pitch Volatiles (CTPV)	65996-93-2	0.2 mg/m^3	0.2 mg/m^3	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

Table 3-1
Chemical Data

Compound	CAS #	ACGIH TLV	OSHA PEL	Route of Exposure	Symptoms of Exposure	Target Organs	Physical Data
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 ºF 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: 40º 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: 90º F IP: 8.56 eV LEL: 0.9% UEL: 6.7% VP: 9 mm

Abbreviations

C = ceiling limit, not to be exceeded
CNS = Central Nervous System
CVS = Cardiovascular System
eV = electron volt
FP = Flash point
IP = Ionization Potential
GI = Gastro-intestinal
A.L. = Action Level
LEL = Lower explosive limit
mg/m^3 = milligrams per cubic meter
f/cc = fibers per cubic centimeter
mm = millimeter
ppm = parts per million
Skin = significant route of exposure
STEL = Short-term exposure limit (15 minutes)
TWA = Time-weighted average (8 hours)
UEL = Upper explosive limit
VP = vapor pressure approximately 68° F in mm Hg (mercury)
ACGIH = American Conference of Governmental Industrial Hygienists
TLV = Threshold Limit Values

3.2 Physical Hazards

3.2.1 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:

- Lock Out/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.

3.2.1.1 Lock Out/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 an O&R 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 O&R 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 G.

All power lines, which have been indicated by O&R 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 O&R that they have completed work in the area and that all personnel are clear of the area. O&R representatives will thoroughly familiarize Contractor personnel with Site-specific lock out/tag out procedures during the Site orientation. The lock out procedures must be equivalent in effectiveness to those found in Appendix G.

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.

3.2.1.2 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.

3.2.1.3 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.

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 4 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.

3.2.1.4 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 hazards 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.

3.2.1.5 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 6 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 H will apply in accordance with OSHA 1910.146 and 1910.134.

3.2.2 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 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 B 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.

3.2.3 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, and hypothermia; as well as slippery surfaces, brittle equipment, poor judgment, and unauthorized procedural changes. The procedures to be followed are found in Appendix D, the Cold Stress Program.

3.2.4 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 E, the Heat Stress Program.

3.2.5 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.

3.2.6 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.

3.2.7 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.

3.2.8 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 whenever 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.

3.2.9 Steam, Heat, and Splashing

Exposure to steam, heat, or splashing hazards can occur during steam cleaning activities. Exposure to steam, heat, or 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.

3.3 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.

3.3.1 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.

3.3.2 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.

3.3.2.1 **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.

3.3.2.2 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 who are over 50 and some immunocompromised individuals (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.

3.3.3 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.

3.3.4 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; tenderness in the affect are; fatigue, chills, and fever; pustules; and abscesses. If allowed to progress without treatment, the organisms may multiply and cause an overwhelming infection which can lead to death.

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

3.4 Activity 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 B, which addresses the health and safety hazards of each specific project task or operation and includes requirements and procedures for worker protection.

Table 3-2
Activity Hazard Analysis

Activity: Preliminary Site Visit/Pre-Investigation Activities		
Work Task	**Potential Hazards**	**Controls**
Site Mobilization/Activity	Biological Hazards.	Proper clothes, body inspections, insect repellant.
	Slip, Trip, and 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, and drinking warm/cold fluids.
Activity: Investigation Activities		
Work Task	**Potential Hazards**	**Controls**
Subsurface Boring Installation and Sample Collection	Heavy Equipment/Proximity to Heavy Equipment	Distancing, safe work practices, inspections, and 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, and drinking warm/cold fluids.
	Slip, Trip, and Fall Hazards	Maintain safe and orderly work areas. Unloading areas should be on even terrain. Identify and repair potential tripping hazards.
	Noise	Distancing from noise; hearing protection.
	Tool Use	Use proper guarding, inspections, wear safety glasses with side shields, and hearing protection.

Table 3-2
Activity Hazard Analysis

Activity: Investigation Activities (Continued)		
Work Task	**Potential Hazards**	**Controls**
Subsurface Boring Installation and Sample Collection	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. PPE 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 PID and multiple gas meter (that monitors % oxygen, lower explosive limit, hydrogen sulfide, and hydrogen cyanide), and a dust monitor to monitor the workzone as specified in Section 7 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 11 of the HASP.
Activity: Remedial Activities		
Work Task	**Potential Hazards**	**Controls**
Excavation, Oversight, Community Air Monitoring Plan (CAMP), 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, and Fall Hazards	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.

Table 3-2
Activity Hazard Analysis

Activity: Remedial Activities (Continued)		
Work Task	**Potential Hazards**	**Controls**
Excavation, Oversight, CAMP, and Sample Collection	Excavation Safety	Perform Daily Inspections or excavations, Establish setback distances and controls, Install proper support, access points, air sampling for safe entry, when required.
	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 11 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 7 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 11 of the HASP. Community air monitoring of the area immediately surrounding the work zone will be completed in accordance with the Site-Specific CAMP.

Table 3-3
Potential Hazards and Controls

Potential Hazards	Controls
Inclement Weather	Weather reports, proper clothing, and work stoppage.
Heat/Cold Stress	Proper clothing, acclimatization, regular work breaks, fluid intake, and watch for signs of heat/cold stress.
Chemical Exposure	Protective coveralls (e.g. Tyvek®) with shoe covers, safety glasses, face shield, P100 disposable respirator (when necessary), nitrile (or latex) gloves.
Electrical Hazards	Ensure portable electrical equipment is equipped with a GFCI.
Slip, Trip, and Fall Hazards	Keep trafficked areas free of slip, trip, and fall hazards.
Heavy Lifting – Sprains & Strains	Use proper lifting techniques. Ask fellow worker for help.
Falling or handling debris – crushing, eye injury, head injury, splinters	Maintain awareness of operations and keep a safe distance away from structures as they are torn down; wear eye protection and hard hat; wear leather or Kevlar gloves.
General on site provisions shall include: extra nitrile, leather, latex, and/or Kevlar gloves, extra protective coveralls (e.g. Tyvek®) with boot covers, drinking water, P100 disposable respirators first aid kit, hearing protection and washing facilities.	

4. Training Program

4.1 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. 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 GEI CHSO or her representative prior to the start of field activities.

4.2 Annual 8-Hour Refresher Training

Annual 8-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 GEI CHSO or her representative prior to the start of field activities.

4.3 Supervisor Training

Personnel acting in a supervisory capacity shall have received 8 hours of instruction in addition to the initial 40-hour training. In addition, supervisors shall have 1 year of field experience and training specific to work activities (i.e., sampling, construction observation, etc.).

4.4 SSO Training

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

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

4.5 Site-Specific Training

Prior to commencement of field activities, the GEI CHSO or her representative 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.

4.6 On-Site Safety Briefings

Other GEI personnel will be given health and safety briefings daily by GEI's field representative to assist GEI 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 workers on monitoring results.

4.7 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.

4.8 Hazard Communication

Hazard communication training will be provided in accordance with the requirements of GEI's Health and Safety Program.

5. Medical Surveillance Program

GEI maintains a continuous, corporate, medical surveillance program that includes a plan designed specifically for field personnel engaged in work at sites where hazardous or toxic materials may be present. Dr. Robin DeHate is GEI's CHSO and is responsible for the administration and coordination of medical evaluations conducted for GEI's employees at all branch office locations. Comprehensive examinations are given to all GEI field personnel participating in hazardous waste operations on an annual or biennial basis (as determined to be appropriate by the CHSO. The medical results of the examinations aid in determining the overall fitness of employees participating in field activities.

Dr. DeHate's address and telephone numbers are:

Office:	(813) 774-6965
Cell:	(813) 323-6220

Under the CHSO's supervision, all field personnel undergo a complete initial physical examination, including a detailed medical and occupational history, before they participate in hazardous waste site investigations. Extensive annual/biennial reexaminations are also performed. Upon completion of these tests, personnel are certified by an occupational health physician as to whether they are fit for field work in general, and fit to use all levels of respiratory protection, in particular.

If a GEI employee or other project worker shows symptoms of exposure to a hazardous substance and wishes to be rechecked, he/she will be directed to the nearest area hospital or medical facility.

All GEI subcontractor personnel that will enter any active waste handling or other active non-"clean" area must certify that they are participating in a medical surveillance program that complies with OSHA regulations for hazardous waste operations (i.e., 29 CFR 1910.120 and 29 CFR 1926.65). Proof of medical clearance shall be submitted to the GEI CHSO or her representative prior to the start of field activities.

6. 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's employees and subcontractors. The Consultant will monitor and document daily Site conditions and operations on O&R'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 will provide the following equipment for health and safety monitoring of its personnel:

- PID
- Particulate Meter (PM-10 capable)
- Multiple Gas Meter with Combustible Gas Indicator (CGI)/Oxygen (O2)/Hydrogen Sulfide (H2S)/Hydrogen Cyanide (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 6-1 below. In the event that a Contractor has a more stringent action level requirement than the HASP, the Contractor will notify O&R and the Consultant to rectify the action level discrepancy.

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

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

Table 6-1 provides a summary of real time air monitoring action levels and contingency plans for work zone activities.

Table 6-1
Work Zone Air Monitoring Action Levels

Air Monitoring Instrument	Monitoring Location	Action Level	Site Action
PID/FID	Breathing Zone	0.5 ppm	Use Dräger 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 (O2)	Breathing Zone	< 20.7%	Stop work; withdraw from work area; ventilate area, notify SSO & CESM.
		> 21.1%	Stop work; withdraw from work area; notify SSO & CESM.
Hydrogen Sulfide (H2S) 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.

Table 6-1
Work Zone Air Monitoring Action Levels (Continued)

Air Monitoring Instrument	Monitoring Location	Action Level	Site Action
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 µg/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.

7. Site Control Measures

7.1 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 by the Contractor when operations begin for each task requiring such delineation. 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.

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 EZ. The CRZ will be used for EZ 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 EZ. This zone will be clearly delineated by cones, tapes, or other means. The Contractor 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 Contractor allowing adequate space for the activity to be completed, field members, and emergency equipment.

The Contractor is responsible for constructing, maintaining, and enforcing the zones.

7.2 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:

Table 7-1
Typical Hand Signals

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.

8. Accident Reporting

GEI will report incidents involving GEI personnel or subcontractor personnel, such as: lost time injuries, injuries requiring medical attention, near miss incidents, fires, fatalities, accidents involving the public, and property damage. The report shall be made to the GEI PM verbally within 2 hours of the incident and also the Orange and Rockland PM. The GEI PM will immediately inform the CHSO and the Director of Human Resources of the incident. All occupational injuries and illnesses that are required to be recorded under OSHA will be recorded on OSHA Form 300 by GEI's or the subcontractor's personnel within 48 hours of occurrence as is required by statute.

9. Medical Support

In case of minor injuries, on-site care shall be administered with the Site first aid kit. For serious injuries, call 911 and request emergency medical assistance. Seriously injured persons should not be moved, unless they are in immediate danger.

Section 12 of this HASP contains detailed emergency information and a list of emergency services and their telephone numbers. GEI field personnel will carry a cellular telephone.

10. Decontamination Procedures

A decontamination pad will be established for personnel decontamination and equipment decontamination.

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 Station

A personnel decontamination station where workers can drop equipment and remove PPE will be set up at the decontamination pad by the Contractor. It will be equipped with basins for water and detergent, and trash bag(s) or cans for containing disposable PPE and discarded materials. Once personnel have decontaminated at this station and taken off their PPE, they will proceed to a sink where they will wash themselves wherever they have potentially been exposed to any contaminants (e.g., hands, face, etc.)

The following specific decontamination procedure will be used as necessary by GEI personnel or subcontractor personnel wearing PPE from Level D through Level C:

- Step 1 – Equipment drop (respirator, tools, monitoring equipment, etc.) Decontaminate as appropriate (per GEI's field representative's instructions).
- Step 2 – Boot wash/rinse (wash with non-foaming detergent and rinse with fresh water spray). Remove boots. If inner and outer gloves are worn, wash outer gloves, remove and save for later use, or remove and discard outer gloves and place in trash bag/can provided in the decontamination area.
- Step 3 – Hard hat removal, wash if visibly contaminated (use same wash as in Step 2).
- Step 4 – If Tyvek™ (or equivalent) suit was worn and is visibly contaminated, remove and place in trash bag/can provided in the decontamination area or decontaminate (wash), and store for reuse. Contaminated washable coveralls should be removed and bagged for washing.
- Step 5 – Respirator and/or eye protection removal (as applicable). Wash (per Step 2) to remove visible contamination.

- Step 6 – Glove removal.
- Step 7 – Wash potentially exposed skin (use water and soap at indoor sink).
- Step 8 – Disinfect respirator per manufacturer's recommendations.

Contaminated PPE (gloves, suits, etc.) will be decontaminated and stored for reuse or placed in plastic bags (or other appropriate container) and disposed of in an approved facility. Decontamination wastewater and used cleaning fluids will be collected and disposed of in accordance with all applicable state and federal regulations.

10.3 Heavy Equipment Decontamination

Heavy equipment decontamination will be performed by the Contractor within the limits of the on-site decontamination pad in accordance with the contract specifications. A steam generator and brushes will be used to clean demolition equipment and other tools. No heavy equipment will be permitted to leave the Site unless it has been thoroughly decontaminated.

Wastewater from the heavy equipment and personnel decontamination areas will be collected and disposed of in accordance with all applicable state and federal regulations. The Contractor will be responsible for ultimate disposal of investigation-derived wastes.

For further details on heavy equipment decontamination procedures, related with excavation activities, refer to the Excavation Work Plan (EWP) (Appendix A of the Site Management Plan [SMP]).

10.4 Decontamination Equipment Requirements

The following equipment shall be in sufficient supply to implement decontamination procedures for GEI's equipment:

- Buckets
- Alconox™ detergent concentrate
- Hand pump sprayers
- Long-handle, soft-bristle brushes
- Large sponges
- Cleaning wipes for respirators
- Bench or stool(s)
- Liquid detergent and paper towels
- Plastic trash bags

The Contractor performing decontamination procedures is responsible for ensuring that the above materials, as required for their operation, are in sufficient supply.

11. Personal Protective Equipment

The PPE specified in Table 11-1 represents PPE selection required by 29 CFR 1910.132, and is based on the AHA of Section 3. Specific information on the selection rationale for each activity can be found in Appendix F.

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.

PPE required for each level of protection is as follows:

Table 11-1
PPE Required for Each Level

Safety Equipment	Level A	Level B	Level C	Level D
Tyvek® suit or work overalls				X
Hard hats with splash shields or safety glasses			X	X
Steel-toe boots with overboots			X	X
Chemical-resistant gloves as appropriate for work being performed and materials handled			X	X
Half- or full-face respirators with HEPA® cartridges as approved by the CHSO			X	
Tyvek® splash-resistant suit			X	
Chemical-resistant clothing		X		
Pressure-demand, full-face Self Contained Breathing Apparatus (SCBA) or pressure-demand supplied air respirator with escape SCBA	X	X		
Inner and outer chemical-resistant gloves	X	X		
Chemical-resistant safety boots or shoes	X	X		
Two-way radio	X	X		
Hard hat	X	X		
Fully encapsulating chemical-resistant suit	X			

PPE requirements for field activities are as follows:

Table 11-2
PPE Requirements for Field Activities

Activity	Level of Protection	Backup Protection
Preliminary Site Visit	D	D
Pre-Investigation Activities	D	C
Investigation Activities	D	C
Remedial Activities	D	C

Use of Level A or Level B PPE is not anticipated. If conditions indicating the need for Level A or Level B PPE are encountered, personnel will leave the exclusion zone and this HASP will be revised or GEI personnel will not re-enter the exclusion zone until conditions allow.

12. Supplemental Contingency Plan Procedures

12.1 Hazard Communication Plan

GEI personnel have received hazard communication training as part of their 40-hour HAZWOPER training. All hazardous materials used on the Site will be properly labeled, stored, and handled. SDSs will be available to all potentially exposed employees.

12.2 Fire

In the event of a fire all personnel will evacuate the area. GEI's field representative will contact the local fire department, with jurisdiction, and report the fire. Notification of evacuation will be made to the GEI PM. The field representative will account for GEI personnel and subcontractor personnel and report their status to the GEI PM.

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 Underwriters Laboratory (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.

12.3 Overt Chemical Exposure

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

Table 12-1
Overt Chemical Exposure

Chemical Exposure Point	Standard Procedure
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.

12.4 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.

12.5 Severe Weather

The contingency plan for severe weather includes reviewing the expected weather to determine if severe weather is in the forecast. Severe weather includes high winds over 30 mph, heavy rains or snow squalls, thunderstorms, hurricanes, and lightning storms. If severe weather is approaching, the decision to evacuate GEI personnel and Subcontractor personnel from the Site will be the responsibility of GEI's field representative. Notification of evacuation will be made to the GEI PM. The field representative will account for GEI personnel and Subcontractor personnel and report their status to the GEI PM.

12.6 Spill Control and Response

All small hazardous spills/environmental releases shall be contained as close to the source as possible. Whenever possible, the SDS 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 National Fire Protection Association (NFPA)-approved safety cans and by approved United States Coast Guard (USCG) refueling methods. Fuel will be stored in containers meeting applicable fuel storage safety regulations.

The Emergency Coordinator should take the following steps:

- Determine the nature, identity and amounts of major spill components.
- Make sure all unnecessary persons are removed from the spill area.
- Notify appropriate response teams and authorities.
- Use proper PPE in consultation with the SSO and information provided on the SDS for the spilled material.
- 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.).
- If possible, try to stop the leak with appropriate material.
- Remove all surrounding materials that can react or compound with the spill.
- Notify the Client PM.

12.7 Alcohol and Drug Abuse Prevention

Alcohol and drugs will not be allowed on the work site. Project personnel under the influence of alcohol or drugs will not be allowed to enter the Site.

12.8 Emergency Contact Information:

Table 12-2
Emergency Phone List

Emergency	Phone Number
Medical Emergencies	
Emergency	911
All other communications	311
Nearest Emergency Room (Nyack Hospital)	(845) 348-2000
Fire and Rescue Emergencies	
Emergency	911
Utility Emergencies	
Electric (O&R)	(845) 358-7800
Natural Gas (O&R)	(800) 533-5325
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

12.9 Emergency Equipment

The following minimum emergency equipment will 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 will be administered with the Site first aid kit. The first aid kit will include at a minimum the items specified in Appendix I 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 cannot 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.

12.10 Postings

The following information will 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.

12.11 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.

13. 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 CHSO or designee will maintain a parallel file off site.

13.1 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 CHSO and copies provided to the SSO prior to the initiation of work on site.

13.2 On-Site Log

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

13.3 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 CHSO.

13.4 Accident/Incident Reports

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

13.5 Work Permits

All work permits, including confined space entry, hot work, lock out/tag out, and line-breaking permits will be maintained in the project files. Copies of the work permits will also be provided to the SSO, and the O&R PM.

14. Health and Safety Plan Sign-Off

All GEI personnel conducting Site activities must read the Health and Safety Plan, be familiar with its requirements, and agree to its implementation.

Once the Health and Safety Plan has been read, complete this sign-off sheet, and return it to the Project Manager.

Site Name: 93B Maple Avenue MGP Site

GEI Project No: 1512010

I have received and read the Health and Safety Plan, been briefed on it, and agree to its implementation.

PRINT NAME/COMPANY	SIGNATURE	DATE

PRINT NAME/COMPANY	SIGNATURE	DATE

PRINT NAME/COMPANY	SIGNATURE	DATE

Appendix A

Tentative Project Team Contact Information

Table A-1
Orange & Rockland Utilities
Contact Information

Name	Title	Contact Information
Maribeth McCormick	O&R Site Representative	Office: 845-294-1757 Mobile: 914-557-1361 E-mail:
TBD	O&R Safety Administrator	Office: Mobile: E-mail:
		Office: Mobile: E-mail:
		Office: Mobile: E-mail:
		Office: Mobile: E-mail:

Table A-2
GEI Consultants, Inc., P.C.
Tentative Project Team Contact Information

Name	Title	Contact Information
Robin DeHate	Corporate Health and Safety Officer (CHSO)/ Corporate Environmental Safety Manager (CESM)	Office: 813-774-6965 Mobile: 813-323-6220 Email: rdehate@geiconsultants.com
Joe Simone, P.E.	Project Manager (PM)	Mobile: 607-592-4677 Email: jsimone@geiconsultants.com

Appendix B

Project-Specific Activity Hazard Analysis

Table B-1
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.		
Activity: Subsurface Boring, Test Pits, Monitoring Well Installation, and Sample Collection		
Subsurface Boring, Test Pits, 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 Hazards	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.

Table B-1
Project Specific Activity Hazard Analysis

WORK TASK	POTENTIAL HAZARDS	CONTROLS
ACTIVITY: Subsurface Boring, Test Pits, Monitoring Well Installation, and Sample Collection (Continued)		
Subsurface Boring, Test Pits, and Monitoring Well Installation and Sample Collection	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 11 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, and hydrogen cyanide), and dust monitor to monitor the works zone as specified in Section 7 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 11 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.		
Activity: Excavation, Oversight, CAMP, and Sample Collection		
Excavation, Oversight, CAMP, 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.
	Excavation Safety	Perform Daily Inspections or excavations, Establish setback distances and controls, Install proper support, access points, air sampling for safe entry, when required.
	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.

Table B-1
Project Specific Activity Hazard Analysis

WORK TASK	POTENTIAL HAZARDS	CONTROLS
ACTIVITY: Excavation, Oversight, CAMP, and Sample Collection (Continued)		
	Slip, Trip, and Fall Hazards	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 11 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, and hydrogen cyanide), and dust monitor to monitor the works zone as specified in Section 7 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 11 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 C

Hazard Communication (HAZCOM) Program

GEI Hazard Communication (HAZCOM) Program

Policy and Purpose

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

The GEI 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 GEI workplace hazards and communication of pertinent hazard information to GEI employees.

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 GEI job site.

Location of Written Program

A complete original of this written program is located with the GEI Corporate Health and Safety Officer (CHSO) and with each GEI Office/Branch Manager.

Responsibilities

Overall coordination and implementation of GEI's HAZCOM Program is the responsibility of the CHSO. Any questions, comments, or suggestions relating to GEI's HAZCOM Program should be directed to the CHSO. The following subsections delineate the responsibilities of personnel as required for successful implementation of this program.

Corporate Health and Safety Officer

The CHSO 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 GEI HAZCOM Program within 30 days of hire or prior to performing field work (whichever is sooner).
- Maintain at his/her office/branch an inventory of Safety Data Sheets (SDSs) as available for all hazardous materials with which employees have the potential of coming into contact while on the job.
- Determine that SDSs are made readily available for employee review upon request by the employee.
- Determine that GEI's label and warning protocol for hazardous materials is complied with.

Supervisors (Project Managers and/or Field Team Leaders)

Project Managers and/or Field Team Leaders 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 GEI's 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.

Staff

It is the Staff's responsibility to:

- Read GEI's HAZCOM procedure within 30 days of employment by GEI or prior to performing field work for GEI (whichever is sooner).
- Gain familiarization with SDSs of those hazardous materials that they use or may be exposed to.

- Utilize information and measures as learned from the GEI HAZCOM Program, including associated training and professional experiences, to protect themselves from adverse exposure to hazardous materials.

Program Requirements

Safety Data Sheets and Chemical List

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

A list of chemicals potentially used/encountered by GEI personnel at offices/branches involved in hazardous waste operations is provided in Table C-1. Note that Table C-1 is not necessarily complete. SDSs for the listed chemicals provided are described below:

- SDSs for chemicals that are typically used for decontamination and/or sample preservation are compiled and maintained by GEI. Supplies of these chemicals are generally kept in GEI field equipment storerooms.
- SDSs for chemicals and materials that may be encountered on typical GEI job sites are compiled and maintained by GEI. SDSs included in Site-specific HASPs should be reviewed prior to performing field work on those sites.
- SDSs for chemicals used as photoionization detector (PID) soil gas instrument and standards are maintained by GEI. These chemicals are generally kept in small quantities to be used only by soil gas instrument technical personnel.
- A comprehensive additional collection of SDSs as printed by Genium Publishing Corporation and as obtained from manufacturers of products received at GEI are available for use by employees by request to the CHSO. This SDS collection is updated periodically.

Table C-1
Decontamination and/or Preservation Chemicals

Chemicals Potentially Encountered on Typical Job Sites	
Benzene	Pentachlorophenol
Coal Tar Creosote	Perchloroethylene
Coal Tar Pitch	Polychlorinated Biphenyls
Cresol	Styrene
Cyanide	1,1,2,2-Tetrachloroethane
1,1-Dichloroethylene	Tetraethyl Lead
1,2-Dichloroethylene (both isomers)	Toluene
Ethylbenzene	1,1,1-Trichloroethane (methyl chloroform)
Gasoline	Trichloroethylene
Naphtha (Coal Tar)	Xylene
Naphthalene and related PAHs	
**Soil Gas Standard Chemicals (Used by Soil Gas Personnel Only)	

Label and Warnings

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

Training

The GEI Office/Branch Manager is responsible for determining that the HAZCOM Training Program is complied with by GEI personnel employed at his/her office/branch.

GEI'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 GEI HAZCOM Program, and with the SDSs 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 waste
  - Chemicals in the work area.
  - Measures employees can take to protect themselves from these hazards.
  - The details of the GEI HAZCOM Program, including an explanation of SDSs and GEI's 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.

Multi-Employer Work Places

GEI 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 GEI shall be obligated to identify all hazardous materials/conditions to which GEI employees may be exposed. The employer sharing space with GEI will be required by the GEI 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, SDSs 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 SDSs as appropriate.

Biennial Review

This program will be formally reviewed by the GEI CHSO and company management on a biennial basis or more frequently if the CHSO 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 D

Cold Stress Program

Purpose and 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.

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.

Working in Cold Environments

Metabolic Responses

The human body is designed to function best at a rectal temperature of 99 to 100°F. 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.

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.

Hypothermia

Hypothermia is a condition of reduced body temperature. Most cases develop in air temperatures between 30 to 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 D-1 provides information on the onset of hypothermia and metabolic responses at different body temperatures.

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.

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.

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 30°F. 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:

- Skin changes color to white or grayish-yellow, progresses to reddish-violet, and finally turns black as the tissue dies;
- Pain may be felt at first, but subsides;
- Blisters may appear;
- 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 D-2 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.

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.

Frostnip

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

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.

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.

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.

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.

Control Measures

When the wind chill factor results in an equivalent temperature of -26°F, continuous exposure of the skin will not be permitted. Any worker exposed to temperatures of 36°F or less, that become 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.

Engineering Controls

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

- General or spot heating should be used to increase temperature in certain areas in the workplace;
- 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;
- Shield the work area if air velocity at the work site is increased by wind, draft, or ventilating equipment;
- Metal handles of tools and control bars should be covered with thermal insulating material at temperatures below 30°F;
- Unprotected metal chair seats will not be used in cold environments;
- When appropriate and feasible, equipment and processes will be substituted, isolated, relocated, or redesigned;
- Power tools, hoists, cranes, or lifting aids will be used to reduce the metabolic workload;
- Heated warming shelters will be made available for continuous work being performed in an equivalent temperature of 20°F or below. Workers will be encouraged to use the shelters regularly.

Administrative Work Practice Controls

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

- Work-rest schedules to reduce the peak of cold stress;
- Enforce scheduled breaks;
- Enforce intake of warm caffeine-free, non-alcoholic beverages;
- Schedule work that has potential exposure to cold stress for the warmest part of the day;
- Move work to warmer areas, whenever possible;
- Assign extra workers for high-demand tasks;
- Provide relief workers for other workers needing breaks;
- Teach basic principles of recognizing and preventing cold stress;
- Use the buddy system for work at 10°F or below, and keep within eyeshot;
- Allow new employees to adjust to the conditions before they work full-time in cold environments;
- Minimize sitting and standing in one place for long periods of time;
- Include weight and bulkiness of clothing when estimating work performance requirements and weights to be lifted;

Table D-3 provides a work/warm-up schedule for cold environments, with wind chill taken into account.

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 30°F or below.

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:

- Polypropylene under shirt and shorts under thermal underwear (preferably two-piece);
- Wool socks;
- Wool or thermal pants, lapped over boot tops to keep out snow and water;
- Suspenders (belts can constrict and reduce circulation);
- Insulated work boots, preferably waterproof. Safety toe, if necessary;
- Wool or cotton shirt;
- Parka;
- Knit cap/hard hat liner;
- Wool mittens or gloves (depending on the dexterity required);
- 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 D-1
Progressive Clinical Presentation of Hypothermia*

Core Temperature		Clinical Signs
Deg. C	Deg. F	
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 D-2
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
	LITTLE DANGER In < hour 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.				

* 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 D-3
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:

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 -30°F 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/m^2; 2) all non-emergency work should have ceased at or before a wind-chill of 2250 W/m^2. 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 Labor.

Appendix E

Heat Stress Program

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.

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.

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.

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.

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.

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."

Selection of 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.

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.
2. Provide shelter or shaded areas to protect personnel during rest periods.
3. 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.
4. Encourage physical fitness among the workers.
    a. 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.

5. 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.

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

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

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

Appendix F

Personal Protective Equipment Program

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.

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 (HASP) prepared for each project.

OSHA Requirements (29 CFR 1910.120)

A written PPE program, which is part of the employer's safety and health program and also part of the Site-specific HASP, 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 the Contractor maintain a consistent approach in complying with health and safety procedures. The Project Manager (PM) 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 are required when working around high-voltage systems.

The Contractor is responsible for supplying all PPE required for Contractor's projects.

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 (CPC)/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.

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.

Level A

1. Protection provided:

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

2. Should be used when:

a. 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.

3. Recommended equipment:

   a. Pressure-demand, full face piece Self-contained Breathing Apparatus (SCBA) or pressure-demand supplied-air respirator with escape SCBA;
   b. Fully-encapsulating, chemical resistant suit (pressure tested immediately before use);
   c. Inner chemical resistant suit;
   d. Inner chemical resistant gloves;
   e. Chemical resistant safety boots/shoes; and
   f. Two-way radio communications.

4. Optional equipment:

   a. Cooling unit;
   b. Coveralls;
   c. Long cotton underwear;
   d. Hard hat; and
   e. Disposable gloves and boot covers.

5. Limiting criteria:

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

Level B

1. Protection provided:

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

2. Should be used when:

    a. 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 Immediately Dangerous to Life and Health (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;

    b. Atmospheres contain less than 19.5% oxygen; and

    c. 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.

3. Recommended equipment:

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

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

    c. Inner and outer chemical resistant gloves;

    d. Chemical resistant safety boots/shoes;

    e. Hard hat; and

    f. Two-way radio communications.

4. Optional equipment:

    a. Coveralls;
    b. Disposable boot covers;
    c. Face shield; and
    d. Long cotton underwear.

5. Limiting criteria:

a. 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.

b. 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.

Level C

1. Protection provided:

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

2. Should be used when:

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

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

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

3. Recommended equipment:

   a. Full face piece or half face piece air-purifying negative-pressure respirator;
   b. Chemical resistant clothing;
   c. Inner and outer chemical resistant gloves;
   d. Chemical resistant safety boots and shoes;
   e. Disposable boot covers;
   f. Hard hat; and
   g. Two-way radio communications.

4. Optional equipment:

   a. Coveralls;
   b. Face shield;
   c. Escape bottle; and
   d. Long cotton underwear.

5. Limiting criteria:

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

Level D

1. Protection provided:

   a. No respirator protection and minimal skin protection.

2. Should be used when:

   a. The atmosphere contains no known hazard; and
   b. Work functions preclude splashes, immersion, or the potential for unexpected inhalation of or contact with hazardous levels of any chemicals.

3. Recommended equipment:

   a. Coveralls;
   b. Safety boots/shoes;
   c. Safety glasses or chemical splash goggles; and
   d. Hardhat.

4. Optional equipment:

   a. Gloves;
   b. Face shield.

5. Limiting criteria:

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

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 a 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 (CESM) before setting up the job.

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 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:

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

6. Construction safety boots:

a. 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:

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

8. Hearing protection:

a. Provides protection against physiological damage.

9. Canvas work gloves:

a. Provide protection for the hands against abrasions and slivers.

Selection of Chemical Protective Clothing

1. 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.

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.

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.

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 HASP for the site.

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.

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; and
    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; and
e. Cracks.

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.

1. 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.

Evaluation of PPE Program

Contractor's PPE 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.

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

    a. Accident and illness experience on various job sites.
    b. Type and degree of exposure.
    c. Adequacy of equipment selection process.
    d. Degree of fulfillment of program objectives.
    e. Employee acceptance.
    f. Coordination with overall health and safety program elements.

g. Recommendations for program improvements and modifications.

h. Adequacy of program records.

Appendix G

Lock Out/Tag Out Program

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, the 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 lock out or tag out, 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.

- **Lock Out:** 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.
- **Tag Out:** 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.

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.

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.

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; and
    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 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 lock out/tag out 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 Lock Out/Tag Out 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 Lock Out/Tag Out 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 lock out/tag out 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

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

Lock Out/Tag Out Absent Employee Form

Notice

Upon completion of work performed under lock out/tag out 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 H

Confined Space/Hot Work Permitting Procedure

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.

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.

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.

Procedure

1. Hazard Identification

    a. The Project Manager (PM) 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 PM, Site Safety Officer (SSO) and Corporate Environmental Safety Manager (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 (HASP) to be reviewed with the CESM prior to starting the project.

    d. The PM 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 PM if the there are questions on hazard determination. The SSO will act as the entry supervisor.

    f. The CESM will review entry with the PM 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 1 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 ½-hour after hot work procedures have ended.
      - All safety equipment will be on site and functional.

   b. 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 PM 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 PM 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.

c. 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.

d. 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.

e. 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.

f. The PM will meet with the client to arrange for adequate rescue services from the client, if available, or from outside rescue operations. The PM 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.

g. The PM 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

   a. The Confined Space Work Permit (see Attachment A) will be completed by the PM 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. 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 a time.

6. Entrant

   a. 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 and sampling devices, and exiting the confined space safely.

7. Entry Procedures:

   a. 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.

   b. Where air-moving equipment is used to ventilate space, chemicals shall be removed from the vicinity to prevent introduction into the confined space.

c. 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.

d. Blank, double block, and bleed or otherwise isolate, lock out, and tag out all chemical, physical, and/or electrical hazards wherever possible. Reduce all forms of energy to zero state energy.

e. One person (standby) must remain at the entryway at all times and must keep continuous contact with 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 with adequate respiratory protection and dermal protection.

f. 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 a permanent ladder 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, 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.

g. Vehicles should not be left running near confined space work or near air-moving equipment being used for confined space ventilation.

h. 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 to prevent contact with light bulb.

i. 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 PM 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. Lower Explosive Limit (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 5% 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 [USTs]) 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 HASP for Flammable and Combustible UST 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 Confined Space Entry Permit (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 1 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 3 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

a. All workers involved with confined space entry will receive training relative to their role on the project. Since a 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

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 #	1	2	3	4	5	6	7	8	9	10
				Date:										
				Time:										
Oxygen			19.5-23.5%											
LEL			<10%											
CO			<25 ppm											
H2S			<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 I

Accident and Incident Reporting

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 the 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.

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

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 PM 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 (HASP). The phone numbers will be posted by SSO or the 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 are presented below:

1. Minor First Aid Treatment

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

        - Inform your supervisor.
        - Administer first aid treatment to the injury or wound.
        - If a first aid kit is used, indicate usage on the accident investigation report.
        - Access to a first aid kit is not intended to be a substitute for medical attention.
        - Provide details for the completion of the accident investigation report.

2. Non-Emergency Medical Treatment

    a. 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:

        - Inform your supervisor.
        - Proceed to the posted medical facility. Your supervisor will assist with transportation, if necessary.
        - Provide details for the completion of the accident investigation report.

3. Emergency Medical Treatment

    a. If you sustain a severe injury requiring emergency treatment:

        - Call for help and seek assistance from a co-worker.
        - 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.
        - Provide details for the completion of the accident investigation report.
        - The PM 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

    a. 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.

b. 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

    a. If the victim appears to have injured his/her neck or spine, or is unable to move his/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.
    c. Make the victim lie down in a cooler place with the feet raised.

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 3 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.

Safety Responsibilities

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

1. The responsibility for reporting all injuries and illnesses to your supervisor, no matter how small.
2. The responsibility for always following the safety rules for every task performed.
3. The responsibility for reporting any hazards seen.
4. The responsibility for helping co-workers recognize unsafe actions or conditions.
5. The responsibility for 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 before 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 each
Antiseptic wipes	1 box
Ammonia inhalants	1 box
Flexible gauze	1 roll
First aid guide	1 each
Latex gloves	2 pair

Appendix J

Safety Data Sheets

Appendix B

Safety Data Sheets

Safety Data Sheet
according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), and GHS

Printing date: 31.12.2013 **Revision:** 31.12.2013

1 Identification of the substance/mixture and of the company/undertaking

· **1.1 Product identifier**

· **Trade name: ALCONOX**

· **1.2 Relevant identified uses of the substance or mixture and uses advised against**
No further relevant information available.

· **Application of the substance / the mixture:** Cleaning material/ Detergent

· **1.3 Details of the supplier of the Safety Data Sheet**

· **Manufacturer/Supplier:**
Alconox, Inc.
30 Glenn St., Suite 309
White Plains, NY 10603
Phone: 914-948-4040

· **Further information obtainable from:** Product Safety Department

· **1.4 Emergency telephone number:**
ChemTel Inc.
(800)255-3924, +1 (813)248-0585

2 Hazards identification

· **2.1 Classification of the substance or mixture**

· **Classification according to Regulation (EC) No 1272/2008**

GHS05 corrosion

Eye Dam. 1; H318: Causes serious eye damage.

GHS07

Skin Irrit. 2; H315: Causes skin irritation.

· **Classification according to Directive 67/548/EEC or Directive 1999/45/EC**

Xi; Irritant

R38-41: Irritating to skin. Risk of serious damage to eyes.

· **Information concerning particular hazards for human and environment:**
The product has to be labelled due to the calculation procedure of the "General Classification guideline for preparations of the EU" in the latest valid version.

· **Classification system:**
The classification is according to the latest editions of the EU-lists, and extended by company and literature data.
The classification is in accordance with the latest editions of international substances lists, and is supplemented by information from technical literature and by information provided by the company.

· **2.2 Label elements**

· **Labelling according to Regulation (EC) No 1272/2008**
The product is classified and labelled according to the CLP regulation.

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Safety Data Sheet
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· **Hazard pictograms**

GHS05

· **Signal word:** Danger

· **Hazard-determining components of labelling:**
sodium dodecylbenzene sulfonate

· **Hazard statements**
H315: Causes skin irritation.
H318: Causes serious eye damage.

· **Precautionary statements**
P280 Wear protective gloves/protective clothing/eye protection/face protection.
P264: Wash thoroughly after handling.
P305+P351+P338: IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P310: Immediately call a POISON CENTER or doctor/physician.
P321: Specific treatment (see on this label).
P362: Take off contaminated clothing and wash before reuse.
P332+P313: If skin irritation occurs: Get medical advice/attention.
P302+P352: IF ON SKIN: Wash with plenty of soap and water.

· **Hazard description:**

· **WHMIS-symbols:**
D2B - Toxic material causing other toxic effects

· **NFPA ratings (scale 0 - 4)**

Health = 1
Fire = 0
Reactivity = 0

· **HMIS-ratings (scale 0 - 4)**

Health = 1
Fire = 0
Reactivity = 0

· **HMIS Long Term Health Hazard Substances**
None of the ingredients is listed.

· **2.3 Other hazards**

· **Results of PBT and vPvB assessment**

· **PBT:** Not applicable.

· **vPvB:** Not applicable.

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3 Composition/information on ingredients

· **3.2 Mixtures**
· **Description:** Mixture of substances listed below with nonhazardous additions.

· **Dangerous components:**

CAS: 68081-81-2	sodium dodecylbenzene sulfonate Xn R22; Xi R36 Acute Tox. 4, H302; Eye Irrit. 2, H319	10-25%
CAS: 497-19-8 EINECS: 207-838-8 Index number: 011-005-00-2	Sodium Carbonate Xi R36 Eye Irrit. 2, H319	2,5-10%
CAS: 7722-88-5 EINECS: 231-767-1	tetrasodium pyrophosphate substance with a Community workplace exposure limit	2,5-10%
CAS: 151-21-3 EINECS: 205-788-1	sodium dodecyl sulphate Xn R21/22; Xi R36/38 Acute Tox. 4, H302; Acute Tox. 4, H312; Skin Irrit. 2, H315; Eye Irrit. 2, H319	2,5-10%

· **Additional information:** For the wording of the listed risk phrases refer to section 16.

4 First aid measures

· **4.1 Description of first aid measures**
· **After inhalation:** Supply fresh air; consult doctor in case of complaints.
· **After skin contact:**
Immediately wash with water and soap and rinse thoroughly.
If skin irritation continues, consult a doctor.
· **After eye contact:**
Remove contact lenses if worn.
Rinse opened eye for several minutes under running water. If symptoms persist, consult a doctor.
· **After swallowing:**
Rinse out mouth and then drink plenty of water.
Do not induce vomiting; call for medical help immediately.
· **4.2 Most important symptoms and effects, both acute and delayed**
No further relevant information available.
· **4.3 Indication of any immediate medical attention and special treatment needed**
No further relevant information available.

5 Firefighting measures

· **5.1 Extinguishing media**
· **Suitable extinguishing agents:**
CO2, powder or water spray. Fight larger fires with water spray or alcohol resistant foam.

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· **5.2 Special hazards arising from the substance or mixture:** No further relevant information available.
· **5.3 Advice for firefighters**
· **Protective equipment:**
Wear self-contained respiratory protective device.
Wear fully protective suit.
· **Additional information:** No further relevant information available.

6 Accidental release measures

· **6.1 Personal precautions, protective equipment and emergency procedures**
Product forms slippery surface when combined with water.
· **6.2 Environmental precautions:** Do not allow to enter sewers/ surface or ground water.
· **6.3 Methods and material for containment and cleaning up:**
Pick up mechanically.
Clean the affected area carefully; suitable cleaners are:
Warm water
· **6.4 Reference to other sections**
See Section 7 for information on safe handling.
See Section 8 for information on personal protection equipment.
See Section 13 for disposal information.

7 Handling and storage

· **7.1 Precautions for safe handling**
Prevent formation of dust.
Keep receptacles tightly sealed.
· **Information about fire - and explosion protection:** No special measures required.

· **7.2 Conditions for safe storage, including any incompatibilities**
· **Storage:**
· **Requirements to be met by storerooms and receptacles:** No special requirements.
· **Information about storage in one common storage facility:** Not required.
· **Further information about storage conditions:** Protect from humidity and water.
· **7.3 Specific end use(s):** No further relevant information available.

8 Exposure controls/personal protection

· **Additional information about design of technical facilities:** No further data; see item 7.

· **8.1 Control parameters**

· **Ingredients with limit values that require monitoring at the workplace:**	
7722-88-5 tetrasodium pyrophosphate	
REL (USA)	5 mg/m³
TLV (USA)	TLV withdrawn
EV (Canada)	5 mg/m³

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· **Additional information:** The lists valid during the making were used as basis.

· **8.2 Exposure controls**
· **Personal protective equipment:**
· **General protective and hygienic measures:**
Keep away from foodstuffs, beverages and feed.
Immediately remove all soiled and contaminated clothing.
Wash hands before breaks and at the end of work.
Avoid contact with the skin.
Avoid contact with the eyes and skin.
· **Respiratory protection:**
Not required under normal conditions of use.
In case of brief exposure or low pollution use respiratory filter device. In case of intensive or longer exposure use self-contained respiratory protective device.
· **Protection of hands:**

Protective gloves

The glove material has to be impermeable and resistant to the product/ the substance/ the preparation.
Due to missing tests no recommendation to the glove material can be given for the product/ the preparation/ the chemical mixture.
Selection of the glove material on consideration of the penetration times, rates of diffusion and the degradation.
· **Material of gloves**
Butyl rubber, BR
Nitrile rubber, NBR
Natural rubber, NR
Neoprene gloves
The selection of the suitable gloves does not only depend on the material, but also on further marks of quality and varies from manufacturer to manufacturer. As the product is a preparation of several substances, the resistance of the glove material cannot be calculated in advance and has therefore to be checked prior to the application.
· **Penetration time of glove material**
The exact break through time has to be found out by the manufacturer of the protective gloves and has to be observed.
· **Eye protection:**

Safety glasses

· **Body protection:** Protective work clothing

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9 Physical and chemical properties

· **9.1 Information on basic physical and chemical properties**	
· **General Information**	
· **Appearance:**	
Form:	Powder
Colour:	White
· **Odour:**	Odourless
· **Odour threshold:**	Not determined.
· **pH-value (10 g/l) at 20 °C:**	9,5 (- NA for Powder form)
· **Change in condition**	
Melting point/Melting range:	Not Determined.
Boiling point/Boiling range:	Undetermined.
· **Flash point:**	Not applicable.
· **Flammability (solid, gaseous):**	Not determined.
· **Ignition temperature:**	
Decomposition temperature:	Not determined.
· **Self-igniting:**	Product is not self-igniting.
· **Danger of explosion:**	Product does not present an explosion hazard.
· **Explosion limits:**	
Lower:	Not determined.
Upper:	Not determined.
· **Vapour pressure:**	Not applicable.
· **Density at 20 °C:**	1,1 g/cm³
· **Relative density**	Not determined.
· **Vapour density**	Not applicable.
· **Evaporation rate**	Not applicable.
· **Solubility in / Miscibility with water:**	Soluble.
· **Partition coefficient (n-octanol/water):**	Not determined.
· **Viscosity:**	
Dynamic:	Not applicable.
Kinematic:	Not applicable.
· **Solvent content:**	
Organic solvents:	0,0 %
Solids content:	100 %
· **9.2 Other information**	No further relevant information available.

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10 Stability and reactivity

· **10.1 Reactivity**
· **10.2 Chemical stability**
· **Thermal decomposition / conditions to be avoided:**
No decomposition if used according to specifications.
· **10.3 Possibility of hazardous reactions**
Reacts with acids.
Reacts with strong alkali.
Reacts with strong oxidizing agents.
· **10.4 Conditions to avoid:** No further relevant information available.
· **10.5 Incompatible materials:** No further relevant information available.
· **10.6 Hazardous decomposition products:**
Carbon monoxide and carbon dioxide
Phosphorus compounds
Sulphur oxides (SOx)

11 Toxicological information

· **11.1 Information on toxicological effects**
· **Acute toxicity:**
· **Primary irritant effect:**
· **On the skin:** Irritant to skin and mucous membranes.
· **On the eye:** Strong irritant with the danger of severe eye injury.
· **Sensitization:** No sensitizing effects known.
· **Additional toxicological information:**
The product shows the following dangers according to the calculation method of the General EU Classification Guidelines for Preparations as issued in the latest version:
Irritant
Swallowing will lead to a strong caustic effect on mouth and throat and to the danger of perforation of esophagus and stomach.

12 Ecological information

· **12.1 Toxicity**
· **Aquatic toxicity:** No further relevant information available.
· **12.2 Persistence and degradability:** No further relevant information available.
· **12.3 Bioaccumulative potential:** Not worth-mentioning accumulating in organisms
· **12.4 Mobility in soil:** No further relevant information available.
· **Additional ecological information:**
· **General notes:**
Water hazard class 2 (German Regulation) (Self-assessment): hazardous for water.
Do not allow product to reach ground water, water course or sewage system.
Danger to drinking water if even small quantities leak into the ground.
· **12.5 Results of PBT and vPvB assessment**
· **PBT:** Not applicable.

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· **vPvB:** Not applicable.
· **12.6 Other adverse effects:** No further relevant information available.

13 Disposal considerations

· **13.1 Waste treatment methods**
· **Recommendation**
Smaller quantities can be disposed of with household waste.
Small amounts may be diluted with plenty of water and washed away. Dispose of bigger amounts in accordance with Local Authority requirements.
The surfactant used in this product complies with the biodegradability criteria as laid down in Regulation (EC) No. 648/2004 on detergents. Data to support this assertion are held at the disposal of the competent authorities of the Member States and will be made available to them, at their direct request or at the request of a detergent manufacturer.

· **Uncleaned packaging:**
· **Recommendation:** Disposal must be made according to official regulations.
· **Recommended cleansing agents:** Water, if necessary together with cleansing agents.

14 Transport information

· **14.1 UN-Number** · **DOT, ADR, IMDG, IATA, ICAO**	Not Regulated
· **14.2 UN proper shipping name** · **DOT, ADR, IMDG, IATA, ICAO**	Not Regulated
· **14.3 Transport hazard class(es)** · **DOT, ADR, IMDG, IATA, ICAO** · **Class**	Not Regulated
· **14.4 Packing group** · **DOT, ADR, IMDG, IATA, ICAO**	Not Regulated
· **14.5 Environmental hazards:** · **Marine pollutant:**	No
· **14.6 Special precautions for user**	Not applicable.
· **14.7 Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code**	Not applicable.
· **UN "Model Regulation":**	Not Regulated

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15 Regulatory information

· **15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture**
· **United States (USA)**
· **SARA**

· **Section 355 (extremely hazardous substances):**
None of the ingredients is listed.
· **Section 313 (Specific toxic chemical listings):**
None of the ingredients is listed.
· **TSCA (Toxic Substances Control Act):**
All ingredients are listed.

· **Proposition 65 (California):**

· **Chemicals known to cause cancer:**
None of the ingredients is listed.
· **Chemicals known to cause reproductive toxicity for females:**
None of the ingredients is listed.
· **Chemicals known to cause reproductive toxicity for males:**
None of the ingredients is listed.
· **Chemicals known to cause developmental toxicity:**
None of the ingredients is listed.

· **Carcinogenic Categories**

· **EPA (Environmental Protection Agency)**
None of the ingredients is listed.
· **IARC (International Agency for Research on Cancer)**
None of the ingredients is listed.
· **TLV (Threshold Limit Value established by ACGIH)**
None of the ingredients is listed.
· **NIOSH-Ca (National Institute for Occupational Safety and Health)**
None of the ingredients is listed.
· **OSHA-Ca (Occupational Safety & Health Administration)**
None of the ingredients is listed.

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· **Canada**

· **Canadian Domestic Substances List (DSL)**	
All ingredients are listed.	
· **Canadian Ingredient Disclosure list (limit 0.1%)**	
None of the ingredients is listed.	
· **Canadian Ingredient Disclosure list (limit 1%)**	
497-19-8	Sodium Carbonate
7722-88-5	tetrasodium pyrophosphate
151-21-3	sodium dodecyl sulphate

· **15.2 Chemical safety assessment:** A Chemical Safety Assessment has not been carried out.

16 Other information

This information is based on our present knowledge. However, this shall not constitute a guarantee for any specific product features and shall not establish a legally valid contractual relationship.

· **Relevant phrases**
H302: Harmful if swallowed.
H312: Harmful in contact with skin.
H315: Causes skin irritation.
H319: Causes serious eye irritation.

R21/22: Harmful in contact with skin and if swallowed.
R22: Harmful if swallowed.
R36: Irritating to eyes.
R36/38: Irritating to eyes and skin.

· **Abbreviations and acronyms:**
ADR: Accord européen sur le transport des marchandises dangereuses par Route (European Agreement concerning the International Carriage of Dangerous Goods by Road) IMDG: International Maritime Code for Dangerous Goods DOT: US Department of Transportation
IATA: International Air Transport Association
GHS: Globally Harmonized System of Classification and Labelling of Chemicals
ACGIH: American Conference of Governmental Industrial Hygienists
NFPA: National Fire Protection Association (USA)
HMIS: Hazardous Materials Identification System (USA)
WHMIS: Workplace Hazardous Materials Information System (Canada)

Safety Data Sheet: **Simple Green® All-Purpose Cleaner** ★

Version No. 13000-14A Issue Date: January 7, 2014 Supersedes Date: June 4, 2013 *OSHA HCS-2012 / GHS*

Section 1: IDENTIFICATION

Product Name: Simple Green® All-Purpose Cleaner
Additional Names: Simple Green® Industrial Cleaner & Degreaser

Manufacturer's Part Number: **Please refer to Section 16*

Recommended Use: Cleaner/Degreaser that can be used full strength or diluted on any rinseable surface.

Company: Sunshine Makers, Inc.
15922 Pacific Coast Highway
Huntington Beach, CA 92649 USA
Telephone: 800-228-0709 ● 562-795-6000 *Monday – Friday, 8am – 5pm PST* Fax: 562-592-3830
Emergency Phone: Chem-Tel 24-Hour Emergency Service: 800-255-3924

Section 2: HAZARDS IDENTIFICATION

GHS Hazards classification: Not classifiable as hazardous.
Signal Word: Not applicable
Pictograms: Not applicable
Hazard Statements: Not applicable.
Precautionary Statements: Not applicable.

Section 3: COMPOSITION/INFORMATION ON INGREDIENTS

Ingredient	CAS Number	Percent Range
Water	7732-18-5	≥ 84%
Ethoxylated Alcohol	68439-46-3	≤ 5%
Sodium Citrate	68-04-2	≤ 5%
Tetrasodium *N,N*-bis(carboxymethyl)-L-glutamate	51981-21-6	≤ 1%
Sodium Carbonate	497-19-8	≤ 1%
Citric Acid	77-92-9	≤ 1%
Isothiazolinone mixture	55965-84-9	≤ 1%
Fragrance	Proprietary Mixture	≤ 1%
Colorant	Proprietary Mixture	≤ 1%

Section 4: FIRST-AID MEASURES

If Inhaled: Not expected to cause respiratory inhalation. If adverse effect occurs, move to fresh air.
If on skin: Not expected to cause skin irritation. If adverse effect occurs, rinse skin with water.
If in eyes: Not expected to cause eye irritation. If adverse effect occurs, flush eyes with water.
If ingested: May cause upset stomach. Drink plenty of water to dilute. See section 11.

Section 5: FIRE-FIGHTING MEASURES

Suitable Extinguishing Media: Use Dry chemical, CO2, water spray or "alcohol" foam. Avoid high volume jet water.
Specific hazards arising from chemical: In event of fire, fire created carbon oxides may be formed.
Special Protective actions for fire-fighters: Wear positive pressure self-contained breathing apparatus; Wear full protective clothing.

See section 16 for NFPA rating.

Section 6: ACCIDENTAL RELEASE MEASURES

Personal Precautions: *For non-emergency and emergency personnel:* See section 8 – personal protection. Protective gloves and safety goggles not necessary, but suggested.

Environmental Precautions: Do not allow into open waterways and ground water systems.

Methods and materials for containment and clean up: Dike or soak up with inert absorbent material. See section 13 for disposal considerations.

Section 7: HANDLING AND STORAGE

Precautions for safe handling: Ensure adequate ventilation. Keep out of reach of children. Keep away from heat, sparks, open flame and direct sunlight. Do not pierce any part of the container. Do not mix or contaminate with any other chemical. Do not eat, drink or smoke while using this product.

Storage: Keep container tightly closed. Keep in cool dry area. Avoid prolonged exposure to sunlight. Do not store at temperatures above 109°F (42.7°C). If separation occurs, mix the product for reconstitution.

Section 8: EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure Limit Values: No components listed with TWA or STEL values under OSHA or ACGIH.
Appropriate Engineering Controls: Not applicable.

Individual Protection Measures / Personal Protective Equipment (PPE)
Eye Contact: Use protective glasses or safety googles if splashing or spray-back is likely.
Respiratory: Use in well ventilated areas or local exhaust ventilations when cleaning small spaces.
Skin Contact: Use protective gloves (any material) when used for prolong periods or dermally sensitive.
General Hygiene Considerations: Wash thoroughly after handling and before eating or drinking.

Section 9: PHYSICAL AND CHEMICAL PROPERTIES

Appearance: Green Liquid

Odor: Added sassafras (sweet herbal) odor
Odor Threshold: Not determined

Boiling Point ASTM D-1120:	101°C (213.8°F)	**Flash Point** ASTM D-93:	> 212°F
Freezing Point ASTM D-1177:	0 - 3.33°C (32 - 38°F)	**Flammability:**	Non-flammable
Specific Gravity ASTM D-891:	1.01 – 1.03	**Autoignition Temperature:**	Not applicable
Evaporation Rate ASTM D-1901:	½ Butyl Acetate @ 25°C	**Decomposition Temperature:**	Not determined
Vapor Pressure ASTM D-323:	0.60 PSI @77°F, 2.05 PSI @100°F	**Density** ASTM D-4017:	8.552 lb/gal
Vapor Density:	Not determined	**Water Solubility:**	100%
pH ASTM D-1293:	9.0 ± 0.5	**Partial Coefficient:**	Not available

VOCs:

SCAQMD 304-91 / EPA 24:	0 g/L	0 lb/gal	0 %
CARB Method 310**:	2.5 g/L	0.021 lb/gal	0.25%
SCAQMD Method 313:	Not tested		

***Water & fragrance exemption in calculation*

VOC composite Partial Pressure: Not determined
Nutrient Content: Phosphorous: 0.0%

Section 10: STABILITY AND REACTIVITY

Reactivity: Non-reactive.
Chemical stability: Stable under normal conditions 70°F (21°C) and 14.7 psig (760 mmHg).

Section 10: STABILITY AND REACTIVITY - continued

Possibility of hazardous reactions: None known.
Conditions to Avoid: Excessive heat or cold.
Incompatible Materials: Do not mix with oxidizers, acids, bathroom cleaners, or disinfecting agents.
Hazardous Decomposition Products: Normal products of combustion - CO, CO2.

Section 11: TOXICOLOGICAL INFORMATION

Acute Toxicity: Oral LD_{50} (rat) > 5 g/kg body weight
Dermal LD_{50} (rabbit) > 5 g/kg body weight
Calculated via OSHA HCS 2012 / Globally Harmonized System of Classification and Labelling of Chemicals

Skin corrosion/irritation: Non-irritant per Dermal Irritection® assay modeling. *No animal testing performed.*
Eye damage/irritation: Minimal irritant per Ocular Irritection® assay modeling. *No animal testing performed.*
Germ Cell Mutagenicity: No ingredients trigger or classify under this category.
Carcinogenicity: No ingredients trigger or classify under this category.
Reproductive toxicity: No ingredients trigger or classify under this category.
STOT-Single Exposure: No ingredients trigger or classify under this category.
STOT-repeated exposure: No ingredients trigger or classify under this category.
Aspiration hazard: No ingredients trigger or classify under this category.

Likely routes of exposure:
Inhalation - Overexposure may cause headache.
Skin contact - Not expected to cause irritation.
Eye contact - May cause minimal eye irritation.
Ingestion - May cause upset stomach.

Symptoms related to the physical, chemical and toxicological characteristics: no symptoms expected under typical use conditions.
Delayed and immediate effects and or chronic effects from short term exposure: no symptoms expected under typical use conditions.
Delayed and immediate effects and or chronic effects from long term exposure: headache, dry skin, or skin irritation may occur.
Interactive effects: Not known.

Section 12: ECOLOGICAL INFORMATION

Toxicity: Aquatic Toxicity - Low, based on OECD 201, 202, 203 + Microtox: EC_{50} & IC_{50} ≥100 mg/L. Volume of ingredients used does not trigger toxicity classifications under the Globally Harmonized System of Classification and Labelling of Chemicals.

Persistence and degradability: Readily Biodegradable per OECD 301D, Closed Bottle Test.
Mobility: No data available.
Bioaccumulation: Not applicable.

Section 13: DISPOSAL CONSIDERATIONS

Unused or Used liquid: May be considered hazardous in your area depending on usage and tonnage of disposal – check with local, regional, and or national regulations for appropriate methods of disposal.

Empty Containers: May be offered for recycling.

Never dispose of used degreasing rinsates into lakes, streams, and open bodies of water or storm drains.

Section 14: TRANSPORT INFORMATION

U.S. (DOT) / Canadian TDG: Not Regulated for shipping.
IMO / IDMG: Not classified as Hazardous
ICAO/ IATA: Not classified as Hazardous
ADR/RID: Not classified as Hazardous

U.N. Number: Not applicable
Hazard Class: Non-Hazardous
Marine Pollutant: No
Proper Shipping Name: Cleaning Compound, Liquid NOI
NMFC#48580-3
Class 55

Section 15: REGULATORY INFORMATION

All components are listed on: TSCA and DSL Inventory.

SARA Title III: Sections 311/312 – Not applicable.
Sections 313 – Not applicable.
Sections 302 – Not applicable.

State Right To Know Lists No ingredients listed.
CA Prop 65: None listed.
Texas ESL:

Ethoxylated Alcohol	68439-46-3	60 µg/m3 long term	600 µg/m3 short term
Sodium Citrate	68-04-2	5 µg/m3 long term	50 µg/m3 short term
Sodium Carbonate	497-19-8	5 µg/m3 long term	50 µg/m3 short term
Citric Acid	77-92-9	10 µg/m3 long term	100 µg/m3 short term

WHMIS Classification – Non Hazardous, not classifiable.

Name	Toxic Substances List – Schedule 1 – CEPA	NPRI Inventory
NA	No	No

This product has been classified according to the hazard criteria of the CPR and the MSDS contains all the information required by Canada's Controlled Products Regulation.

Section 16: OTHER INFORMATION

PART NUMBER:	SIZE:
2710001213022	22 oz. Trigger Spray 12/case
2710001213012	24 oz. Trigger Spray 12/case
2710001213033	32 oz. Trigger Spray 12/case
2710200613005	1-gallon Bottle 6/case
2740116800128	1-gallon Bottle
2710000213225	2.5-gallon Bottle 2/case
2700000113006	5-gallon Pail each
2700000113008	55-gallon Drum each
2700000113275	275-gallon Tote each
2710001213013	24 oz. Trigger Spray 12/case

BATCH CODING:
Containers of this formula will be batch coded as follows:
Example: *AT3001002, GG3001002* where...
AT & *GG* are codes for production facilities,
"*3*" is the last digit of the year product was produced,
"*001*" is the Julian date product was produced, and
"*002*" is the batch number for that product in that year.

USA part numbers listed only. Not all part numbers listed. USA part numbers may not be valid for international sale.

NFPA:
Health – non irritating
Flammability – non-flammable
Stability – Stable
Special - None

Prepared / Revised By: Sunshine Makers, Inc., Regulatory Department.
This SDS has been revised in the following sections: OSHA HCS 2012 / GHS format update.

Material Safety Data Sheet

Isobutylene

Section 1. Chemical product and company identification

Product name	:	Isobutylene
Supplier	:	AIRGAS INC., on behalf of its subsidiaries 259 North Radnor-Chester Road Suite 100 Radnor, PA 19087-5283 1-610-687-5253
Product use	:	Synthetic/Analytical chemistry.
Synonym	:	Propene, 2-methyl-; γ-Butylene; Isobutene; Isobutylene; Isopropylidenemethylene; 1,1-Dimethylethylene; 2-Methyl-1-propene; 2-Methylpropene; iso-C4H8; Methylpropene; 2-Methylpropene-isobutylene; UN 1055; UN 1075
MSDS #	:	001031
Date of Preparation/ Revision	:	**11/22/2013.**
In case of emergency	:	1-866-734-3438

Section 2. Hazards identification

Physical state	:	Gas. [COLORLESS LIQUEFIED COMPRESSED GAS WITH A SWEET GASOLINELIKE ODOR]
Emergency overview	:	WARNING! FLAMMABLE GAS. MAY CAUSE FLASH FIRE. CONTENTS UNDER PRESSURE. Keep away from heat, sparks and flame. Do not puncture or incinerate container. Use only with adequate ventilation. Keep container closed. Contact with rapidly expanding gases can cause frostbite.
Routes of entry	:	Inhalation
Potential acute health effects		
Eyes	:	Contact with rapidly expanding gas may cause burns or frostbite.
Skin	:	Contact with rapidly expanding gas may cause burns or frostbite.
Inhalation	:	Acts as a simple asphyxiant.
Ingestion	:	Ingestion is not a normal route of exposure for gases
Medical conditions aggravated by over-exposure	:	Acute or chronic respiratory conditions may be aggravated by overexposure to this gas.

See toxicological information (Section 11)

Section 3. Composition, Information on Ingredients

Name	CAS number	% Volume	Exposure limits
Isobutylene	115-11-7	100	**ACGIH TLV (United States, 3/2012).** TWA: 250 ppm 8 hours.

Section 4. First aid measures

No action shall be taken involving any personal risk or without suitable training.If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus.It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.

Eye contact : Check for and remove any contact lenses. Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical attention immediately.

Isobutylene	
Skin contact	: In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. To avoid the risk of static discharges and gas ignition, soak contaminated clothing thoroughly with water before removing it. Wash clothing before reuse. Clean shoes thoroughly before reuse. Get medical attention immediately.
Frostbite	: Try to warm up the frozen tissues and seek medical attention.
Inhalation	: Move exposed person to fresh air. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.
Ingestion	: As this product is a gas, refer to the inhalation section.

Section 5. Fire-fighting measures

Flammability of the product	: Flammable.
Auto-ignition temperature	: 465°C (869°F)
Flammable limits	: Lower: 1.8% Upper: 9.6%
Products of combustion	: Decomposition products may include the following materials: carbon dioxide carbon monoxide
Fire hazards in the presence of various substances	: Extremely flammable in the presence of the following materials or conditions: open flames, sparks and static discharge and oxidizing materials.
Fire-fighting media and instructions	: In case of fire, use water spray (fog), foam or dry chemical. In case of fire, allow gas to burn if flow cannot be shut off immediately. Apply water from a safe distance to cool container and protect surrounding area. If involved in fire, shut off flow immediately if it can be done without risk. Contains gas under pressure. Flammable gas. In a fire or if heated, a pressure increase will occur and the container may burst, with the risk of a subsequent explosion.
Special protective equipment for fire-fighters	: Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Section 6. Accidental release measures

Personal precautions	: Immediately contact emergency personnel. Keep unnecessary personnel away. Use suitable protective equipment (section 8). Shut off gas supply if this can be done safely. Isolate area until gas has dispersed.
Environmental precautions	: Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.
Methods for cleaning up	: Immediately contact emergency personnel. Stop leak if without risk. Use spark-proof tools and explosion-proof equipment. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.

Section 7. Handling and storage

Handling	: Use only with adequate ventilation. Use explosion-proof electrical (ventilating, lighting and material handling) equipment. High pressure gas. Do not puncture or incinerate container. Use equipment rated for cylinder pressure. Close valve after each use and when empty. Keep container closed. Keep away from heat, sparks and flame. To avoid fire, eliminate ignition sources. Protect cylinders from physical damage; do not drag, roll, slide, or drop. Use a suitable hand truck for cylinder movement.
Storage	: Keep container in a cool, well-ventilated area. Keep container tightly closed and sealed until ready for use. Avoid all possible sources of ignition (spark or flame). Segregate from oxidizing materials. Cylinders should be stored upright, with valve protection cap in place, and firmly secured to prevent falling or being knocked over. Cylinder temperatures should not exceed 52 °C (125 °F).

Section 8. Exposure controls/personal protection

Engineering controls : Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. The engineering controls also need to keep gas, vapor or dust concentrations below any lower explosive limits. Use explosion-proof ventilation equipment.

Personal protection

Eyes : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists or dusts.

Skin : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Respiratory : Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

The applicable standards are (US) 29 CFR 1910.134 and (Canada) Z94.4-93

Hands : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary.

Personal protection in case of a large spill : Self-contained breathing apparatus (SCBA) should be used to avoid inhalation of the product.

Product name

2-methylpropene — **ACGIH TLV (United States, 3/2012).** TWA: 250 ppm 8 hours.

Consult local authorities for acceptable exposure limits.

Section 9. Physical and chemical properties

Molecular weight : 56.12 g/mole

Molecular formula : C4-H8

Boiling/condensation point : -6.9°C (19.6°F)

Melting/freezing point : -140°C (-220°F)

Critical temperature : 144.8°C (292.6°F)

Vapor pressure : 24.3 (psig)

Vapor density : 1.9 (Air = 1)

Specific Volume (ft^3/lb) : 6.6845

Gas Density (lb/ft^3) : 0.1496

Section 10. Stability and reactivity

Stability and reactivity : The product is stable.

Incompatibility with various substances : Extremely reactive or incompatible with the following materials: oxidizing materials.

Hazardous decomposition products : Under normal conditions of storage and use, hazardous decomposition products should not be produced.

Hazardous polymerization : Under normal conditions of storage and use, hazardous polymerization will not occur.

Section 11. Toxicological information

Toxicity data

Product/ingredient name	Result	Species	Dose	Exposure
2-methylpropene	LC50 Inhalation Vapor	Rat	550000 mg/m³	4 hours

Chronic effects on humans : **CARCINOGENIC EFFECTS**: A4 (Not classifiable for humans or animals.) by ACGIH.

Other toxic effects on humans : No specific information is available in our database regarding the other toxic effects of this material to humans.

Specific effects

Carcinogenic effects : No known significant effects or critical hazards.

Mutagenic effects : No known significant effects or critical hazards.

Reproduction toxicity : No known significant effects or critical hazards.

Section 12. Ecological information

Aquatic ecotoxicity

Not available.

Products of degradation : Products of degradation: carbon oxides (CO, CO_2) and water.

Environmental fate : Not available.

Environmental hazards : No known significant effects or critical hazards.

Toxicity to the environment : Not available.

Section 13. Disposal considerations

Product removed from the cylinder must be disposed of in accordance with appropriate Federal, State, local regulation.Return cylinders with residual product to Airgas, Inc.Do not dispose of locally.

Section 14. Transport information

Regulatory information	UN number	Proper shipping name	Class	Packing group	Label	Additional information
DOT Classification	UN1055	ISOBUTYLENE	2.1	Not applicable (gas).		**Limited quantity** Yes. **Packaging instruction** **Passenger aircraft** Quantity limitation: Forbidden. **Cargo aircraft** Quantity limitation: 150 kg **Special provisions** 19, T50

Isobutylene						
TDG Classification	UN1055	ISOBUTYLENE	2.1	Not applicable (gas).		**Explosive Limit and Limited Quantity Index** 0.125 **ERAP Index** 3000 **Passenger Carrying Ship Index** Forbidden **Passenger Carrying Road or Rail Index** Forbidden **Special provisions** 29
Mexico Classification	UN1055	ISOBUTYLENE	2.1	Not applicable (gas).		-

"Refer to CFR 49 (or authority having jurisdiction) to determine the information required for shipment of the product."

Section 15. Regulatory information

United States

U.S. Federal regulations : **TSCA 8(a) CDR Exempt/Partial exemption**: Not determined
United States inventory (TSCA 8b): This material is listed or exempted.
SARA 302/304/311/312 extremely hazardous substances: No products were found.
SARA 302/304 emergency planning and notification: No products were found.
SARA 302/304/311/312 hazardous chemicals: 2-methylpropene
SARA 311/312 MSDS distribution - chemical inventory - hazard identification: 2-methylpropene: Fire hazard, Sudden release of pressure
Clean Water Act (CWA) 307: No products were found.
Clean Water Act (CWA) 311: No products were found.

Clean Air Act (CAA) 112 regulated flammable substances: 2-methylpropene
Clean Air Act (CAA) 112 regulated toxic substances: No products were found.

State regulations : **Connecticut Carcinogen Reporting:** This material is not listed.
Connecticut Hazardous Material Survey: This material is not listed.
Florida substances: This material is not listed.
Illinois Chemical Safety Act: This material is not listed.
Illinois Toxic Substances Disclosure to Employee Act: This material is not listed.
Louisiana Reporting: This material is not listed.
Louisiana Spill: This material is not listed.
Massachusetts Spill: This material is not listed.
Massachusetts Substances: This material is listed.
Michigan Critical Material: This material is not listed.
Minnesota Hazardous Substances: This material is not listed.
New Jersey Hazardous Substances: This material is listed.

New Jersey Spill: This material is not listed.
New Jersey Toxic Catastrophe Prevention Act: This material is not listed.
New York Acutely Hazardous Substances: This material is not listed.
New York Toxic Chemical Release Reporting: This material is not listed.
Pennsylvania RTK Hazardous Substances: This material is listed.
Rhode Island Hazardous Substances: This material is not listed.

Canada

WHMIS (Canada) : Class A: Compressed gas.
Class B-1: Flammable gas.

CEPA Toxic substances: This material is not listed.
Canadian ARET: This material is not listed.
Canadian NPRI: This material is not listed.
Alberta Designated Substances: This material is not listed.
Ontario Designated Substances: This material is not listed.
Quebec Designated Substances: This material is not listed.

Section 16. Other information

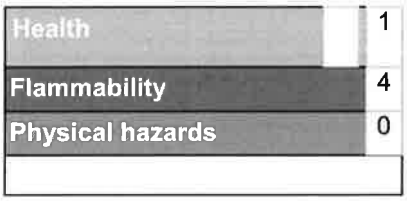
United States

Label requirements : FLAMMABLE GAS.
MAY CAUSE FLASH FIRE.
CONTENTS UNDER PRESSURE.

Canada

Label requirements : Class A: Compressed gas.
Class B-1: Flammable gas.

Hazardous Material Information System (U.S.A.) :



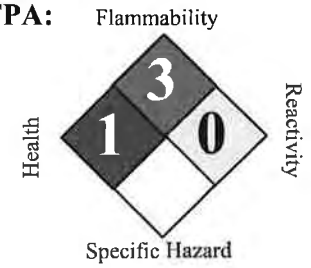
National Fire Protection Association (U.S.A.) :

Notice to reader

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.
Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.

Safety Data Sheet
Gasoline, Unleaded

NFPA:



TESORO

SECTION 1. PRODUCT AND COMPANY IDENTIFICATION

Product name	:	Gasoline, Unleaded			
Synonyms	:	Blend of Highly Flammable Petroleum Distillates, Regular, Mid-Grade, Premium, 888100008809			
SDS Number	:	888100008809	**Version**	:	1.1
Product Use Description	:	Fuel			
Company	:	For: Tesoro Refining & Marketing Co. 19100 Ridgewood Parkway, San Antonio, TX 78259			
Tesoro Call Center	:	(877) 783-7676	**Chemtrec (Emergency Contact)**	:	(800) 424-9300

SECTION 2. HAZARDS IDENTIFICATION

Classifications : Flammable Liquid – Category 1 or 2 depending on formulation.
Aspiration Hazard – Category 1
Carcinogenicity – Category 2
Specific Target Organ Toxicity (Repeated Exposure) – Category 2
Specific Target Organ Toxicity (Single Exposure) – Category 3
Skin Irritation – Category 2
Eye Irritation – Category 2B
Chronic Aquatic Toxicity – Category 2

Pictograms :

Signal Word : **Danger**

Hazard Statements

Extremely flammable liquid and vapor.
May be fatal if swallowed and enters airways – do not siphon gasoline by mouth.
Suspected of causing blood cancer if repeated over-exposure by inhalation and/or skin contact occurs.
May cause damage to liver, kidneys and nervous system by repeated and prolonged inhalation or skin contact. Causes eye irritation. Can be absorbed through skin.
May cause drowsiness or dizziness. Extreme exposure such as intentional inhalation may cause unconsciousness, asphyxiation and death.
Repeated or prolonged skin contact can cause irritation and dermatitis.

Harmful to aquatic life.

Precautionary statements

Prevention : Obtain special instructions before use.
Do not handle until all safety precautions have been read and understood.
Keep away from heat, sparks, open flames, welding and hot surfaces.
No smoking.
Keep container tightly closed.
Ground and/or bond container and receiving equipment.
Use explosion-proof electrical equipment.
Use only non-sparking tools (if tools are used in flammable atmosphere).
Take precautionary measures against static discharge.
Wear gloves, eye protection and face protection (as needed to prevent skin and eye contact with liquid).
Wash hands or liquid-contacted skin thoroughly after handling.
Do not eat, drink or smoke when using this product.
Do not breathe vapors.
Use only outdoors or in a well-ventilated area.

Response : In case of fire: Use dry chemical, CO2, water spray or fire fighting foam to extinguish.
If swallowed: Immediately call a poison center, doctor, hospital emergency room, medical clinic or 911. Do NOT induce vomiting. Rinse mouth.
If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower.
If in eye: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
If skin or eye irritation persists, get medical attention.
If inhaled: Remove person to fresh air and keep comfortable for breathing.
Get medical attention if you feel unwell.

Storage : Store in a well ventilated place. Keep cool. Store locked up. Keep container tightly closed . Use only approved containers. Some containers not approved for gasoline may dissolve and release flammable gasoline liquid and vapors.

Disposal : Dispose of contents/containers to approved disposal site in accordance with local, regional, national, and/or international regulations.

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

Component	CAS-No.	Weight %
Gasoline, natural; Low boiling point naphtha	8006-61-9	10 - 30%
Toluene	108-88-3	10 - 30%
Xylene	1330-20-7	10 - 30%
Ethanol; ethyl alcohol	64-17-5	0-8.2%
Trimethylbenzene	25551-13-7	1 - 5%
Isopentane; 2-methylbutane	78-78-4	1 - 5%

Naphthalene	91-20-3	1 - 5%
Benzene	71-43-2	Less than 1.3%
Pentane	109-66-0	1 - 5%
Cyclohexane	110-82-7	1 - 5%
Ethylbenzene	100-41-4	1 - 5%
Butane	106-97-8	1 - 20%
Heptane [and isomers]	142-82-5	0.5 - 0.75%
N-hexane	110-54-3	0.5 - 0.75%

SECTION 4. FIRST AID MEASURES

Inhalation : If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Seek medical attention immediately.

Skin contact : In case of contact, immediately flush skin with plenty of water. Take off contaminated clothing and shoes immediately. Wash contaminated clothing before re-use. Contaminated leather, particularly footwear, must be discarded. Note that contaminated clothing may be a fire hazard. Seek medical advice if symptoms persist or develop.

Eye contact : Remove contact lenses. Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Seek medical advice if symptoms persist or develop.

Ingestion : Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Obtain medical attention.

Notes to physician : Symptoms: Dizziness, Discomfort, Headache, Nausea, Kidney disorders, Liver disorders. Aspiration may cause pulmonary edema and pneumonitis. Swallowing gasoline is more likely to be fatal for small children than adults, even if aspiration does not occur.

SECTION 5. FIRE-FIGHTING MEASURES

Suitable extinguishing media : SMALL FIRES: Any extinguisher suitable for Class B fires, dry chemical, CO2, water spray or fire fighting foam. LARGE FIRES: Water spray, fog or fire fighting foam. Water may be ineffective for fighting the fire, but may be used to cool fire-exposed containers. Keep containers and surroundings cool with water spray.

Specific hazards during fire fighting : Extremely flammable liquid and vapor. This material is combustible/flammable and is sensitive to fire, heat, and static discharge.

Special protective equipment for fire-fighters : Firefighting activities that may result in potential exposure to high heat, smoke or toxic by-products of combustion should require NIOSH/MSHA- approved pressure-demand self-contained breathing apparatus with full facepiece and full protective clothing.

Further information	:	Isolate area around container involved in fire. Cool tanks, shells, and containers exposed to fire and excessive heat with water. For massive fires the use of unmanned hose holders or monitor nozzles may be advantageous to further minimize personnel exposure. Major fires may require withdrawal, allowing the tank to burn. Large storage tank fires typically require specially trained personnel and equipment to extinguish the fire, often including the need for properly applied fire fighting foam. Exposure to decomposition products may be a hazard to health. Use extinguishing measures that are appropriate to local circumstances and the surrounding environment. Use water spray to cool unopened containers. Fire residues and contaminated fire extinguishing water must be disposed of in accordance with local regulations.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Personal precautions	:	Evacuate personnel to safe areas. Ventilate the area. Remove all sources of ignition. Response and clean-up crews must be properly trained and must utilize proper protective equipment (see Section 8).
Environmental precautions	:	Discharge into the environment must be avoided. If the product contaminates rivers and lakes or drains inform respective authorities.
Methods for cleaning up	:	Contain and collect spillage with non-combustible absorbent material, (e.g. sand, earth, diatomaceous earth, vermiculite) and place in container for disposal according to local / national regulations.

SECTION 7. HANDLING AND STORAGE

Precautions for safe handling :

Keep away from fire, sparks and heated surfaces. No smoking near areas where material is stored or handled. The product should only be stored and handled in areas with intrinsically safe electrical classification.

Hydrocarbon liquids including this product can act as a non-conductive flammable liquid (or static accumulators), and may form ignitable vapor-air mixtures in storage tanks or other containers. Precautions to prevent static-initated fire or explosion during transfer, storage or handling, include but are not limited to these examples:

(1) Ground and bond containers during product transfers. Grounding and bonding may not be adequate protection to prevent ignition or explosion of hydrocarbon liquids and vapors that are static accumulators.

(2) Special slow load procedures for "switch loading" must be followed to avoid the static ignition hazard that can exist when higher flash point material (such as fuel oil or diesel) is loaded into tanks previously containing low flash point products (such gasoline or naphtha).

(3) Storage tank level floats must be effectively bonded.

For more information on precautions to prevent static-initated fire or explosion, see NFPA 77, Recommended Practice on Static Electricity (2007), and API Recommended Practice 2003, Protection Against Ignitions Arising Out of Static, Lightning, and Stray Currents (2008).

Conditions for safe storage, including incompatibilities : Keep away from flame, sparks, excessive temperatures and open flame. Use approved containers. Keep containers closed and clearly labeled. Empty or partially full product containers or vessels may contain explosive vapors. Do not pressurize, cut, heat, weld or expose containers to sources of ignition. Store in a well-ventilated area. The storage area should comply with NFPA 30 "Flammable and Combustible Liquid Code". The cleaning of tanks previously containing this product should follow API Recommended Practice (RP) 2013 "Cleaning Mobile Tanks In Flammable and Combustible Liquid Service" and API RP 2015 "Cleaning Petroleum Storage Tanks".

Reports suggest that government-mandated ethanol, if present, may not be compatible with fiberglass gasoline tanks. Ethanol may dissolve fiberglass resin, causing engine damage and possibly allow leakage of explosive gasoline.

Keep away from food, drink and animal feed. Incompatible with oxidizing agents. Incompatible with acids.

No decomposition if stored and applied as directed. Emergency eye wash capability should be available in the near proximity to operations presenting a potential splash exposure. Store only in containers approved and labeled for gasoline.

SECTION 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure Guidelines

List	Components	CAS-No.	Type:	Value
OSHA	Benzene	71-43-2	TWA	1 ppm
		71-43-2	STEL	5 ppm
		71-43-2	OSHA_ACT	0.5 ppm
OSHA Z1	Xylene	1330-20-7	PEL	100 ppm 435 mg/m3
	Ethanol; Ethyl alcohol	64-17-5	PEL	1,000 ppm 1,900 mg/m3
	Naphthalene	91-20-3	PEL	10 ppm 50 mg/m3
	Cyclohexane	110-82-7	PEL	300 ppm 1,050 mg/m3
	Ethylbenzene	100-41-4	PEL	100 ppm 435 mg/m3
	Heptane [and isomers]	142-82-5	PEL	500 ppm 2,000 mg/m3
	N-hexane	110-54-3	PEL	500 ppm 1,800 mg/m3
ACGIH	Toluene	108-88-3	TWA	50 ppm
	Xylene	1330-20-7	TWA	100 ppm
		1330-20-7	STEL	150 ppm
	Ethanol; Ethyl alcohol	64-17-5	TWA	1,000 ppm
	Trimethylbenzene	25551-13-7	TWA	25 ppm
	Isopentane; 2-Methylbutane	78-78-4	TWA	600 ppm
	Naphthalene	91-20-3	TWA	10 ppm
		91-20-3	STEL	15 ppm
	Benzene	71-43-2	TWA	0.5 ppm
		71-43-2	STEL	2.5 ppm
	Pentane	109-66-0	TWA	600 ppm
	Cyclohexane	110-82-7	TWA	100 ppm
	Ethylbenzene	100-41-4	TWA	100 ppm
		100-41-4	STEL	125 ppm
	Heptane [and isomers]	142-82-5	TWA	400 ppm
		142-82-5	STEL	500 ppm

	N-hexane	110-54-3	TWA	50 ppm

Engineering measures : Use adequate ventilation to keep gas and vapor concentrations of this product below occupational exposure and flammability limits, particularly in confined spaces. Use only intrinsically safe electrical equipment approved for use in classified areas.

Eye protection : Safety glasses or goggles are recommended where there is a possibility of splashing or spraying. Ensure that eyewash stations and safety showers are close to the workstation location.

Hand protection : Gloves constructed of nitrile or neoprene are recommended. Consult manufacturer specifications for further information.

Skin and body protection : If needed to prevent skin contact, chemical protective clothing such as of DuPont TyChem®, Saranex or equivalent recommended based on degree of exposure. Flame resistant clothing such as Nomex ® is recommended in areas where material is stored or handled.

Respiratory protection : A NIOSH/ MSHA-approved air-purifying respirator with organic vapor cartridges or canister may be permissible under certain circumstances where airborne concentrations are or may be expected to exceed exposure limits or for odor or irritation. Protection provided by air-purifying respirators is limited. Refer to OSHA 29 CFR 1910.134, ANSI Z88.2-1992, NIOSH Respirator Decision Logic, and the manufacturer for additional guidance on respiratory protection selection. Use a NIOSH/ MSHA-approved positive-pressure supplied-air respirator if there is a potential for uncontrolled release, exposure levels are not known, in oxygen-deficient atmospheres, or any other circumstance where an air-purifying respirator may not provide adequate protection.

Work / Hygiene practices : Emergency eye wash capability should be available in the near proximity to operations presenting a potential splash exposure. Use good personal hygiene practices. Avoid repeated and/or prolonged skin exposure. Wash hands before eating, drinking, smoking, or using toilet facilities. Do not use as a cleaning solvent on the skin. Do not use solvents or harsh abrasive skin cleaners for washing this product from exposed skin areas. Waterless hand cleaners are effective. Promptly remove contaminated clothing and launder before reuse. Use care when laundering to prevent the formation of flammable vapors which could ignite via washer or dryer. Consider the need to discard contaminated leather shoes and gloves.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance : Clear to straw colored liquid

Odor : Characteristic hydrocarbon-like

Odor threshold 0.5 - 1.1 ppm

pH : Not applicable

Melting point/freezing point About -101°C (-150°F)

Initial boiling point & range Boiling point varies: 30 – 200°C (85 – 392°F)

Flash point < -21°C (-5.8°F)

Evaporation rate : Higher initially and declining as lighter components evaporate

Flammability (solid, gas) : Flammable vapor released by liquid

Upper explosive limit	7.6 %(V)
Lower explosive limit	1.3 %(V)
Vapor pressure	345 - 1,034 hPa at 37.8 °C (100.0 °F)
Vapor density (air = 1)	Approximately 3 to 4
Relative density (water = 1)	0.8 g/mL
Solubility (in water)	Negligible
Partition coefficient (n-octanol/water)	2 – 7 as log Pow
Auto-ignition temperature	Approximately 250°C (480°F)
Decomposition temperature	Will evaporate or boil and possibly ignite before decomposition occurs.
Kinematic viscosity	0.64 to 0.88 mm²/s range reported for gasoline
Conductivity (conductivity can be reduced by environmental factors such as a decrease in temperature)	: Hydrocarbon liquids without static dissipater additive may have conductivity below 1 picoSiemens per meter (pS/m). The highest electro-static ignition risks are associated with "ultra-low conductivities" below 5 pS/m. See Section 7 for sources of information on defining safe loading and handling procedures for low conductivity products.

SECTION 10. STABILITY AND REACTIVITY

Reactivity	: Vapors may form explosive mixture with air. Hazardous polymerization does not occur.
Chemical stability	: Stable under normal conditions.
Possibility of hazardous reactions	Can react with strong oxidizing agents, peroxides, alkaline products and strong acids. Contact with nitric and sulfuric acids will form nitrocresols that can decompose violently.
Conditions to avoid	: Avoid high temperatures, open flames, sparks, welding, smoking and other ignition sources. Avoid static charge accumulation and discharge (see Section 7).
Hazardous decomposition products	: Ignition and burning can release carbon monoxide, carbon dioxide and non-combusted hydrocarbons (smoke).

SECTION 11. TOXICOLOGICAL INFORMATION

Skin contact	: Irritating to skin. Can be partially absorbed through skin.
Eye contact	: Irritating to eyes.
Ingestion	: Aspiration hazard if liquid is inhaled into lungs, particularly from vomiting after ingestion. Aspiration may result in chemical pneumonia, severe lung damage, respiratory failure and even death. Ingestion may cause gastrointestinal disturbances, including irritation, nausea, vomiting and diarrhea, and central nervous (brain) effects similar to alcohol intoxication. In severe cases, tremors, convulsions, loss of consciousness, coma, respiratory arrest and death may occur.

Inhalation and further information

Acute toxicity of benzene results primarily from depression of the central nervous system (CNS). Inhalation of concentrations over 50 ppm can produce headache, lassitude, weariness, dizziness, drowsiness, over excitation. Exposure to very high levels can result in unconsciousness and death.

Repeated over-exposure may cause liver and kidney injuries.
Components of the product may affect the nervous system.

IARC has determined that gasoline and gasoline exhaust are possibly carcinogenic in humans. Inhalation exposure to completely vaporized unleaded gasoline caused kidney cancers in male rats and liver tumors in female mice. The U.S. EPA has determined that the male kidney tumors are species-specific and are irrelevant for human health risk assessment. The significance of the tumors seen in female mice is not known. Exposure to light hydrocarbons in the same boiling range as this product has been associated in animal studies with effects to the central and peripheral nervous systems, liver, and kidneys. The significance of these animal models to predict similar human response to gasoline is uncertain.
This product contains benzene. Human health studies indicate that prolonged and/or repeated overexposure to benzene may cause damage to the blood-forming system (particularly bone marrow), and serious blood disorders such as aplastic anemia and leukemia. Benzene is listed as a human carcinogen by the NTP, IARC, OSHA and ACGIH.

Component:

Gasoline, natural; Low boiling point naphtha	8006-61-9	Acute oral toxicity: LD50 rat Dose: 18.8 mg/kg Acute inhalation toxicity: LC50 rat Dose: 20.7 mg/l Exposure time: 4 h Skin irritation: Classification: Irritating to skin. Result: Mild skin irritation Eye irritation: Classification: Irritating to eyes. Result: Moderate eye irritation
Toluene	108-88-3	Acute oral toxicity: LD50 rat Dose: 636 mg/kg Acute dermal toxicity: LD50 rabbit Dose: 12,124 mg/kg Acute inhalation toxicity: LC50 rat Dose: 49 mg/l Exposure time: 4 h Skin irritation: Classification: Irritating to skin. Result: Mild skin irritation Prolonged skin contact may defat the skin and produce dermatitis. Eye irritation: Classification: Irritating to eyes. Result: Mild eye irritation
Xylene	1330-20-7	Acute oral toxicity: LD50 rat Dose: 2,840 mg/kg Acute dermal toxicity: LD50 rabbit Dose: ca. 4,500 mg/kg Acute inhalation toxicity: LC50 rat Dose: 6,350 mg/l Exposure time: 4 h Skin irritation: Classification: Irritating to skin. Result: Mild skin irritation

		Repeated or prolonged exposure may cause skin irritation and dermatitis, due to degreasing properties of the product. Eye irritation: Classification: Irritating to eyes. Result: Mild eye irritation
Ethanol; Ethyl alcohol	64-17-5	Acute oral toxicity: LD50 rat Dose: 6,200 mg/kg Acute dermal toxicity: LD50 rabbit Dose: 19,999 mg/kg Acute inhalation toxicity: LC50 rat Dose: 8,001 mg/l Exposure time: 4 h Skin irritation: Classification: Irritating to skin. Result: Mild skin irritation Prolonged skin contact may cause skin irritation and/or dermatitis. Eye irritation: Classification: Irritating to eyes. Result: Mild eye irritation Mild eye irritation
Naphthalene	91-20-3	Acute oral toxicity: LD50 rat Dose: 2,001 mg/kg Acute dermal toxicity: LD50 rat Dose: 2,501 mg/kg Acute inhalation toxicity: LC50 rat Dose: 101 mg/l Exposure time: 4 h Skin irritation: Classification: Irritating to skin. Result: Mild skin irritation Eye irritation: Classification: Irritating to eyes. Result: Mild eye irritation Carcinogenicity: N11.00422130
Benzene	71-43-2	Acute oral toxicity: LD50 rat Dose: 930 mg/kg Acute inhalation toxicity: LC50 rat Dose: 44 mg/l Exposure time: 4 h Skin irritation: Classification: Irritating to skin. Result: Mild skin irritation Repeated or prolonged exposure may cause skin irritation and dermatitis, due to degreasing properties of the product. Eye irritation: Classification: Irritating to eyes. Result: Risk of serious damage to eyes.
Pentane	109-66-0	Acute oral toxicity: LD50 rat Dose: 2,001 mg/kg Acute inhalation toxicity: LC50 rat Dose: 364 mg/l Exposure time: 4 h Skin irritation: Repeated or prolonged exposure may cause skin irritation and dermatitis, due to degreasing properties of the product. Eye irritation: Classification: Irritating to eyes. Result: Mild eye irritation
Cyclohexane	110-82-7	Acute dermal toxicity: LD50 rabbit Dose: 2,001 mg/kg Acute inhalation toxicity: LC50 rat Dose: 14 mg/l Exposure time: 4 h

		Skin irritation: Classification: Irritating to skin. Result: Skin irritation Eye irritation: Classification: Irritating to eyes. Result: Mild eye irritation
Ethylbenzene	100-41-4	Acute oral toxicity: LD50 rat Dose: 3,500 mg/kg Acute dermal toxicity: LD50 rabbit Dose: 15,500 mg/kg Acute inhalation toxicity: LC50 rat Dose: 18 mg/l Exposure time: 4 h Skin irritation: Classification: Irritating to skin. Result: Mild skin irritation Eye irritation: Classification: Irritating to eyes. Result: Risk of serious damage to eyes.
Heptane [and isomers]	142-82-5	Acute oral toxicity: LD50 rat Dose: 15,001 mg/kg Acute inhalation toxicity: LC50 rat Dose: 103 g/m3 Exposure time: 4 h Skin irritation: Classification: Irritating to skin. Result: Skin irritation Repeated or prolonged exposure may cause skin irritation and dermatitis, due to degreasing properties of the product. Eye irritation: Classification: Irritating to eyes. Result: Mild eye irritation
N-hexane	110-54-3	Acute oral toxicity: LD50 rat Dose: 25,000 mg/kg Acute dermal toxicity: LD50 rabbit Dose: 2,001 mg/kg Acute inhalation toxicity: LC50 rat Dose: 171.6 mg/l Exposure time: 4 h Skin irritation: Classification: Irritating to skin. Result: Skin irritation Eye irritation: Classification: Irritating to eyes. Result: Mild eye irritation Teratogenicity: N11.00418960

Carcinogenicity

NTP	:	Naphthalene (CAS-No.: 91-20-3) Benzene (CAS-No.: 71-43-2)
IARC	:	Gasoline, natural; Low boiling point naphtha (CAS-No.: 8006-61-9) Naphthalene (CAS-No.: 91-20-3) Benzene (CAS-No.: 71-43-2) Ethylbenzene (CAS-No.: 100-41-4)
OSHA	:	Benzene (CAS-No.: 71-43-2)
CA Prop 65	:	WARNING! This product contains a chemical known to the State of California to cause birth defects or other reproductive harm. Toluene (CAS-No.: 108-88-3)

Benzene (CAS-No.: 71-43-2)

SECTION 12. ECOLOGICAL INFORMATION

Additional ecological information : Keep out of sewers, drainage areas, and waterways. Report spills and releases, as applicable, under Federal and State regulations.

Component:

Toluene	108-88-3	Toxicity to fish: LC50 Species: Carassius auratus (goldfish) Dose: 13 mg/l Exposure time: 96 h Acute and prolonged toxicity for aquatic invertebrates: EC50 Species: Daphnia magna (Water flea) Dose: 11.5 mg/l Exposure time: 48 h Toxicity to algae: IC50 Species: Selenastrum capricornutum (green algae) Dose: 12 mg/l Exposure time: 72 h
Ethanol; Ethyl alcohol	64-17-5	Toxicity to fish: LC50 Species: Leuciscus idus (Golden orfe) Dose: 8,140 mg/l Exposure time: 48 h Acute and prolonged toxicity for aquatic invertebrates: EC50 Species: Daphnia magna (Water flea) Dose: 9,268 - 14,221 mg/l Exposure time: 48 h
Isopentane; 2-Methylbutane	78-78-4	Toxicity to fish: LC50 Species: Oncorhynchus mykiss (rainbow trout) Dose: 3.1 mg/l Exposure time: 96 h Acute and prolonged toxicity for aquatic invertebrates: EC50 Species: Daphnia magna (Water flea) Dose: 2.3 mg/l Exposure time: 96 h
Naphthalene	91-20-3	Toxicity to algae: EC50 Species: Dose: 33 mg/l Exposure time: 24 h
Pentane	109-66-0	Acute and prolonged toxicity for aquatic invertebrates: EC50 Species: Daphnia magna (Water flea) Dose: 9.74 mg/l Exposure time: 48 h
Cyclohexane	110-82-7	Acute and prolonged toxicity for aquatic invertebrates: EC50 Species: Daphnia magna (Water flea) Dose: 3.78 mg/l Exposure time: 48 h

Heptane [and isomers]	142-82-5	Toxicity to fish: LC50 Species: Carassius auratus (goldfish) Dose: 4 mg/l Exposure time: 24 h Acute and prolonged toxicity for aquatic invertebrates: EC50 Species: Daphnia magna (Water flea) Dose: 1.5 mg/l Exposure time: 48 h
N-hexane	110-54-3	Toxicity to fish: LC50 Species: Pimephales promelas (fathead minnow) Dose: 2.5 mg/l Exposure time: 96 h Acute and prolonged toxicity for aquatic invertebrates: EC50 Species: Daphnia magna (Water flea) Dose: 2.1 mg/l Exposure time: 48 h

SECTION 13. DISPOSAL CONSIDERATIONS

Disposal : Dispose of container and unused contents in accordance with federal, state and local requirements.

SECTION 14. TRANSPORT INFORMATION

CFR

Proper shipping name	: Petrol
UN-No.	: 1203
Class	: 3
Packing group	: II

TDG

Proper shipping name	: Gasoline
UN-No.	: UN1203
Class	: 3
Packing group	: II

IATA Cargo Transport

UN UN-No.	: UN1203
Description of the goods	: Gasoline
Class	: 3
Packaging group	: II
ICAO-Labels	: 3
Packing instruction (cargo aircraft)	: 364
Packing instruction (cargo aircraft)	: Y341

IATA Passenger Transport

UN UN-No.	: UN1203
Description of the goods	: Gasoline
Class	: 3

	Packaging group	: II
	ICAO-Labels	: 3
	Packing instruction (passenger aircraft)	: 353
	Packing instruction (passenger aircraft)	: Y341
IMDG-Code		
	UN-No.	: UN 1203
	Description of the goods	: Gasoline
	Class	: 3
	Packaging group	: II
	IMDG-Labels	: 3
	EmS Number	: F-E S-E
	Marine pollutant	: No

SECTION 15. REGULATORY INFORMATION

OSHA Hazards : Flammable liquid
Highly toxic by ingestion
Moderate skin irritant
Severe eye irritant
Carcinogen

TSCA Status : On TSCA Inventory

DSL Status : . All components are on the Canadian DSL list.

SARA 311/312 Hazards : Fire Hazard
Acute Health Hazard
Chronic Health Hazard

CERCLA SECTION 103 and SARA SECTION 304 (RELEASE TO THE ENVIROMENT)
The CERCLA definition of hazardous substances contains a "petroleum exclusion" clause which exempts crude oil. Fractions of crude oil, and products (both finished and intermediate) from the crude oil refining process and any indigenous components of such from the CERCLA Section 103 reporting requirements. However, other federal reporting requirements, including SARA Section 304, as well as the Clean Water Act may still apply.

California Prop. 65 : WARNING! This product contains a chemical known to the State of California to cause birth defects or other reproductive harm.

Toluene	108-88-3
Benzene	71-43-2

SECTION 16. OTHER INFORMATION

Further information

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

Revision Date : 08/09/2012

6, 8, 10, 12, 14, 16, 64, 68, 91, 112, 306, 1092, 1106, 1500, 1570, 1571, 1651, 1652, 1654, 1700, 1701, 1702, 1710, 1711, 1714, 1726, 1729, 1730, 1732, 1733, 1826, 1848, 1880, 1950

APPENDIX G – O&R EHASP

APPENDIX G – ORANGE AND ROCKLAND UTILITIES EHASP

Prior to work being performed at the site, O&R's consultant and/or contractor will complete an O&R EHASP. The O&R EHASP will be reviewed and approved by O&R Safety prior to the start of any field activities at the site. A preliminary EHASP is attached; however the EHASP will be required to be updated prior to completing any site work.

Site Specific
Environmental Health and Safety Plan

Haverstraw 93B Maple Ave. MGP Site
Soil Vapor Intrusion Evaluation
Project Title/Description

Haverstraw 93B Maple Ave. MGP Site
93B Maple Avenue
Village of Haverstraw, New York
Project Location

PO # 2047831
Oracle Project Number

GEI Consultants, Inc., P.C.
Contracting Company

A fully executed copy of this EHASP must be kept on the jobsite by the Contracting Company listed above. All O&R operating procedures, policies, and permits shall be followed as directed by the O&R Project Manager.

Orange & Rockland EHS
REVIEW and Signature Page

O&R ENVIRONMENTAL SERVICES

ACCEPTED BY: _____

DATE: _____

O&R SAFETY

ACCEPTED BY: _____

DATE: _____

O&R PROJECT MANAGER

ACCEPTED BY: _____

DATE: _____

CONTRACTOR REPRESENTATIVE

ACCEPTED BY: _____

DATE: _____

Contact Information

Contracting Company GEI Consultants, Inc., P.C.

Contractor Project Manager James Edwards, C.P.G.

Phone (607) 216-8955 Cell (607) 592-6786

Emergency Contact 607-592-6786 E-mail Address jedwards@geiconsultants.com

Contractor Job Site Supervisor Drew Blicharz

Phone (860) 368-5338 Cell (860) 287-0188

Emergency # (860) 287-0188 Pager NA

Orange & Rockland EHS/Safety Representative Mark Impomeni (Safety Officer)

Phone 845-577-3277 Cell 845-988-6546

Orange & Rockland EHS/Environmental Services Representative Maribeth McCormick

Phone (845) 783-5534 Cell (914) 557-1361

Orange & Rockland Site Representative Maribeth McCormick

Phone (845) 294-1757 Pager NA

Site Location Description 93B Maple Avenue, Village of Haverstraw, New York

Hospital Phone Number Nyack Hospital (845) 348-2000

Fire Dept. Phone Number 911

Off-Site Contacts: Orange & Rockland Utilities

Name:	Title:	Company:	Office Phone:	Cell/Vehicle:
Mark Travers – Section Manager	Safety	ORU	845-577-3241	914-447-6918
Denise Coyle Specialist			845-577-3383	845-590-0226
Tom Lennon Eastern Division			845-577-3895	845-608-6033
Anthony Lombardo Northern Division			845-342-8952	845-629-1410
Mark Impomeni Compliance			845-577-3277	845-988-6546
Gwen Keeble – Section Manager	Environmental	ORU	845-577-3534	917-418-5764
Bobta Kim			845-577-3577	845-558-6644
Chris McCallion			845-577-3152	845-290-2372
Gregory Eiband			845-577-3309	845-664-9397
Arthur Barikyan			845-577-3440	845-597-8333
Brian Bury			845-577-3650	646-306-2772
Maribeth McCormick Technical Manager	Environmental	ORU	845-294-1757	914-557-1361

Off-Site Contacts: Contractor/Engineering Company

Name:	Title:	Company:	Office Phone:	Cell/Vehicle:
James Edwards	Geologist	GEI Consultants, Inc., P.C.	607-216-8955	607-592-6786

COMMITMENT TO SAFETY

The following Environmental Health and Safety Plan (EHASP) has been submitted for review and acceptance by O&R.

The above stated contractor is committed to providing a safe and accident free work environment. The purpose of this written plan is to establish requirements that will assist our field representatives in monitoring and maintaining the desired level of safety and environmental compliance on O&R projects. While written plans and procedures can offer guidance towards a safe and accident free jobsite, it must be realized that the most important safety device is a well trained, mentally aware worker. It shall be the field supervisor's responsibility to ensure that each and every employee working under him/her is aware of and familiar with the requirements of this plan. It shall be Company policy to expect every employee to abide by the provisions of this plan. Penalties for failure to comply with established EH&S procedures include reprimand, suspension and/or permanent dismissal.

In order to assure a safe and accident free work site, all operations will be conducted in accordance with the applicable provisions of this document as well as O&R Safety Requirements, policies, and procedures, 29 CFR 1926 and 1910, Occupational Safety and Health Administration (OSHA), Federal DOT, the Overhead Proximity Act, and all federal, state, and local environmental regulations. Where differences exist between standards, the one affording the greater employee protection shall govern.

Each contractor site supervisor will have the responsibility to ensure all activities performed by his/her crew are performed in a safe and proper manner. The contractor site supervisor will continually monitor the jobsite for health and safety compliance. Should any unsafe practices or equipment be identified, the contractor site supervisor will take immediate steps to correct the situation. All safety problems and corrective actions will be noted and reported to the project manager who in turn will report to the Safety Department. All injuries and spills shall be reported as soon as possible to the O&R project manager who will in turn make the appropriate notifications in accordance with O&R company policy.

If any unusual hazards are found or anticipated at any time during the course of the project, they will be discussed with the O&R Project Manager at that time and an addendum submitted to this EHASP to cover same.

Subcontractors of the above stated contractor will be given copies of this EHASP and will be required to abide by all policies and procedures contained herein. If a subcontractor's work entails tasks not covered by this EHASP an addendum to cover the subcontractors work will be submitted for approval a minimum of 5 business days prior to the subcontractor beginning work on site. It is the responsibility of the Contractor to ensure that any subcontractor is aware of the provisions of this EHASP.

Rules We Live By

The following rules have been established by Orange & Rockland Utilities to prevent employee exposure to hazards that pose imminent danger and can result in serious injury or death. If a Rules We Live By Violation is determined and verified, the contractor employee will be suspended from all O&R and CECONY work for a minimum of 20 days and the Contractor company will have an action line placed against them, at a minimum.

PPE for Hazardous Energy Sources

- Prior to working on hazardous electrical or gas energy sources; use the appropriate rubber gloves, rubber sleeves, fire retardant clothing/coveralls, eye protection/face shield, rubber hose, blankets, hoods etc. as required for exposure to the greatest hazard.

Electric Operating Orders and Clearances

- Do not perform work without properly obtaining permission / clearance from the Operating Authority
- Do not change the status of a piece of equipment without permission from the Operating Authority.
- Follow the proper sequence of all Operating/Switching Orders

Atmospheric Testing

- Before entering and while working in a confined space or in a permit-required confined space proper atmospheric testing and monitoring must be performed.

Verify Dead/Lockout-Tag Out – Before beginning work:

- Conduct or ensure proper lock out/tag out of equipment.
- Properly test or verify that equipment is tested dead and grounded for equipment that is to be worked dead.

Fall Protection/Rescue/Retrieval

- Properly utilize enclosed/confined space rescue equipment.
- Properly utilize fall protection equipment.

Sheeting/Shoring

- Do not enter excavations five feet or deeper unless they are properly sheeted and shored, sloped or benched.

Introduction of Gas to Mains and Services

- Main – A gas main shall not be energized without proper authorization from the Gas Distribution Control Center (GDCC).
- Service – Gas shall not be introduced into an existing service without first closing the riser valve.
- Customer Piping – A proper integrity test must be performed on customer-owned piping after the meter before gas can be restored.

Environmental Health and Safety Plan (EHASP)

1) Work Description

Provide a complete description of the work scope and attach the scope presented in the project specification package. Include the different work phases and major tasks, such as mobilization, excavation, drilling, demolition, painting, installing conduit, etc. Identify all equipment and materials. Include site plans, plates, prints, layouts, drawings and/or photos.

GEI has prepared a site-specific Work Plan and HASP for the Haverstraw MGP site for the completion of the soil vapor intrusion sampling. The GEI Work Plan and HASP is attached. The GEI HASP is intended to describe the safety procedures that will be utilized for the tasks identified in this EHASP.

A description of the work to be performed under this EHASP is included in the attached NYSDEC-approved Work Plan. It includes the installation of soil vapor sampling points and the collection of soil vapor samples. The field activities are anticipated to be limited to two days in a garage building with one GEI staff. Only hand tools, such as a hand drill, will be used. It is not anticipated that GEI staff will have the potential to contact MGP-related residuals in soil or groundwater because subsurface work, other than drilling holes in a concrete floor slab, will not be performed. The potential risk for an exposure to MGP-related residuals for this project is therefore anticipated to be very low.

Are permits and/or licenses needed for this work?

Yes [ ] No [X]

If yes, identify the licenses/permits and effective dates and provide attachments.

2) Emergency Procedures

Provide emergency evacuation procedures for job location including all emergency contacts (Fire Dept., Police Dept. Nearest hospital etc.). Provide nearest hospital and route map. List all applicable emergency equipment. See Attachment 1 for a listing of local area hospitals and directions. Note: This list may not be all inclusive.

The nearest hospital is the Nyack, NY Hospital.

GEI HASP – Section 12.0

Orange & Rockland Emergency number: 845-577-3600

3) <u>Site Control</u>

Describe site control measures to be taken on the project (access points, security, barricades, fencing etc.).

Prior to entering any substation, the operating authority shall be contacted and authorization granted prior to entry. Only authorized persons shall enter a substation; non-authorized persons must have an authorized escort.

GEI HASP – Section 9.0

4) Job Hazard Analysis and Control

Hazard Identification: Identify all environmental health and safety (EHS) hazards that will be encountered when performing this work. Below are general hazard classifications that you are required to select. All O&R Policies and Procedures are to be followed as directed by the O&R Project Representative.

General Hazard Classifications		Yes	No	GEI HASP Section
1.0	Air Resources	X		Section 4.3.5
2.0	Asbestos Awareness		X	
3.0	Asbestos Abatement		X	
4.0	Bloodborne Pathogens Exposure Control Plan	**YES**		Section 4.4.6
5.0	Chemical Safety and HAZCOM *****	X		Section 4.3 and attached GEI program
6.0	Confined Space Program (Permit-Required) *****		X	
7.0	Crane & Derricks (29 CFR 1926 Subpart CC) *****		X	
8.0	Electrical Safety	X		Section 4.2.2
9.0	Excavation and Trenching		X	
10.0	Fish, Wildlife and Wetlands		X	
11.0	Fire Protection and Prevention	X		Section 13.2
12.0	Flame Retardant (FR) Clothing		X	
13.0	Hearing Conservation *****		X	
14.0	Insulation Materials (Non-Asbestos)		X	
15.0	Lead Management Program		X	
16.0	Lockout/Tagout (L.O.T.O) *****		X	
17.0	Management of Change	**YES**		Section 6.0
18.0	Materials Handling	X		Section 4.2.1
19.0	Mechanical Equipment (hand tools only)	X		Section 4.2.6
20.0	Noise	X		Section 4.2.5
21.0	Oil and Dielectric Fluid		X	
22.0	PCB Management		X	
23.0	Personal Protective Equipment	X		Section 5.1
24.0	Pesticide Use, Storage, and Disposal		X	
25.0	Respiratory Protection Program *****	X		Section 8.0 and attached GEI program
26.0	Sampling	X		Section 3.2
27.0	Vehicle Management	X		Section 3.2
28.0	Waste Management		X	
29.0	Water Resources		X	
30.0	Welding and Burning		X	
31.0	Work Area Protection	X		Section 10.1
32.0	Working at Elevations		X	

Additional hazards not identified above shall be identified and a hazard analysis completed for the hazard.

Provide a description of other Hazards present:

The potential hazards of the soil vapor sampling are described in the GEI HASP – Section 4.2. As described in the GEI HASP, PPE will be worn to prevent possible dermal contact with MGP-related residuals; however, contact with these materials is not anticipated for this project.

******* - These General Hazard Evaluations require the contractor to provide additional information. Please include how the hazard will be addressed and how the work will be completed in the appropriate section. The information provided shall include the written program for your company.**

This Environmental, Health and Safety Plan (EHASP) has been developed by Orange & Rockland Utilities to serve as a guideline only and does not claim to be an all-inclusive list of each and every possible hazard that can exist on the site. **The contractor identified herein is ultimately responsible for worksite safety, providing on-site EH&S oversight and for informing Orange & Rockland utilities of any changes or EH&S concerns not specifically contained herein.**

Addressed in the GEI HASP.

Job Briefings

The contractor employee in charge shall conduct a documented signed off job briefing with the employees involved before they start each job, when the scope of work changes, or when new employees enter the work zone. The briefing shall cover at least the following subjects: hazards associated with the job, work procedures involved, special precautions, energy source controls, personal protective equipment requirements, spill reporting and waste management.

GEI will conduct safety briefings each morning and provide a signed Daily Form to O&R. The Daily Form is provided in the GEI HASP.

5) Hazard Analysis

See attached .pdf file for Hazard Analysis.

The hazards denoted below will also require the contractor's written program as an attachment for review.

******* Hazard 5: Chemical Safety and HAZCOM**
******* Hazard 6: Confined Space Program (Permit-Required) (Not Applicable for this project)**
******* Hazard 7: Crane & Derricks (29 CFR 1926 Subpart CC) (Not Applicable for this project)**
******* Hazard 13: Hearing Conservation**
******* Hazard 16: Lockout/Tagout (L.O.T.O) (Not Applicable for this project)**
******* Hazard 25: Respiratory Protection Program**

GEI HASP Section 4.2 provides additional hazard analysis information.

6) Housekeeping

Identify housekeeping procedures that will be utilized throughout the project durations. Identify techniques to be used for normal operations or when hazardous materials are involved:

GEI HASP – Section 12.0

Upon completion of the work, the Contractor will remove all work-related materials, chemicals and equipment from the site, unless directed otherwise.

7) Training and Hazard Communication

Safety Data Sheet (SDS) Requirements: All products, materials and chemicals brought to an O&R facility and/or will be used in/on O&R equipment or systems must be approved by the O&R EHS Department prior to initiating work. SDS sheets not older than 5 yrs shall be submitted to O&R for acceptance. List (below) product names of all products and materials for this project, and attach SDS's to this EHASP.

SDS Product/Material Name	Method or Manner In Which It Is To Be Used
Alconox	To be used in conjunction with soil vapor sampling (not anticipated to be likely)
Simple Green All-Purpose Cleaner	Same as above
Isobutylene	Calibration of PID equipment (provided in a container by an equipment rental company)

Note 1: Products and materials other than instrument calibration gas will not be brought to the site to complete the work. Section retained because there is a very limited potential for contact with MGP-related residuals.

Information included in Appendix B in the GEI HASP.

Are all your personnel (including sub-contractors) trained to conduct their job responsibilities in this plan?
Yes [X] No [ ]

Are your employees Haz-Com trained in the hazards they will be confronting for this project?
Yes [X] No [ ]

Job Briefings will be conducted with employees at the start of the shift?
Yes [X] No [ ]

How often are documented safety talks conducted?
Daily [X] Shift [ ] Weekly [ ]

Will all visitors be briefed on evacuation/fire/emergency procedures?
Yes [X] No [ ]

Will all Sub-Contractors be covered under this site-specific HASP?
Yes [X] No [ ]

If respirators are used, will all employees be medically qualified, clean-shaven and fit-tested in the respirator?
Yes [X] No [ ]

Comments (explain all negative responses and discuss with the O&R Representative):

Training and hazard communication:
GEI HASP – Section 7.0 and 13.1

8) <u>Environmental Management</u>

Check-off and address all environmental issues for this work:

Spill Management	[ ]	Waste Management	[ ]
Asbestos Management	[ ]	Hazardous Waste Management	[ ]
PCB Management	[ ]	Water Resources: streams, lakes, erosion	[ ]

Wetlands	☐	Protected Species: fish and wildlife	☐
Air Resources	☐	Other	☐

Explain in detail all issues identified above and control methods to manage or avoid the concern:

GEI HASP – Section 10.0 – Site Control Measures, Section 12.0 – Decontamination Procedures, and Section 10.4 – IDW Management. Note: IDW not anticipated for this project.

Spill Management

The Contractor will immediately report all oil and chemical spills to the Orange & Rockland (O&R) Site Representative, who will notify the O&R Control Center immediately.

GEI HASP – Section 10.0 (not anticipated for this project)

If the Contractor encounters evidence of contaminated soil, the Contractor will suspend work and immediately notify the O&R Site Representative, who will contact O&R Environmental Services for guidance.

Waste Management

Prior to commencing work, the O&R project coordinator will notify O&R Environmental Services of the project schedule.

If the lead and PCB content of a painted surface is not known, the paint is assumed to contain lead and PCBs. If the Contractor encounters areas of known or suspected lead-based paint (LBP), PCB-containing paint or asbestos-containing materials (ACM) or if Hazardous Waste is generated by this work, the Contractor will immediately notify the O&R Site Representative who will contact O&R Environmental Services for guidance on management of the wastes.

All containers of wastes will be properly labeled with all pertinent information including waste description, date, location, and names of the O&R Site Representative and Contractor. The Contractor will transfer the labeled containers of waste(s) to the onsite O&R waste storage area/building designated by the O&R Site Representative and Environmental Services. The O&R Site Representative will then immediately notify O&R Environmental Services about the waste(s).

Recyclable Materials must be separated from other wastes and must be deposited, stored and transported in separate containers specified and labeled for that type of Recyclable Material, and must be shipped to a recycling facility.

Upon completion of the work, the Contractor will remove all work-related materials, unused products, chemicals, equipment and non-hazardous waste from the site, unless directed

otherwise. Waste disposal will be in accordance with all applicable laws and regulations, and with the requirements of Section 9.

GEI HASP – Section 10.0. It is not anticipated that IDW will be generated for the SVI sampling task.

9) Waste Disposal

Provide information about waste disposal; identify all waste streams generated by the work, specify estimated quantities, explain how wastes will be stored, packaged, transported and disposed, specify containers and labeling, and identify waste-transportation companies and disposal facilities.

Note: waste-transportation companies and disposal facilities for the project must be approved by O&R Environmental Services prior to initiating the work.

GEI HASP – Section 10.4 – IDW Management is included as a contingency; however, it is not anticipated that IDW will be generated during the SVI sampling.

10) Contractor Employee Acknowledgement

Contractor site supervision is responsible for assuring the contents of this EHASP are known by all contractor employees and are implemented on site during performance of the work.

Typical Hazards of Concern

Physical – GEI HASP – Section 4.2, and GEI SOPs (Appendix C)					
Heat		Noise	X	Radiation	
Cold		Confined Space		Excavation	
Trenching		Welding		Burning	
Electrical		Fire Protection		Road Work	
Rotating Equipment		Cranes		Work in Elevations	
Scaffolding		Rigging		Material Handling	
Grinding		Hand Tools	X	Demolition	
Ladders		Steel Erection		Concrete	
Power Tools	X	Mechanical Equipment		Slippery Surfaces	X

Chemical					
Lead		Asbestos		PCBs	
Mercury		Oil		Lubricants	
Cement		Dielectric Fluid		Solvents	
Gasoline		Diesel		Other Fuels	
Silica		Carbon Monoxide		Pesticides	
Dust-Particulates	X	Hydrogen Sulfide		Isocyanates	
Acids		Caustics		Glues	
Adhesives		Epoxies		Detergents	
Bleach		Ammonia		Heavy Metals	
Benzene	X	VOCs	X	Lacquers	
Solders		Asphalt			

Note: No solvents are anticipated to be encountered, or are used by GEI to perform the sampling. The potential for an exposure to any solvents during the work identified for this project is believed to be very low. Because all work will be performed on a concrete floor of a garage, exposure to MGP-related residuals is believed to be very unlikely. Exposure to constituents in soil vapor is unlikely because of the SVI sampling methods and the likelihood of very low concentrations in soil vapor.

Attachment 1
(This list may not be all inclusive, be sure to complete section 2.0 - Emergency Procedures with the appropriate information.)

Hospital Locations

The Nyack hospital is identified as the primary hospital for this project. A map to the hospital is attached.

NYACK HOSPITAL – NYACK, NY

Main Hospital Phone:
845-348-2000

Address:
160 North Midland Avenue
Nyack, NY

From New Jersey and Upstate New York.

From New Jersey, take the Garden State Parkway North to the New York State Thruway South. From upstate New York, take the New York State Thruway South, or the Palisades Parkway South to the New York State Thruway South. Exit the Thruway (I-287/I-87)at Exit 11, Nyack. At the traffic light, turn left onto Route 59 East. Proceed ahead under the overpass to the next traffic light (corner of Route 9W). Turn left onto Route 9W North. Proceed to the next traffic light, then continue ahead one block. The hospital entrance is on the right.

GOOD SAMARITAN HOSPITAL – SUFFERN, NY

Main Hospital Phone:
845-368-5000

Address:
255 Lafayette Ave.
(Route 59) Suffern, NY

Good Samaritan Hospital is located 30 miles north of New York City, in the southwest portion of Rockland County, New York, and just one mile from Bergen County, New Jersey.

From the Tappan Zee Bridge
(from Westchester County and points southeast)

1. From the Tappan Zee Bridge toll plaza, continue northwest approximately 14 miles on 287/87 (New York State Thruway).
2. Take Exit 14B and go to the traffic light. At the traffic light, make a left onto Airmont Road.
3. Proceed to the second traffic light and make a right onto Route 59 (Lafayette Avenue).
4. Proceed approximately one mile. Good Samaritan Hospital is on the left side of Route 59. Park in visitor's lot and proceed to information desk in lobby.

From the Garden State Parkway North
(from New Jersey)

1. Take the Garden State Parkway North.
2. Proceed onto Route 287/87, also known as the New York State Thruway, following signs to Albany. Proceed to Exit 14B.
3. At the traffic light, make a left onto Airmont Road.
4. Proceed to the second traffic light and make a right onto Route 59 (Lafayette Avenue).
5. Proceed approximately one mile. Good Samaritan Hospital is on the left side of Route 59. Park in visitor's lot and proceed to information desk in lobby.

From the Palisades Interstate Parkway North
(from Bergen County, lower Rockland and New York City)

1. Take the Palisades Interstate Parkway north to Exit 9W (Albany - Route 287/87 - New York State Thruway).
2. Proceed on the New York State Thruway to exit 14B.
3. At the traffic light make a left onto Airmont Road.
4. Proceed to the second traffic light and make a right onto Route 59 (Lafayette Avenue).
5. Proceed approximately one mile. Good Samaritan Hospital is on the left side of Route 59. Park in visitor's lot and proceed to information desk in lobby.

From Route 17 North
(from Bergen County and Orange County)

1. Follow signs to New York State Thruway (287/87) southeast. Signs will indicate New York City.
2. Proceed to Exit 14B and at the traffic light make right onto Airmont Road.
3. Proceed to the second traffic light and make a right onto Route 59 (Lafayette Avenue).
4. Proceed approximately one mile. Good Samaritan Hospital is on the left side of Route 59. Park in visitor's lot and proceed to information desk in lobby.

From Route 4
(Ramsey/ Mahwah area)

1. Continue on Route 17N for 7-8 miles.
2. Follow signs for Route 202-Suffern, just past the Toyota Dealership and Quest Fitness Center on the right.
3. Continue bearing right and follow H signs, this becomes Washington Avenue.
4. At the end is Sacred Heart School/ Church and a light - make right turn.
5. Continue for approximately 1 mile on Route 59 (Lafayette Ave). Hospital is on the right. Park in visitor's lot and proceed to information desk in lobby.

THE VALLEY HOSPITAL – RIDGEWOOD, NJ

Main Hospital Phone:
201-447-8000

Address:
223 N. Van Dien Avenue
Ridgewood, NJ 07450

The Valley Hospital is located at 223 N. Van Dien Avenue in Ridgewood. A parking attendant is on duty at the Main Entrance to assist you.

From New Jersey & South: Take Garden State Parkway North to Exit 163. Follow Route 17 North. Exit at Linwood Avenue Westbound. Cross over Route 17 and continue on Linwood Avenue to third traffic light. Turn right on North Van Dien Avenue to Main Entrance.

From New York City Area: Take George Washington Bridge to New Jersey. Follow I-80 (express or local lanes) to Garden State Parkway North exit. Follow **directions** above (From New Jersey & South).

From New York State & North: Take NY Thruway (I-87) south to Suffern (Route 17) exit. Follow Route 17 South. Exit at Linwood Avenue Westbound. Proceed on Linwood to third traffic light. Turn right on North Van Dien Avenue to Main Entrance.

From Westchester & New England: Take Connecticut Turnpike (I-95) and Cross-Westchester Expressway (I-287) to Tappan Zee Bridge. Continue to Exit 14A, the Garden State Parkway extension exit. Travel south to New Jersey to Exit 166. Turn right off ramp, then left onto Linwood Avenue (at Charlie Brown's), crossing over Route 17, to third traffic light. Turn right on North Van Dien Avenue to Main Entrance.

From Northern Pennsylvania & West: Take I-80 East to Garden State Parkway North. Follow **directions** above (From New Jersey & South).

SAINT ANTHONY COMMUNITY HOSPITAL - WARWICK

Main Hospital Phone:
845-986-2276

Address:
15-19 Maple Avenue
Warwick NY 10990

From the NJ Turnpike:

1. NJ Turnpike North to Route 3 West exit (when going north on the Turnpike, the road divides for "W" and "E" exits- KEEP LEFT for "W" exit).
2. Route 3 West will turn into Route 46 West.
3. Proceed approximately 5 miles on Route 46 West, then take Route 23 North.
4. Proceed approximately 40 miles, then turn right onto Route 515 (Highland Lakes exit).
5. Proceed approximately 7 miles on Route 515 to traffic light. Continue straight on Route 94 for approximately 7 miles through the Village of Warwick. The hospital is on your left (at the corner of Grand Street and Maple Avenue).

OR

1. NJ Turnpike North to NYS Thruway North to Exit 16 (Harriman).
2. Proceed West on Route 17.
3. Take Exit 127 (Warwick/ Sugar Loaf); bear left at stop sign.
4. At the multiple light intersection, proceed straight across Route 17A to Kings Highway (County Rt. 13).
5. Follow Kings Highway (County Rt. 13) past Sugar Loaf, making a right at the stop sign.
6. Make a left at the next stop sign and proceed about 3-4 miles to the end of the road.
7. Turn right at the light at the Mobil gas station. The hospital is on your left (at the corner of Grand Street and Maple Avenue).

From the Tappan Zee Bridge:

1. After the Tappan Zee Bridge, take NYS Thruway to Exit 16 (Harriman exit).
2. Follow directions above from line 2.

From the George Washington Bridge:

1. Take Route 80 West to Route 17 North.
2. Continue on Route 17 to New York and proceed through Tuxedo.
3. At the traffic light (Sterling Forest/Greenwood Lake exit) make a left onto 17A West.
4. Continue on 17A until you get to Warwick (road ends).

5. Make a right onto Route 94 and go through center of town, the hospital will be on your left (at the corner of Grand Street and Maple Avenue).

From Albany:

1. Take the NYS Thruway South to Exit 17, Stewart Airport exit.
2. Take the second exit onto Route 84 West.
3. Take 84 West to Middletown, take Exit 4 to Route 17 East.
4. Proceed on Route 17, take exit 124 (Florida/Goshen).
5. Proceed to the stop light at the end of the ramp and turn left onto Route 17A (also Route 94) towards Florida.
6. Proceed approximately 10 miles into the Village of Warwick. The hospital will be on your right (at the corner of Grand Street and Maple Avenue).

From Port Jervis:

1. Take Route 84 East to Exit 2 (Greenville) and turn left.
2. Proceed 1/4 mile and turn left onto Route 6 and continue for 2/3 mile.
3. Turn right onto County Route 1 (look for sign to Warwick).
4. Continue through Pine Island staying on Route 1.
5. Turn left at the blinking light; proceed ½ mile and bear right at the "Y".
6. Continue into the village of Warwick. The hospital will be on your left (at the corner of Grand Street and Maple Avenue).

FIRST CARE ASSOCIATES - MONROE

Main Phone:
845-783-6699

Address:
505 Route 208 #15
Monroe, NY 10950

From NYS Thruway- Take Route 17W, exit 130. Go straight through light, we are located on bottom level.

NEED DIRECTIONS FOR ORANGE REGIONAL

BON SECOURS COMMUNITY HOSPITAL – PORT JERVIS

Main Hospital Phone:
845-858-7000

Address:
160 East Main Street
Port Jervis, NY 12771

From New York:

1. Take New York State Thruway North over Tappan Zee Bridge to exit 16 (Harriman).
2. Take Route 17 West.
3. Take Exit 123 for Port Jervis - Route 84 West.
4. Take 84 West to last exit in New York (Exit 1).
5. At end of ramp, turn left follow. The hospital is located on the right hand side.

From Pennsylvania:

1. Interstate 84 East into New York.
2. Take first exit (Exit 1) which says Port Jervis.
3. At the end of the ramp, turn right. Proceed to traffic light.
4. At traffic light, turn left onto Main Street, Route 6.
5. Go through two additional traffic lights, over the bridge.
6. Proceed approximately 1/2 mile. You will see the hospital on your right. Parking is in the back. You may enter the building through the back main entrance.

From New Jersey:

1. Take Route 80 W to Route 15 N (Exit will also say Sparta).
2. Take 15 N to 206 N (straight through a four-way light 15 becomes 206).
3. Continue on 206 N all the way to the entrance to the bridge to Pennsylvania (Montague/Milford) bridge. DO NOT CROSS THE BRIDGE.
4. Bear right onto 521 - this is River Road - continue to end of 521 (light) There is a fish market on the left.
5. Turn left, cross the bridge, this is East Main Street. Continue on East Main Street about ¼ mile. Hospital is on right.

MILFORD URGENT CARE - PENNSYLVANIA

Main Hospital Phone:
570-409-9700

Address:
111 E. Catharine Street – Suite 130
Milford, PA 18337

From Newton Memorial Hospital
Left out of driveway (Route 94 N). Follow Route 94 around Newton town square to US Route 206. Continue for 4.9 miles. Left at light in Augusta (continuation of US 206). Follow for approx 16 miles, (will cross into Pennsylvania) turn slight right onto US 209. Continue for 8/10 mi. Turn right onto us 6/ Broad St. Proceed for 1/10 mi., turn right onto E. Catherine Street. Milford Health & Wellness Center will be approx. 1/10 mi. on right.

From Eastern New Jersey
Take I-80 West to exit 34B Route 15N Jefferson/Sparta. Continue on 15N to end (approx 18 miles). 15N turns into US 206N, follow for approx. 16 miles (will cross into Pennsylvania). Turn slight right onto US 209. Continue for 8/10 mi. Turn right onto us 6/ Broad St. Proceed for 1/10 mi., turn right onto E. Catherine Street. Milford Health & Wellness Center will be approx. 1/10 mi. on right.

NEWTON MEMORIAL HOSPITAL – NEWTON, NJ

Main Hospital Phone:
973-383-2121

Address:
175 High Street
Newton, NJ 07860

From Northeastern New Jersey
Take I-80 West to exit 25 marked "Exit 25 US-206 N to Stanhope / Newton" and go North for 0.3 miles.
Bear left onto US-206 and go North for 12 miles. Turn left onto Liberty Street (Dennis library will be on right corner).
At end(1/10 mi.), turn left onto Hwy 94 West (High Street). Newton Memorial Hospital will be on right, approx. 1/10 mi.

From Northwestern New Jersey
Take I-80 East to exit 25 and then follow directions from Northeastern New Jersey (above).

From Central and Southern New Jersey
Take I-287 North to Exit 22B "US-202 N / US-206 N to Bedminster / Netcong" and go South for 0.3 miles.
Bear right on US-206 and go North for 18 miles. Turn left on ramp at sign reading "I-80 W / US-206 N to Newton" and go West for 0.4 miles. Continue on I-80, US-206 and go Northwest for 1.4 miles. Exit I-80, via ramp at sign reading "Exit 25 US-206 N to Stanhope / Newton" and go North for 0.3 miles. On US-206 go North for 12 miles. Turn left onto Liberty Street (Dennis library will be on right corner). At end(1/10 mi.), turn left onto Hwy 94 West (High Street). Newton Memorial Hospital will be on right, approx. 1/10 mi.

From Newark Area
Take I-280 West to I-80 West to exit 25. Follow as road goes into US 206 North. Turn left onto Liberty Street (Dennis library will be on right corner). At end(1/10 mi.), turn left onto Hwy 94 West (High Street). Newton Memorial Hospital will be on right, approx. 1/10 mi. Follow signs to Hospital entrance.

From Eastern Pennsylvania
Take I-78 East to State Route 57 East. Exit onto US 46 East and turn left onto I-80 East.to exit 25. Follow as road goes into US 206 North. Turn left onto Liberty Street (Dennis library will be on right corner). At end(1/10 mi.), turn left onto Hwy 94 West (High Street). Newton Memorial Hospital will be on right, approx. 1/10 mi. Follow signs to Hospital entrance.

ORANGE REGIONAL MEDICAL CENTER – MIDDLETOWN, NY

Directions to:
Orange Regional Medical Center, 707 East Main Street, Middletown:

From the East:
Take I-84 West. Merge onto NY-17 East via Exit 4E toward New York.
Take Exit 122 - East Main Street / Crystal Run Road.
Take left at light onto East Main Street.
Drive approximately 0.3 miles.
Hospital entrance will be on your right.

From the West:
Take I-84 East.
Merge onto NY-17 East via Exit 4E toward New York.
Take Exit 122 - East Main Street / Crystal Run Road.
Take left at light onto East Main Street.
Drive approximately 0.3 miles.
Hospital entrance will be on your right.

From the North:
Take I-87 South / New York State Thruway South.
Take Exit 17 - Route 17K / I-84 / Newburgh / Stewart Airport.
Pay toll and follow signs for I-84 West.
Merge onto I-84 West.
Merge onto NY-17 East via Exit 4E toward New York.
Take Exit 122 - East Main Street / Crystal Run Road.
Take left at light onto East Main Street.
Drive approximately 0.3 miles.
Hospital entrance will be on your right.

From the South:
Take I-87 North / New York State Thruway North.
Take Exit 16, NY 17 toward US 6 / Harriman.
Merge onto NY-17 West. Take Exit 122 - Crystal Run Crossing
Turn right at first light.

Turn right at next light onto Crystal Run Road; Crystal Run Road turns into East Main Street.
Drive approximately 0.6 miles.
Hospital entrance will be on your right.

GEI's Respiratory Protection Program

The GEI respiratory protection program is based on requirements established by OSHA for general industry (29 CFR 1910.134) and construction (29 CFR 1926.103). This program is designed to reduce employee exposures against occupational dusts, fumes, mists, radio nuclides, gases, and vapors. The primary objective is to prevent excessive exposure to these contaminants. Where feasible, exposure to such contaminants will be eliminated by engineering controls (i.e., general and local ventilation, enclosure or isolation, and substitution of a less hazardous process or material). However, when effective engineering controls are not feasible, use of personal respiratory protective equipment may be required to achieve this goal. All respiratory protection equipment use must be approved by the CHSO.

Responsibilities

GEI Consultants, Inc. GEI will provide proper respiratory protection equipment to employees as necessary to meet the needs of each specific application at no cost to the employee. GEI will provide adequate training and instruction to employees on all respiratory equipment with which they are provided.

Corporate Health and Safety Officer (CHSO). GEI's CHSO is responsible for determining what specific applications require the use of respiratory equipment and what type of equipment is required.

Management/Supervisory. Managers, supervisors, or group leaders of each GEI project are responsible for determining that all personnel under their direction are completely knowledgeable of the respiratory protection requirements for the projects on which they work. They are also responsible for determining that their personnel comply with all facets of the program, including respirator inspection and maintenance.

Employees. It is the responsibility of the employee to have an awareness of the respiratory protection requirements for their projects (as explained by management/supervisor and described in the site-specific HASP). Employees are also responsible for wearing the appropriate respiratory equipment according to proper instructions, and for maintaining the equipment in a clean and operable condition.

Administration

Corporate Health and Safety Officer (CHSO). The GEI CHSO is responsible for overseeing selection of proper methodologies and equipment for airborne contaminant identification and measurement, including technical support, air sampling, and laboratory analysis (as applicable/ appropriate). The CHSO, with the RSHOs, are responsible for determining proper selection, issuance, and fit testing of all respirators used by GEI personnel. The CHSO and RSHOs must also determine that all associated records are properly maintained and that all personnel assigned respirators are trained in their functions and proper use.

Site Safety Officer (SSO). For each GEI project, the assigned SSO is responsible for determining that GEI project personnel comply with all respiratory requirements of the project HASP.

Physicians. The Medical Director at AllOne of Woburn, Massachusetts is responsible for implementing GEI's comprehensive employee medical surveillance program. The program includes annual (as applicable to work performed) personnel physical examinations. The health monitoring program is to ensure employee fitness for work, and for use of respiratory protection devices.

Respirator Selection

Respiratory protection requirements are determined by the GEI CHSO. The determination is based upon the physical and chemical properties of the air contaminants and the concentration level likely to be encountered by the employee. The CHSO/RSHO will make a respirator and appropriate filters (as applicable) available to each employee who is assigned to a project that requires respiratory protection. Replacement respirators/filters will be made available as required.

Employee Training

Employees that work on hazardous waste sites, emergency response operations, or sites with potential asbestos exposures may be required to use respiratory protection. These personnel are required to first complete 40 hours of HAZWOPER training in compliance with 29 CFR Part 1910.120 and 29 CFR 1926.65. The 40-hour training includes instruction in the need, use, limitations, and care of respirators, and to complete 8 hours of refresher training as appropriate.

In addition personnel using respirators who are not HAZWOPER trained, such as laboratory personnel, will receive respirator training in compliance with 29 CFR 1910.134. This training will be delivered in the annual General Health and Safety training program.

Upon assignment to a project potentially requiring respirators, each employee must be instructed by the GEI SSO as to his/her responsibilities in the Respiratory Protection Program.

Employee Fit Testing

Employees who may be required to wear a respirator will be fitted properly and tested for a face seal prior to being placed on a project requiring respirator protection.

Qualitative fit testing using isoamyl acetate (banana oil) and/or irritant smoke (stannic chloride), or quantitative methodologies will be repeated at least once per calendar year on each employee potentially required to wear respiratory protection. Each employee will use his/her assigned make/model of respirator (or an identical make/model) for his/her fit test. If the fit is no longer correct, testing will be continued using other respirator models until a secure fitting respirator is identified. The employee will then be assigned the appropriate respirator.

Fit testing of respirators will not be performed on personnel with facial hair that interferes with respirator fit or function.

Respirator Inspection and Maintenance

The following guidelines should be followed for respirator inspection and maintenance:

- The wearer of a respirator will inspect it daily whenever it is in use.
- The Project Manager or SSO will periodically spot check respirators for fit, usage, and condition.
- When in use, respirators will be cleaned on a daily basis, according to the manufacturer's instructions, by the assigned employee or other designated person.
- Respirators will be marked or stored in such a manner as to determine that they are worn only by the assigned employee. If use by more than one employee is required, the respirator will be cleaned between uses.

Once the individual has selected a properly fit-tested, approved, half mask or full-face air-purifying respirator (APR), **only** NIOSH-approved cartridges specifically designed for use with the selected APR make and model will be used. As approved by the CHSO, N100 and P100 particulate masks may also be worn by GEI personnel. Interchanging filter, canisters, or cartridges not designed for use with the selected APR is strictly forbidden. The filter/canister/cartridge types to be used will include particulate filters, vapor- or gas-removing filters, pesticide filters, combination particulate gas vapor and radionuclide filters, and high-efficiency filters. Selection of the proper filter/canister/cartridge is work-site specific and can be found in the Health and Safety Plan specifically developed for each individual work site.

Regardless of the make and model of APR used by an employee, filters, canisters, and cartridges for all APRs will be changed in accordance with the following schedule:

- When the end-of-service-life indicator (ESLI) indicates the need for change (if applicable to the respiratory protection type used).
- If work site monitoring indicates the need for change or upgrading (in accordance with pre-established values [OSHA/ACGIH] assigned within the HASP).
- If breakthrough occurs.
- If the flow of air through the filter/canister/cartridge becomes constricted, or breathing resistance increases.
- At the end of each work shift.

GEI's Hazard Communication (HAZCOM) Program

Policy and Purpose

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

The GEI Hazard Communication (HAZCOM) Program has been compiled to provide guidelines meeting the requirements of OSHA's Hazard Communication Standard. This program addresses the evaluation of potential GEI workplace hazards and communication of these hazards to GEI employees.

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. GEI employees speak and understand English; hazard communication is conveyed in English.

Location of Written Program

The written HAZCOM is located on the GEI Health and Safety intranet page.

Responsibilities

Overall coordination and implementation of GEI's HAZCOM Program is the responsibility of the CHSO. Any questions, comments, or suggestions relating to GEI's HAZCOM Program should be directed to the CHSO or the RHSOs. The following subsections delineate the responsibilities of personnel as required for successful implementation of this program.

Corporate Health and Safety Officer

The CHSO will:

- Develop and oversee implementation of the written HAZCOM Program.
- Track 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).
- Track that other personnel receive the general Health and Safety training and annual 4-hour refresher training as required by GEI.

Regional Health and Safety Officer

The RHSO will:

- Determine that all new employees in their region receive training in accordance with the GEI HAZCOM Program within 30 days of hire or prior to performing field work (whichever is sooner). This will be conducted in conjunction with the new employee health and safety orientation.
- Maintain at his/her office/branch an inventory of Safety Data Sheets (SDSs) as available for all hazardous materials with which employees have the potential of coming into contact with while on the job.
- Determine that SDSs are made readily available for employee review upon request by the employee.
- Determine that GEI's label and warning protocol for hazardous materials is complied with.
- Determine that field personnel are familiar with GEI's HAZCOM Program regarding chemical use and potential chemical exposures in the field.

Supervisors (Project Managers and/or Project Staff)

Project Managers and/or Field Team Leaders will:

- 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 GEI's HAZCOM Program regarding site-specific chemical use and potential chemical exposures at the site.
- Determine that employees working on their project sites are familiar with site-specific HASPs and comply with the HASPs.
- Determine that copies of Safety Data sheets (SDS) for chemicals used in the field are attached to the final copy of the HASP and are reviewed by GEI field personnel.

Staff

It is the Staff's responsibility to:

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

Program Requirements

Safety Data Sheets (MSDSs) and Chemical List

Safety Data Sheets (SDSs) will be obtained for each required chemical from the chemical manufacturer, supplier or vendor. Complete sets of SDSs for chemicals specific to each office/branch are maintained in each office and made readily available for review upon request by any employee. The content and location of the SDS binders varies by office location. SDS for the Denver Ecology laboratory are maintained in the lab under the direction of the Laboratory Manager.

The binders typically contain SDSs for:

- Chemicals that are typically used for decontamination. Supplies of these chemicals are generally kept in GEI field equipment storerooms.
- Chemicals that are typically used for sample preservation. Sample bottles typically come pre-preserved from the laboratories.
- Chemicals that may be encountered on typical GEI job sites such as decontamination chemicals and laboratory reagents. SDSs included in site-specific HASPs should be reviewed prior to performing field work on those sites.
- Chemicals used to calibrate instruments. These chemicals are generally kept in small quantities to be used only by instrument technical personnel.

If an employee needs an SDS for a specific chemical, they should contact the manufacturer (including searching the manufacturer's website) or distributor. If the chemical is a sample preservative, then the employee should contact the laboratory from which they ordered the glassware. SDSs must be retained for 30 years.

SDS for chemical products brought onto jobsites, such as laboratory reagents, decontamination supplies, and gasoline, diesel fuel or calibration gases, will be included in the site-specific HASP. GEI employees working on project sites with multiple employers will be given the opportunity to be informed of the chemicals at the project site through the Project Safety briefing conducted at the beginning on the project and through the safety briefings conducted during the project.

Before beginning a field assignment, an Activity Hazard Analysis (AHA) will be performed for each activity, routine and non-routine, which will be conducted by GEI personnel to determine what chemicals will be used. SDS will be included in the appendix of the Health and Safety Plan. Employees involved in non-routine tasks will discuss these tasks with the Project Manager, the CHSO or RHSO.

Label and Warnings

GEI's 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). Lids may also be labeled, but not in lieu of container labeling.
- GEI employees will not deface or remove labels from containers.

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

Training

The GEI Office/Branch Manager is responsible for determining that the GEI personnel employed at his/her office/branch complies with the HAZCOM Program. Training records will be maintained for a minimum of three years.

GEI'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 GEI HAZCOM Program and with the SDSs associated with their job function.
  Employees will be required to attend a HAZCOM Program classroom training session as part of the annual HAZWOPER refresher training program or the general Health and Safety training program. Training will 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 material.
  - Chemicals in the work area.
  - Measures employees can take to protect themselves from these hazards.
  - The details of the GEI HAZCOM Program, including an explanation of MSDSs and GEI's container labeling system.

Biennial Review

This program will be formally reviewed by the GEI CHSO and company management on a biennial basis or more frequently if the CHSO 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 H – COMMUNITY AIR MONITORING PLAN

APPENDIX H – COMMUNITY AIR MONITORING PLAN

This CAMP is in compliance with DER-10, and all other applicable Federal, State, and local regulations. It is provided for example only.

Based on changes to State and federal guidelines, and specific methods employed by future contractors, this document may need to be updated. The updated CAMP should be resubmitted to the NYSDEC for approval.

GEI Consultants

Consulting
Engineers and
Scientists

Community Air Monitoring Plan

93B Maple Avenue Former MGP Site,
Haverstraw, New York
AOC Index No. D3-0001-99-01
Site No. 3-44-044

Submitted to:
Orange and Rockland Utilities, Inc
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Spring Valley, NY 10977

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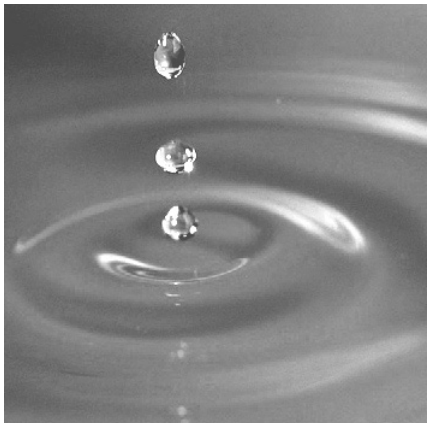

James H. Edwards, C.P.G.
Senior Geologist

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Executive Summary

This Community Air Monitoring Program (CAMP) Work Plan has been developed to provide procedures for measuring, documenting, and responding to potential airborne contaminants during excavation activities associated with the 39B Maple Avenue Former Manufactured Gas Plant (MGP) site (the Site, Fig. 1). The procedures in this CAMP focus on air monitoring techniques and contingency measures designed to mitigate potential airborne contaminants. This CAMP Work Plan is based on the CAMP guidelines established by the New York State Department of Health (NYSDOH) in the New York State Department of Environmental Conservation (NYSDEC) DER-10 Technical Guidance for Site Investigation and Remediation (DER-10) (May 2010).

The CAMP provides Air Monitoring Procedures, Alert Levels, Response Levels, Action Levels, and Contingency Measures if Action Levels are approached. Alert Levels are internally established concentration levels for volatile organic compounds and are not established by the NYSDOH or NYSDEC. Alert Levels are set below the levels established by the NYSDOH so that actions can be taken prior to exceeding a NYSDOH threshold. An Alert Level serves as a screening tool to trigger contingent measures if necessary, to assist in minimizing off-site transport of contaminants during remedial activities. A Response Level is a contaminant concentration level that triggers a temporary work stoppage, continued monitoring, and potential contingent measures. An Action Level is a contaminant concentration that triggers work stoppage and implementation of contingent measures to mitigate potential airborne contaminants prior to resuming work activities. Response Levels and Action Levels are NYSDOH thresholds levels established in the November 2009 NYSDOH Generic CAMP presented in Appendix 1A of DER-10. Exceedances of either Response Levels or Actions Levels will be reported to NYSDEC and NYSDOH.

During times of excavation activity and potential related ground intrusive activities, perimeter air monitoring will be conducted using a combination of fixed-station, moveable tripod-mounted, and “walk-around” air monitoring equipment (as appropriate). Monitoring will be performed for total volatile organic compounds (VOCs), dust, and odors along the Site perimeter 24 hours a day when fixed stations are used or during working hours if the movable tripod-mounted units are used. The Contingency Plan defines Alert Levels, Response Levels, Action Levels, and specific contingency measures to be implemented. The response actions, potentially including work stoppage and work area controls by various methods, are intended to prevent or significantly reduce the migration of airborne contaminants from the Site.

GEI will implement the CAMP and will report any exceedance of Response Levels and Action Levels to the Contractor, the Construction Manager, Orange and Rockland Utilities,

Inc., (O&R) of Spring Valley, New York, NYSDOH, and NYSDEC. As specified in the DER-10, all 15-minute readings will be recorded and be available for State (NYSDEC and NYSDOH) personnel to review. The excavation contractor will be responsible for enacting contingency measures to respond to Alert Levels, if necessary, and to the exceedances of Alert and Action Levels as they may occur. GEI will provide data summary reports to the Contractor, the Construction Manager, O&R, and NYSDEC each week during excavation and/or ground intrusive activity.

1. Introduction

The New York State Department of Health (NYSDOH) Generic Community Air Monitoring Plan (CAMP), as presented in New York State Department of Environmental Conservation's (NYSDEC's) document Draft DER-10 Technical Guidance for Site Investigation and Remediation, recommends that real-time monitoring for total volatile organic compounds (VOCs) and particulates (i.e. dust) be conducted at the downwind perimeter of each designated work area during ground intrusive activities at contaminated sites. As such, this work plan describes the proposed air monitoring means and methods that will be implemented during excavation activities associated with 39B Maple Avenue Former Manufactured Gas Plant (MGP) site (the Site; Fig. 1.

The purpose of the Air Monitoring Plan is to provide early detection in the field of potential short-term emissions. The Plan will be conducted in accordance with the generic NYSDOH CAMP.

- The objectives of the CAMP are as follows:
- Provide an early warning system to alert the Contractor, the Construction Manager (CM), Orange and Rockland Utilities, Inc., (O&R) of Spring Valley, New York, and NYSDEC that concentrations of total VOCs or dust in ambient air are approaching Action Levels due to Site activities.
- Provide potential contingency measures to be enacted by the excavation contractor and related contractors that are designed to reduce the off-site migration of contaminants if established Action Levels are approached or exceeded.
- Determine whether construction controls are effective in reducing ambient air concentrations to below Action Levels and make appropriate and necessary adjustments.
- Develop a permanent record that includes a database of perimeter air monitoring results, equipment maintenance, calibration records, and other pertinent information.

1.1 Roles and Responsibilities

GEI will implement the monitoring and reporting components of this CAMP under contract with O&R. The excavation contractor is responsible for the selection and implementation of appropriate contingency measures that will mitigate the off-site migration of contaminants in response to Action Levels being approached or exceeded. The remainder of this section specifies the roles and responsibilities of each entity relative to the CAMP.

A communication flowchart is shown in Fig. 5 with each entity and lines of communication for the CAMP.

1.1.1 GEI Consultants, Inc.

The scope of GEI's activities will be limited to CAMP monitoring and reporting used for the CAMP. GEI is responsible for the health and safety of their employees. GEI's CAMP roles and responsibilities are as follows:

- GEI will monitor and record total VOCs and dust at various locations around the Site as described in the following sections of this CAMP Work Plan.
- On a daily basis, GEI will communicate to the following entities whether total VOCs or dust exceeded Response Levels or Action Levels specified in Section F-2.1, and suggest corrective actions required to address the situation. GEI will convey the CAMP results to the entities listed below and inform them if the Alert or Response Levels have been exceeded. GEI will direct contractors at the site to take action if warranted.
    - Contractor – Contact Info
    - **New York State Department of Environmental Conservation**
      MGP Remedial Section, Division of Environmental Remediation
      Bureau of Western Remedial Action, 11th Floor
      625 Broadway
      Albany, NY 12233-7017
    - Orange & Rockland (O&R)
    - Construction Manager
- GEI will provide, maintain, and operate the equipment utilized to implement the CAMP.
- GEI will provide data summary reports to the Contractor, CM, O&R, and NYSDEC each week during excavation activity. The reports will identify Response Level and Action Level exceedances and will include data summary reports for all total VOCs and dust data collected.

1.1.2 Excavation Contractor

The excavation contractor is the lead contractor responsible for Site activities pertaining to the excavation activity. The excavation contractor will be responsible for taking contingent actions in conjunction with O&R in response to Response Level and Action Level exceedances. The General Contractor will be responsible for taking contingent actions for

Alert Levels, if required by GEI, CM, and /or O&R. The excavation contractor is responsible for the health and safety of their employees.

1.1.3 Orange & Rockland

O&R has the responsibility to provide mitigation services related to the release of MGP-related vapors in excess of CAMP Response Level and Action Levels. O&R is also ultimately responsible for the remediation of the Site under an approved work plan with NYSDEC.

1.1.4 New York State Department of Environmental Protection

NYSDEC is responsible for the environmental regulatory enforcement for all activities conducted at the site including compliance with this CAMP, stormwater runoff mitigation (erosion and sediment control), and all environmental and remediation regulations, policies, and guidance applicable to the Site. NYSDEC may provide on-site oversight personnel for the work being conducted.

1.1.5 Construction Manager

The CM is O&R's representative on Site and is responsible for day to day operations on the Site. The CM will be responsible for directing the contractor to take contingent actions in conjunction with O&R in response to Alert Level (VOCs only), Response Level, and/or Action Level exceedances. The CM is responsible for the health and safety of its employees and subcontractors.

2. Sampling and Analytical Procedures

This section of the CAMP presents a detailed description of the air monitoring sampling and analytical procedures, including data management that will be used during ground intrusive site activities. The intent of the real-time monitoring program is to provide early detection in the field of short-term emissions and off-site migration of site-related total VOCs and dust.

Real-time sampling methods will be utilized to determine ambient air concentrations during the project. Monitoring for total VOCs and respirable particulate matter (PM-10) will occur at up to six locations. Wind direction will be monitored under all monitoring approaches. A meteorological station will be established if a centralized data logger system is implemented. Supplemental walk-around perimeter monitoring for total VOCs and PM-10, will occur along the perimeter of the project Site on an as-needed basis. In the event of a possible exceedance of a Response Level or Action Level for total VOCs or PM-10, GEI will compare upwind to downwind concentrations within 60 minutes of the possible exceedance to determine if Site activity is causing the Response Level or Action Level exceedance. The air monitoring procedures and equipment are detailed below.

2.1 Alert Level, Response Level, and Action Levels

Alert Levels are not established by the NYSDOH or NYSDEC and are internally established concentration levels for volatile organic compounds. Alert Levels are set below the levels established by the NYSDOH so that actions can be taken prior to exceeding a NYSDOH threshold. An Alert Level serves as a screening tool to trigger contingent measures if necessary, to assist in minimizing off-site transport of contaminants during remedial activities.

A Response Level is a contaminant concentration level that triggers a temporary work stoppage, continued monitoring, reporting, and potential contingent measures. A Response Level serves as a screening tool for both total VOCs and PM10 to trigger contingent measures to assist in minimizing off-site transport of contaminants during remedial ground intrusive activities. Response Levels are NYSDOH thresholds levels established in the November 2009 NYSDOH Generic CAMP presented in Appendix 1A of DER-10.

An Action Level is a contaminant concentration that triggers work stoppage and implementation of contingent measures to mitigate potential airborne contaminants prior to resuming work activities. Action Levels are NYSDOH thresholds levels established in the November 2009 NYSDOH Generic CAMP presented in Appendix 1A of DER-10.

For example, if high concentrations of dust are detected on the site, contingent measures such as the use of spraying water may be required to reduce the concentrations and keep them below Response Levels. An Action Level is a contaminant concentration that when exceeded requires a work stoppage and implementation of contingent measures to mitigate that condition prior to resuming work activities.

The following target compounds and corresponding Alert Levels, Response Levels, and Action Levels were developed in accordance with the NYSDOH Generic CAMP.

Target Compounds	**Alert Level**
Total VOCs (15-minute average concentration)	3.7 parts per million (ppm) greater than background*
Target Compounds	Response Level
Total VOCs (15-minute average concentration)	5.0 ppm greater than background*
Respirable Particulate Matter (PM-10)	100 micrograms per cubic meter ($\mu g/m^3$) greater than background*
Target Compounds	Action Level (**)
Total VOCs (15-minute average concentration)	25 ppm greater than background*
Respirable Particulate Matter (PM-10)	150 $\mu g/m^3$ greater than background*

General Notes:

1. ppm - parts per million
2. $\mu g/m^3$ - micrograms per meter cubed
3. VOCs – Volatile Organic Compounds
4. Background is defined as the current upwind fifteen-minute average concentration.
5. ** Action Level Exceedance Requires Work Stoppage and Mitigation of the condition causing the Exceedance

2.2 Air Monitoring Procedures

During times of excavation activity and potential related ground intrusive activities, perimeter air monitoring will be conducted using a combination of fixed-station, moveable tripod-mounted, and/or "walk-around" air monitoring equipment (as appropriate). Monitoring will be performed for total VOCs, dust, and odors along the site perimeter 24 hours a day when fixed stations are used or during working hours if the movable tripod-mounted units are used.

Monitoring for total VOCs and respirable particulate matter (PM-10) will occur at up to six locations using real-time sampling equipment. Readings will be checked manually on a predetermined periodic basis if tripod mounted units are used or transmitted to a centralized data logger system station once per minute. Depending on the units used, monitoring will be conducted during working hours or 24 hours a day, 7 days a week during construction

activity along the Site perimeter. Supplemental "walk-around" perimeter monitoring for total VOCs and PM-10, and odor will occur along the perimeter of the project Site on an as-needed basis. Each approach is detailed below.

It is anticipated that fixed stations will be used during the excavation portion of the Interim Remedial Measure (IRM). It is anticipated that tripod mounted stations will be used for minimally intrusive work such as installation of monitoring wells, installation of recovery wells, installation of the groundwater treatment system, and during shallow invasive work during facility upgrades.

2.2.1 Fixed-Station Monitoring Procedures

Real-time air monitoring for total VOCs and suspended particulates will be conducted upwind and downwind of the work area along the site perimeter during excavation portions of the IRM. Instruments will be positioned to monitor around the active excavation work zone based on a particular day's activities at up to six locations adjacent to the work area. Real-time monitors will continuously gather data 24 hours a day, 7 days a week. The air monitoring system consists of up to six air monitoring stations, one meteorological tower, and one central computer system. The central computer system will be located in the project trailer or similar work area.

Real-time monitoring will be conducted at six fixed air-monitoring stations (AMS-1 through AMS-6). The real-time fixed air monitoring stations will be positioned between the work zone and the largest number of potential off-site receptors. Therefore, the placement of the fixed air monitoring stations is based on the need to document all potential off-site migration on the perimeter, but also recognizes the potential off-site receptors and the location of the proposed construction activities.

Each real-time air monitoring station contains the following:

1. Station enclosure.
2. An organic vapor analyzer.
3. A particulate monitor.
4. A radio telemetry device.

Each monitoring station is housed in a weather-tight National Electrical Manufacturers Association (NEMA)-4 type enclosure. Each monitoring station will continuously measure and record total VOCs and PM-10 at a rate of one sample per minute and record 15 minute time-weighted running averages. Fig. 2A shows an example of a typical fixed air monitoring station.

In addition to the air monitoring stations, a Campbell Scientific, Inc. Met Data1 meteorological monitoring system, or equivalent, will be established on-site. The meteorological system will continuously monitor temperature, relative humidity, wind speed, and wind direction. Fifteen-minute average values for each meteorological parameter will be stored in the meteorological system and downloaded once per week. Wind direction and wind speed will be displayed on the central computer in real-time to determine upwind and downwind stations for assessing Alert, Response, and Action Levels. Upwind and downwind stations will be reduced real-time. Wind socks and/or flags will be placed at locations around the Site, as necessary, to obtain real-time Site-specific wind direction.

All total VOC, PM-10, and meteorological data will be stored in dataloggers located within each monitoring/meterological station. Stored analytical data along with system performance data from each station will be sent in real-time, via radio telemetry, to the Site central computer system for monitoring and analysis. The meteorological station will be downloaded at a minimum of once per week. In the event of severe weather or power loss at the Site, data recording and/or recovery may be affected.

2.2.2 Tripod Mounted Monitoring Procedures

It is anticipated that tripod mounted stations will be used for minimally intrusive work such as installation of monitoring wells, installation of recovery wells, installation of the groundwater treatment system, and during shallow invasive work during facility upgrades. Instruments will be positioned along the Site perimeter to monitor the air based on a particular day's ground intrusive activities at up to three locations. Real-time monitors will continuously gather data during periods of intrusive activity during working hours. The equipment will be manually read on a predetermined periodic cycle during the work activity.

The readings will be collected at a minimum of 15-minute intervals during periods of intrusive activities. Wind direction will be determined by using a wind sock or flagging placed on a pole at the Site.

Each air monitoring station would include the following:

1. Station Tripod and enclosure.
2. An organic vapor analyzer.
3. A particulate monitor.

Fig. 2B shows an example of a typical tripod mounted air monitoring station.

Each monitoring station will continuously measure and record total VOCs and PM-10. All total VOCs and PM-10 will be stored in dataloggers located within each monitoring station. Data from each piece of equipment will be downloaded daily at the completion of intrusive

activities and stored on a central computer system. The location of each station, the work zone, and the wind direction will be noted daily. At each monitoring station location, the 15-minute average value of total VOCs and PM-10 will be recorded. The 15-minute average value of total VOCs and PM-10 data from the upwind and downwind station will be compared and resultant downwind concentration will be calculated and recorded.

2.2.3 Supplemental and Perimeter Walk-around Monitoring

Supplemental walk-around perimeter monitoring for total VOCs and PM-10 will occur along the perimeter of the project Site on an as-needed basis. Specific Site conditions that may trigger walk-around perimeter monitoring include:

- Visible dust.
- Detection of total VOCs and/or PM-10 at an air monitoring station at concentrations exceeding an Alert Level, Response Level, and Action Levels.
- Direction by the CM, O&R, or NYSDEC.

Fifteen-minute average total VOC and PM-10 readings will be collected continuously at a downwind location between the work area and the nearest receptors.

When a triggering condition is observed during ground intrusive activity, the supplemental downwind perimeter monitoring will occur continuously until the conditions that triggered the monitoring have subsided. Total VOC concentrations will be monitored and recorded using an organic vapor analyzer. PM-10 will be measured and recorded using a portable aerosol monitor equipped with a PM-10 impactor.

At each monitoring point, the 15-minute average value of total VOCs and PM-10, sample time, and sample location will be collected and recorded. Additional temporary monitoring points may be established due to changing Site or meteorological conditions.

2.2.4 Equipment Calibration

Equipment calibration will be performed according to manufacturer's instructions. Each organic vapor analyzer will be calibrated once daily using a certified standard isobutylene gas. Particulate monitors for PM-10 will be zeroed daily. Other hand-held portable equipment will be calibrated before each use, or a minimum of once per week when not in use.

2.3 VOC Analytical Sampling

Verification VOC samples will be collected once per week at two air-monitoring stations. The verification samples are collected to demonstrate that the real-time monitoring stations

are effective in measuring the concentration of the VOC target compounds. VOC samples will be collected using 6-liter Summa® canisters (or equivalent vacuum canisters) and analyzed using U.S. Environmental Protection Agency (EPA) Method TO-15 modified to include naphthalene. An accredited laboratory will perform the analytical testing on the canisters and will provide Category B deliverables as required by the New York Analytical Services Protocol. The data will be validated according to EPA and New York State Requirements.

2.4 Pre-Construction Baseline Sampling

Pre-construction sampling will be completed to establish baseline ambient air concentrations prior to the start of construction activities. Baseline conditions will be developed for total VOCs and PM-10 in ambient air using real-time fixed station sampling methods. Sample collection and analysis methods will follow those described in Subsection F-2.2.1. Pre-construction real-time sampling will take place at the six fixed air monitoring station locations to determine total VOC and PM-10 baseline conditions. Total VOC and PM10 data will be recorded 24 hours per day for a minimum of 3 days.

2.5 Data Management Procedures

This section of the Plan discusses the data management procedures that will be used during the remedy. Data may be generated from a variety of sources, including real-time fixed station analytical monitoring, supplemental walk-around monitoring, tripod-mounted monitoring stations, and meteorological monitoring.

These data must be reduced, evaluated, verified, and presented to related parties in a timely manner to facilitate decision-making. The data management process for each source of data is discussed below.

Analytical data generated at each fixed-station are sent to the central computer system via radio telemetry or will be manually downloaded daily. The monitoring data will also be downloaded to the project database for data evaluation. The following daily charts or tables will be prepared:

- Instantaneous and averaged total VOC concentrations compared to the total VOC Action Level.
- Instantaneous and averaged PM-10 concentrations compared to the PM-10 Action Level.
- Supplemental Perimeter Walk-Around PM-10 concentrations compared to the Action Level (if any).

- Supplemental Perimeter Walk-Around total VOC concentrations compared to the total VOC Action Level (if any).
- Air monitoring station locations.

The following weekly charts or tables will be prepared:

- Meteorological conditions
- Maximum 15-minute average concentrations of total VOC and PM-10.
- Upwind and downwind comparison of Response Level and Action Levels reached during the week.
- Summary of Site activities
- Air monitoring station locations.

GEI will review all real-time data in a timely manner following collection and transmit the final summary report to O&R.

3. Alert Response

The purpose of this section is to identify the procedures to be followed in response to elevated levels of target compounds measured during ground intrusive activities. Response actions will be enacted by the Contractor, CM, and O&R. GEI will report any occurrences where a Response Level or Action Level is exceeded, which would require response measures to be enacted. The NYSDEC will be notified of any occurrence where a Response Level and/or Action Level (NYSDOH threshold) is exceeded. If there is a verified exceedance, GEI will inform the CM, O&R, and NYSDEC within 60 minutes of the exceedance via e-mail at a minimum. In general, a tiered approach to Site conditions with corresponding response actions will be implemented during the air monitoring program. The four tiers of Site conditions are defined as follows:

- **Site Condition 1.** Normal or ambient air-conditions where all target concentrations are less than the Response Levels for respirable particulate matter or total VOCs.
- **Preliminary Site Condition 2.** Concentration of total VOCs only is equal to or greater than the Alert Level, but less than the Response Level.
- **Site Condition 2.** Concentration of at least one target is equal to or greater than Response Level, but less than the Action Level.
- **Site Condition 3.** Concentration of at least one target is equal to or greater than the Action Level.

The response plan will rely on real-time data generated from the fixed-station monitoring, portable equipment monitoring, and meteorological monitoring. These data sources will be evaluated together in order to make appropriate decisions concerning Site conditions and potential control measures.

An explanation of the notification system, specific conditions, and response actions for total VOC s and PM-10 are presented below.

3.1 Total VOCs

Total VOC concentrations in air will be measured and recorded by station monitors. Fig. 3 presents the total VOC decision diagram that will be used to determine the appropriate Site condition based on contaminant concentrations.

3.1.1 Site Condition 1

Site Condition 1 will be in effect when the total VOC concentration is less than the Alert Level (3.7 ppm). Under a Site Condition 1, each organic vapor analyzer located at the monitoring stations will collect and analyze a total VOC sample at a frequency of one sample per minute.

3.1.2 Preliminary Site Condition 2

Preliminary Site Condition 2 will be in effect if the total VOC concentration measured at a station is greater than or equal to the Alert Level (3.7 ppm) but less than the Response Level (5.0 ppm). The Contractor, CM, and O&R will be notified by GEI of elevated measurements and a Preliminary Site Condition 2.

At this time, the upwind and downwind concentrations will be compared to determine if the Preliminary Site Condition 2 is due to Site activities. If downwind total VOC concentrations are greater than upwind concentrations, then it will be assumed that the Preliminary Site Condition 2 is due to Site activities.

If the above condition is true, then a Preliminary Site Condition 2 will be verified. Under a verified Preliminary Site Condition 2, a contingency meeting attended by GEI, the Contractor, CM, and O&R will be held. The Contractor, CM, and O&R will determine appropriate response actions. This meeting will be held within 60 minutes of the Preliminary Site Condition 2 verification. Possible Preliminary Site Condition 2 response actions are listed in Table 1. The Site will remain in Preliminary Site Condition 2 as long as the total VOC concentration is between 3.7 ppm (Alert Level) and 5.0 ppm (Response Level), based on 15-minute averages.

The Site will return to Site Condition 1 if the following condition is true:

- The 15-minute average concentrations for total VOC s at each of the monitoring stations are less than 3.7 ppm (Alert Level).

3.1.3 Site Condition 2

Site Condition 2 will be in effect if average total VOC concentrations increase to greater than the Response Level of 5.0 ppm. Site Condition 2 will remain in effect if one of the following conditions is true:

- The average TVOC concentration, measured over a 15-minute period, is greater than or equal to 5.0 ppm (Response Level).

Under Site Condition 2, construction activities will be temporarily halted. A meeting attended by GEI, the Contractor, CM, O&R, and NYSDEC, will be held within 60 minutes of the Site Condition 2. The Contractor, CM, O&R, and NYSDEC will determine appropriate response actions. Possible Site Condition 2 corrective measures/actions are listed in Table 1. After appropriate corrective measures/actions are taken, work activities may resume provided that the total VOC concentration at the Site perimeter is no more than 5.0 ppm above background for the 15-minute average.

If average total VOC concentrations fall below the Response Level, then the Site will be returned to Preliminary Site Condition 2, at which time work activities may resume. The Preliminary Site Condition 2 Site condition will remain in effect as long as the following condition is true:

- The 15-minute average concentration for total VOC s is greater than 3.7 ppm (Alert Level) and less than 5.0 ppm (Response Level).

The ite will return to Site Condition 1 if the following condition is true:

- The 15-minute average concentrations for total VOC s at each of the monitoring stations are less than 3.7 ppm (Alert Level).

3.1.4 Site Condition 3

Site Condition 3 will be in effect if average total VOC concentrations increase to greater than the Action Level of 25.0 ppm. Site Condition 3 will remain in effect if one of the following conditions is true:

- The average total VOC concentration, measured over a 15-minute period, is greater than 25 ppm (Action Level).

Under Site Condition 3, all construction activities will be halted. A meeting attended by GEI, the Contractor, CM, O&R, and NYSDEC, will be held within 60 minutes of the Response Level notification. The Contractor, CM, O&R, and NYSDEC will determine appropriate response actions. Possible Site Condition 3 corrective measures/actions are listed in Table 1. After appropriate corrective measures/actions are taken, work activities may resume provided that the total VOC concentration at the Site perimeter is no more than 5.0 ppm above background for the 15-minute average.

If average total VOC concentrations fall below the Action Level, then the Site will be returned to a Site Condition 2. If average total VOC concentrations fall below the Response Level, then the Site will be returned to Preliminary Site Condition 2, at which time work activities may resume. The Preliminary Site Condition 2 Site condition will remain in effect as long as the following condition is true:

- The 15-minute average concentration for total VOC s is greater than 3.7 ppm (Alert Level) and less than 5.0 ppm (Response Level).

The Site will return to Site Condition 1 if the following condition is true:

- The 15-minute average concentrations for total VOC s at each of the monitoring stations are less than 3.7 ppm (Alert Level).

Specific total VOC target concentrations for Site Condition 1, Preliminary Site Condition 2, Site Condition 2, and Site Condition 3 are summarized in Table 2.

3.2 Respirable Particulate Matter

PM-10 concentration in air will be measured and recorded by the station monitors and may be temporarily suspended during periods of rain. Fig. 4 presents the PM-10 decision diagram.

3.2.1 Site Condition 1

Site Condition 1 will be in effect when the downwind 15-minute average PM-10 concentration is greater than 100 µg/m^3 above the current average upwind conditions (Alert Level).

3.2.2 Site Condition 2

Site Condition 2 will be in effect if the average 15-minute PM-10 concentration at a station is greater than 100 µg/m^3 and related to Site activities. The Contractor, CM, O&R, and NYSDEC will be notified by GEI of elevated measurements and a possible Site Condition 2. The upwind and downwind PM-10 concentrations will be compared to determine if the elevated PM-10 concentrations are due to Site activities. If downwind PM-10 concentrations are 100 µg/m^3 greater than upwind concentrations (Response Level), then it will be assumed that the Site Condition 2 is due to Site activities.

The Site Condition 2 will remain in effect as long as the average PM-10 concentration is greater than or equal to 100 µg/m^3 above upwind conditions (Response Level), and less than or equal to 150 µg/m^3 (Action Level). Under a verified Site Condition 2, dust suppression techniques must be implemented by the Contractor and/or O&R's contractors. At this point, routine monitoring continues and 15-minute averages continue to be evaluated. Work may continue with dust suppression techniques provided that downwind PM-10 levels do not exceed 150 µg/m^3 above the upwind level (Action Level) and provided that no visible dust is migrating offsite from the work area.

A contingency meeting attended by GEI, the Contractor, CM, O&R, and NYSDEC will be held within 60 minutes of the verified Site Condition 2 if the condition is not mitigated by dust suppression techniques. Possible response actions for dust control are listed in Table 1.

3.2.3 Site Condition 3

Site Condition 3 will be in effect if the average 15-minute PM-10 concentration exceeds 150 µg/m^3 above the current average upwind concentration (Action Level). Under Site Condition 3, work must be stopped and a meeting attended by GEI, the Contractor, CM, O&R, and NYSDEC will be held within 60 minutes of the Response Level notification. The Contractor, CM, O&R, and NYSDEC will determine appropriate response actions. Possible Site Condition 3 response actions for PM-10 are listed in Table 1. Work may resume provided that dust suppression measures and other controls are successful in reducing the downwind PM-10 concentration to within 150 µg/m^3 of the upwind level and in preventing visible dust migration.

Specific PM-10 target concentrations for Site Condition 1, Preliminary Site Condition 2, Site Condition 2, and Site Condition 3 are summarized in Table 2.

3.3 Visible Dust

In addition to measured PM-10 levels, the CAMP requires monitoring of visible dust conditions. If visible airborne dust is observed leaving the work area, then dust suppression techniques must be employed. Work may continue with dust suppression techniques provided that downwind PM-10 levels do not exceed the Action Level concentration of 150 µg/m^3 above the upwind level and provided that no visible dust is migrating from the work area.

4. Reporting

GEI will prepare and submit weekly reports to the Contractor, CM, O&R, and NYSDEC summarizing the CAMP monitoring data. Each report will consist of a letter-style report and charts/tables summarizing the following:

- Maximum 15-minute average concentrations of total VOCs, and PM-10.
- Upwind and downwind comparison of Response Levels and Action Level reached during the weekly period.
- Summary of Site activities.
- Air monitoring station locations.
- Meteorological conditions.

Following the completion of all remedial measures a Final Engineering Report (FER) will be developed and stamped by an engineer licensed to practice in the State of New York. As part of the report, the CAMP activities will be documented. The FER will provide a summary of air monitoring data collected during the remedial activities, any exceedances noted, and responses taken during the remedial activities.

Tables

Table 1. Levels and Response Actions
Community Air Monitoring Program Work Plan
93B Maple Avenue MGP Site
Haverstraw, New York

Site Condition	Response Action
Site Condition 1	■ Normal Site Operations – No Response Action Required.
Preliminary Site Condition 2 and Site Condition 2	■ Establish trend of data and determine if evaluation/wait period is warranted. ■ Temporarily stop work. ■ Temporarily relocate work to an area with potentially lower emission levels ■ Apply water to area of activity or haul roads to minimize dust levels. ■ Reschedule work activities. ■ Cover all or part of the excavation area. ■ Apply VOC emission suppressant foam over open excavation areas. ■ Slow the pace of construction activities. ■ Change construction process or equipment that minimize air emissions. ■ Install a perimeter barrier fence.
Site Condition 3	■ Halt work. ■ Encapsulate construction area and treat air exhaust. ■ Perform work during cold weather. ■ Cease construction activities. ■ Re-evaluate air monitoring work plan.

General Note:

1. MGP = Manufactured Gas Plant.
2. VOC = Volatile Organic Compound.
3. The bulleted response actions specified under each site condition can be implemented in any order that is most appropriate under the existing site conditions.

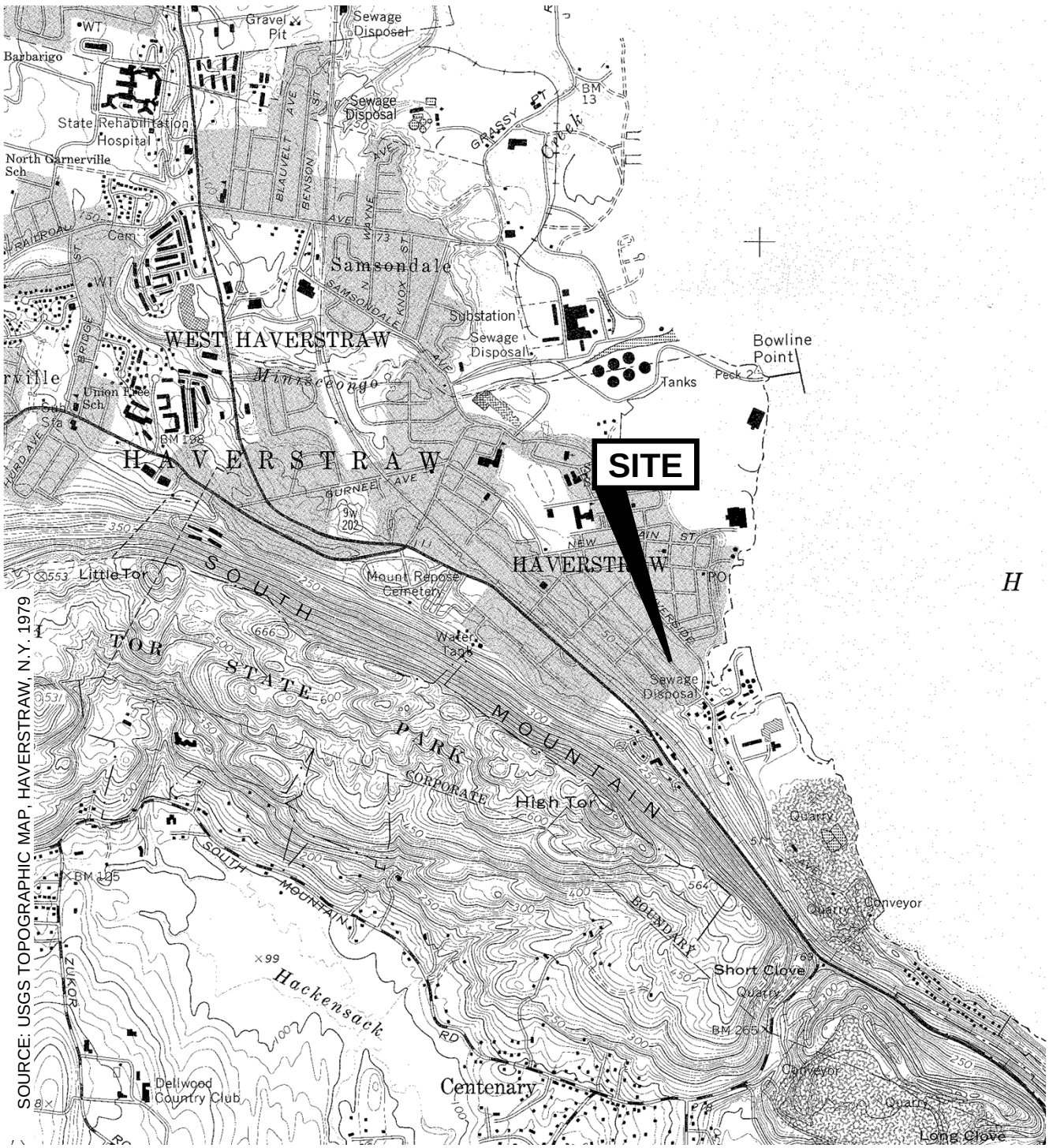
Table 2. Target Concentrations for Site Conditions
Community Air Monitoring Program Work Plan
93B Maple Avenue MGP Site
Haverstraw, New York

Target	Alert Level	Response Level	Action Level	Site Condition			
				Site Condition 1	Preliminary Site Condition 2	Site Condition 2	Site Condition 3
Total VOC by GC (ppmv)	3.7	5.0	25.0	[C]<3.7	[C]>=3.7	NM	NM
Total VOC by PID (ppmv)	3.7	5.0	25.0	[C]<3.7	3.7<=[C]<=5.0	$[C_{avg}]$>5.0	$[C_{avg}]$>25.0
PM-10 ($\mu g/m^3$)	NA	100 greater than upwind	150 greater than upwind	[C]<100	NA	100<=$[C_{avg}]$<=150	$[C_{avg}]$>150

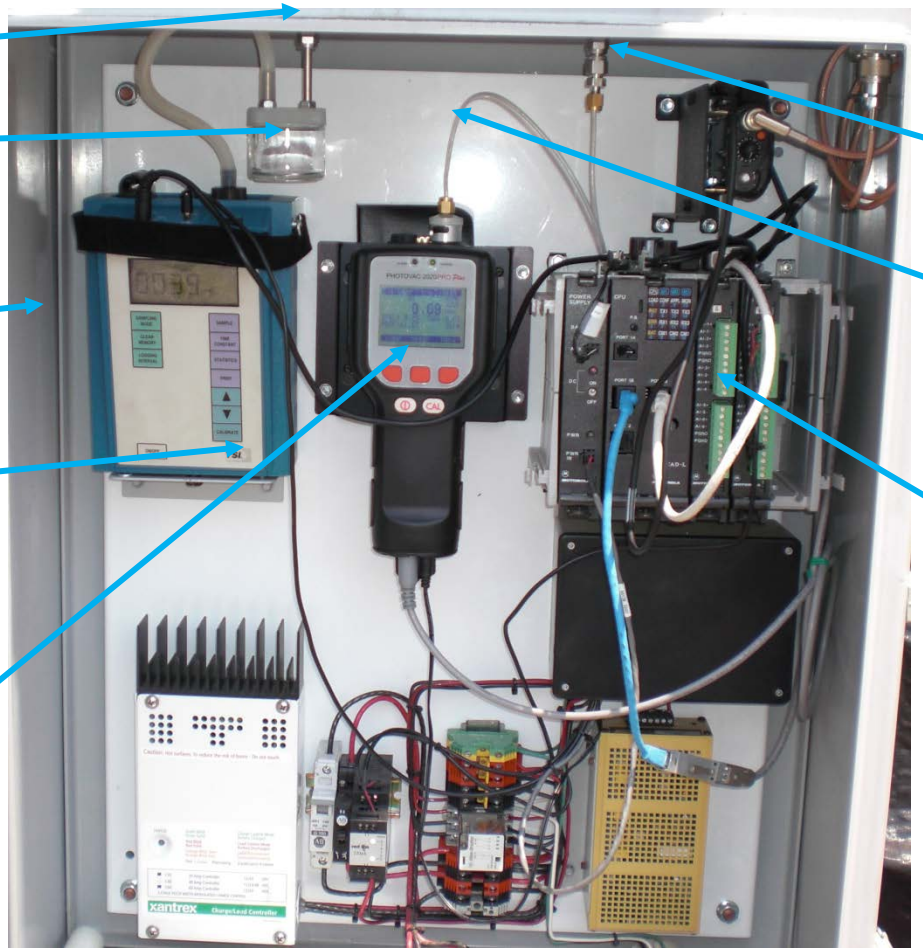
General Notes:

1. MGP = Manufactured Gas Plant.
2. VOC = Volatile Organic Compound.
3. PID = Photoionization Detector.
4. GC = Gas Chromatograph.
5. PM-10 = Respirable Particulate Matter.
6. ppmv = parts per million volume.
7. $\mu g/m^3$ = micrograms per cubic meter.
8. [C] = Concentration of target collected from a discrete sample.
9. $[C_{avg}]$ = 15-minute average concentration of target.
10. NA = Not Applicable.
11. NM = Target is not measured during this site condition.

Figures



COMMUNITY AIR MONITORING PLAN 93B MAPLE AVENUE FORMER MGP SITE HAVERSTRAW, NEW YORK	GEI Consultants	**SITE LOCATION MAP**
ORANGE & ROCKLAND UTILITIES, INC. SPRING VALLEY, NEW YORK	Project 1512010	January 2016 Fig. 1



1. Station enclosure
2. Organic Vapor Monitor (OVM)
3. OVM sample inlet
4. OVM sample inlet tubing
5. Dusttrak™ Aerosol Monitor portable real-time aerosol monitor
6. Dusttrak™ sample inlet with PM-10 impactor
7. DataRAM sample tubing with in-line condensor
9. Data communications device
10. Solar Panel

Note: Figure depicts an Air Monitoring System from Pine Environmental as an example and may not be representative of the actual system or components that will be employed at the Site

COMMUNITY AIR MONITORING PLAN
93B MAPLE AVENUE FORMER MGP SITE
HAVERSTRAW, NEW YORK

ORANGE & ROCKLAND UTILITIES, INC.
SPRING VALLEY, NEW YORK

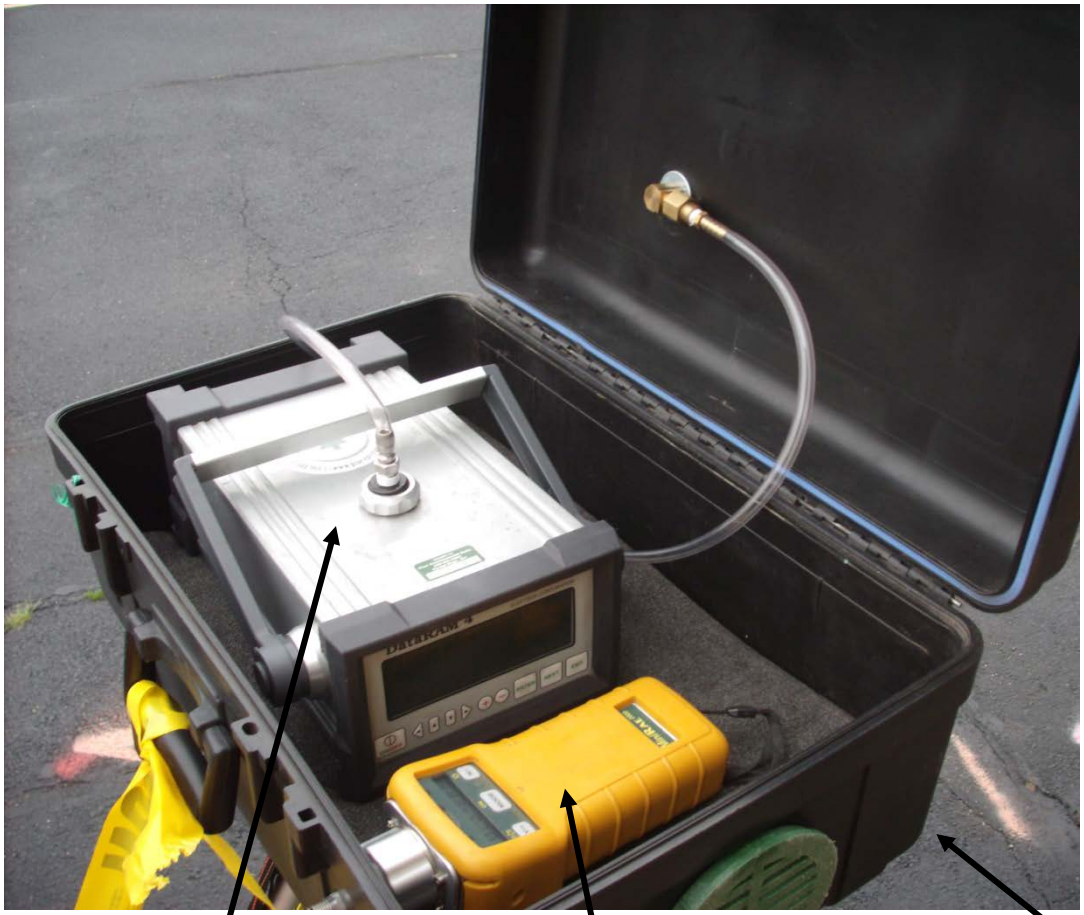
GEI Consultants

Project 1512010

EXAMPLE
FIXED STATION
INTERNAL COMPONENTS

January 2016

Fig. 2A



Particulate Meter

Organic Vapor Analyzer

Station Enclosure

Note: Figure depicts an Air Monitoring System from Pine Environmental as an example and may not be representative of the actual system or components that will be employed at the Site

COMMUNITY AIR MONITORING PLAN
93B MAPLE AVENUE FORMER MGP SITE
HAVERSTRAW, NEW YORK

ORANGE & ROCKLAND UTILITIES, INC.
SPRING VALLEY, NEW YORK

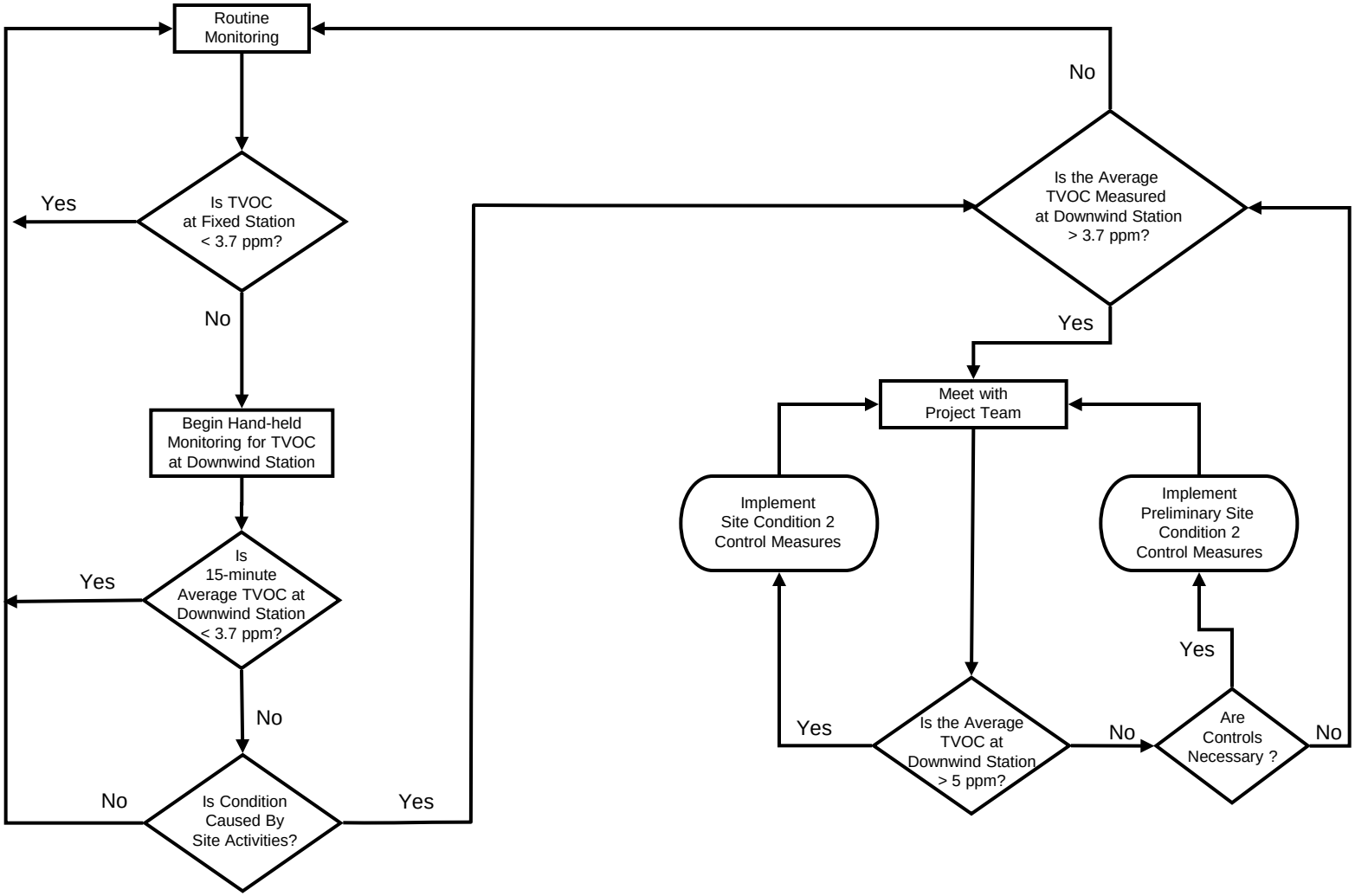
GEI Consultants

Project 1512010

EXAMPLE
TRIPOD MOUNTED STATION
INTERNAL COMPONENTS

January 2016

Fig. 2B



TVOC – Total Volatile Organic Compound

ppm – parts per million

COMMUNITY AIR MONITORING PLAN
93B MAPLE AVENUE FORMER MGP SITE
HAVERSTRAW, NEW YORK

ORANGE & ROCKLAND UTILITIES, INC.
SPRING VALLEY, NEW YORK

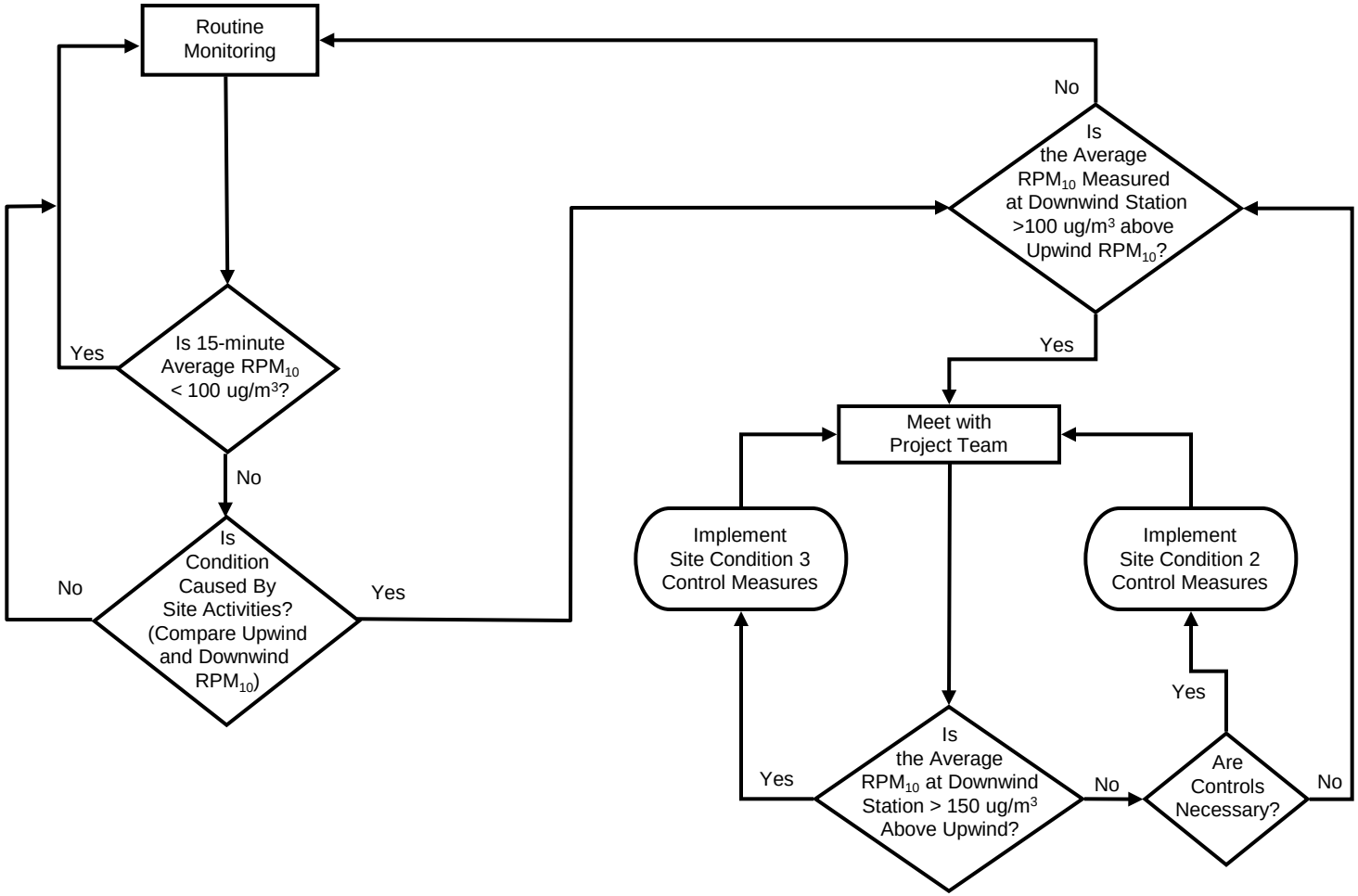
GEI Consultants

Project 1512010

TOTAL VOC DECISION DIAGRAM

January 2016

Fig. 3



RPM_{10} – Respirable Particulate Matter

ug/m^3 – micrograms per cubic meter

COMMUNITY AIR MONITORING PLAN
93B MAPLE AVENUE FORMER MGP SITE
HAVERSTRAW, NEW YORK

ORANGE & ROCKLAND UTILITIES, INC.
SPRING VALLEY, NEW YORK

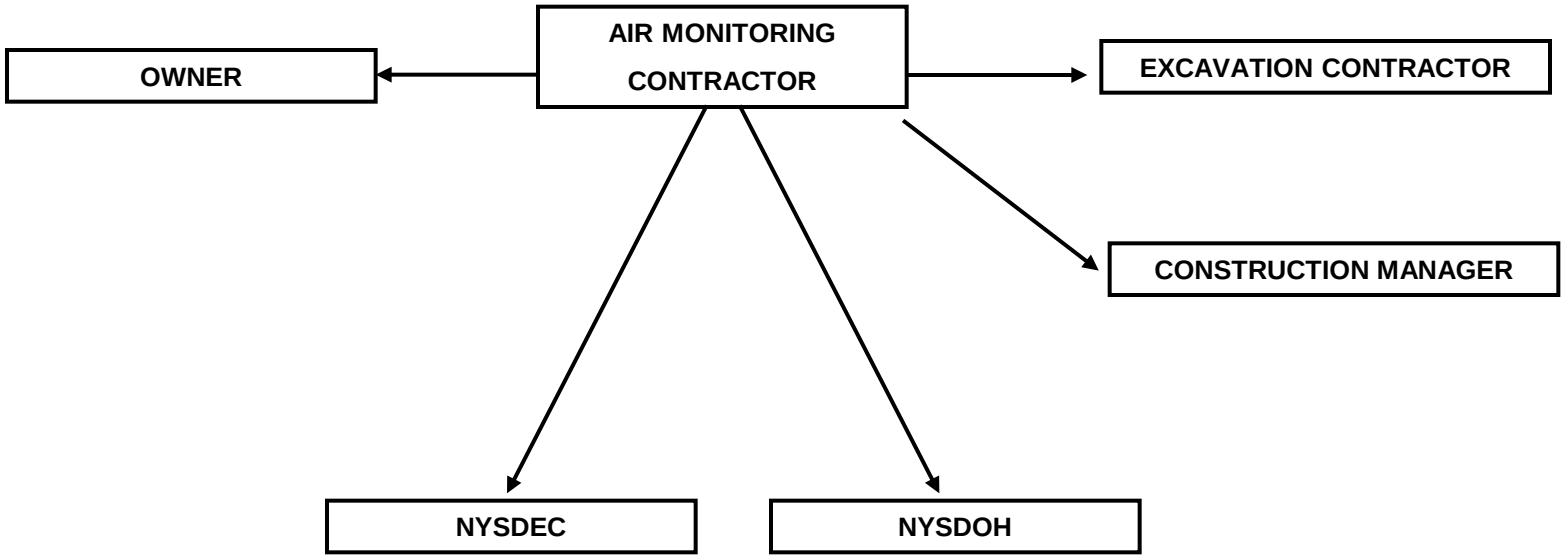
GEI Consultants

Project 1512010

RESPIRABLE PARTICULATE MATTER DECISION DIAGRAM

January 2016

Fig. 4



Owner, Air Monitoring Contractor, Excavation Contractor,
and NYS Representatives

Meet at the Field Office and/or Confer by Phone Within 60 Minutes of the Alert

If the primary contact is unavailable, contact alternatives in the order noted, or as shown on the contact list.

TBD – To Be Determined

COMMUNITY AIR MONITORING PLAN 93B MAPLE AVENUE FORMER MGP SITE HAVERSTRAW, NEW YORK	GEI Consultants	**COMMUNICATION FLOWCHART**
ORANGE & ROCKLAND UTILITIES, INC. SPRING VALLEY, NEW YORK	Project 1512010	January 2016 Fig. 5

APPENDIX I – SITE MANAGEMENT FORMS

APPENDIX I – SITE MANAGEMENT FORMS

Included in this appendix are the specific site management forms required for the SMP. Included is a Site Inspection Form that will be completed, at a minimum, on an annual basis. Operations and maintenance forms are not currently required as no active remedial systems are installed at the site.

SITE INSPECTION FORM

93B Maple Avenue Haverstraw Former Manufactured Gas Plant Site

SITE INSPECTION DATE: _____ **TIME OF ARRIVAL**: _____

DEPARTURE: _____

WEATHER: _____

_____

Orange and Rockland Representative(s): _____

INSPECTION TYPE: **Annual Inspection or Emergency Inspection**

(if emergency indicate event that required an inspection): _____

Are the Institutional Controls in place, performing properly, and remain effective?

Site Signage in Place? Yes / No

Does the Site comply with NYSDEC-approved Site Management Plan? Yes / No

Has ownership of the property changed since the last inspection? Yes / No

(Verify with Real Estate and Survey Departments)

Are there any changes to intended site use (restricted Residential, Commercial Yes / No

Or Industrial which would affect the SMP or institutional controls?

Is site used for agricultural purpose or vegetable gardens? Yes / No

Is groundwater used as source of potable or process water onsite Yes / No

If yes to the above – does water go through the necessary water quality treatment? Yes/No

SITE INSPECTION FORM

93B Maple Avenue Haverstraw Former Manufactured Gas Plant Site

Is solidified material visible? Yes / No

Is there any evidence of the damage to solidified soil from frost and wave Yes / No
Erosion?

Are the Engineering Controls in place, performing properly, and remain effective?

Surface Cover Intact (i.e. no evidence of erosion, excavations)? Yes / No

GENERAL SITE OBSERVATIONS:

Have there been any changes to the property since the last inspection?
(i.e. new equipment, residential buildings or facilities, changes in site topography, erosion, etc.)

NOTE:

Inspections should be made a minimum once a year and within 5 days of an emergency, such as a natural disaster or an unforeseen failure or damage to the building occurs. Inspections will be conducted by Orange and Rockland (or their agent) and results reported to NYSDEC.

COMPLETED BY:	**REVIEWED BY:**
SIGNATURE:	**SIGNATURE**

INSPECTION FORM

Project :	93B Maple Avenue MGP Site	**Date:**	
Property:	93B Maple Avenue (Lot 77) or 95 Maple Avenue (Lot 75)	**Report No.**	
		Page:	1 of
Client :	Orange and Rockland Utilties, Inc.	**Proj. No.**	

Time of Arrival: **Departure:** **Weather:**

GEI Representatives:

Purpose of Site Visit: Annual Inspection or Emergency Inspection (if emergency indicate event that required an inspection).

Observations

NOTES:
Inspections should be made a minimum once a year and within 5 days of an emergency, such as a natural disaster or an unforeseen failure or damage to the building occurs)

Observations should answer the following questions, the extent practicable.

1. Are the Institutional Controls in place, performing properly, and remain effective?
2. Have there been any changes to the property since the last inspection?
3. Has ownership of the property changed since the last inspection?

Attach applicable pictures at the end of this report.

By:	**Reviewed By:**

GEI Consultants

Summary of Green Remediation Metrics for Site Management

Site Name: _____ Site Code: _____
Address: _____ City: _____
State: _____ Zip Code: _____ County: _____

Initial Report Period (Start Date of period covered by the Initial Report submittal)
Start Date: _____

Current Reporting Period
Reporting Period From: _____ To: _____

Contact Information
Preparer's Name: _____ Phone No.: _____
Preparer's Affiliation: _____

I. Energy Usage: Quantify the amount of energy used directly on-site and the portion of that derived from renewable energy sources.

	Current Reporting Period	**Total to Date**
Fuel Type 1 (e.g. natural gas (cf))		
Fuel Type 2 (e.g. fuel oil, propane (gals))		
Electricity (kWh)		
Of that Electric usage, provide quantity:		
Derived from renewable sources (e.g. solar, wind)		
Other energy sources (e.g. geothermal, solar thermal (Btu))		

Provide a description of all energy usage reduction programs for the site in the space provided on Page 3.

II. Solid Waste Generation: Quantify the management of solid waste generated on-site.

	Current Reporting Period (tons)	**Total to Date (tons)**
Total waste generated on-site		
OM&M generated waste		
Of that total amount, provide quantity:		
Transported off-site to landfills		
Transported off-site to other disposal facilities		
Transported off-site for recycling/reuse		
Reused on-site		

Provide a description of any implemented waste reduction programs for the site in the space provided on Page 3.

III. Transportation/Shipping: Quantify the distances travelled for delivery of supplies, shipping of laboratory samples, and the removal of waste.

	Current Reporting Period (miles)	**Total to Date (miles)**
Standby Engineer/Contractor		
Laboratory Courier/Delivery Service		
Waste Removal/Hauling		

Provide a description of all mileage reduction programs for the site in the space provided on Page 3. Include specifically any local vendor/services utilized that are within 50 miles of the site.

IV. Water Usage: Quantify the volume of water used on-site from various sources.

	Current Reporting Period (gallons)	**Total to Date (gallons)**
Total quantity of water used on-site		
Of that total amount, provide quantity:		
Public potable water supply usage		
Surface water usage		
On-site groundwater usage		
Collected or diverted storm water usage		

Provide a description of any implemented water consumption reduction programs for the site in the space provided on Page 3.

V. Land Use and Ecosystems: Quantify the amount of land and/or ecosystems disturbed and the area of land and/or ecosystems restored to a pre-development condition (i.e. Green Infrastructure).

	Current Reporting Period (acres)	**Total to Date (acres)**
Land disturbed		
Land restored		

Provide a description of any implemented land restoration/green infrastructure programs for the site in the space provided on Page 3.

Description of green remediation programs reported above (Attach additional sheets if needed)
Energy Usage:
Waste Generation:
Transportation/Shipping:
Water usage:
Land Use and Ecosystems:
Other:

CERTIFICATION BY CONTRACTOR

I, _____ (**Name**) do hereby certify that I am _____ (**Title**) of the Company/Corporation herein referenced and contractor for the work described in the foregoing application for payment. According to my knowledge and belief, all items and amounts shown on the face of this application for payment are correct, all work has been performed and/or materials supplied, the foregoing is a true and correct statement of the contract account up to and including that last day of the period covered by this application.

_____

Date **Contractor**

APPENDIX J – RECORD OF DECISION

Department of Environmental Conservation

Division of Environmental Remediation

Record of Decision
O&R 93B Maple Avenue, Haverstraw MGP Site

Operable Unit No. 2: Former Stream Channel & Off-Site Building Area
Village of Haverstraw, Rockland County, New York
Site Number 3-44-044

March, 2006

New York State Department of Environmental Conservation
GEORGE E. PATAKI, *Governor* DENISE M. SHEEHAN, *Commissioner*

DECLARATION STATEMENT - RECORD OF DECISION

O&R 93B Maple Avenue, Haverstraw, Former MGP Inactive Hazardous Waste Disposal Site
Operable Unit No. 2: Former Stream Channel & Off-Site Building Area
Village of Haverstraw, Rockland County, New York
Site No. 3-44-044

Statement of Purpose and Basis

The Record of Decision (ROD) presents the selected remedy for Operable Unit 2 of the 93B Maple Avenue, Haverstraw, Former MGP site. The selected remedial program was chosen in accordance with the New York State Environmental Conservation Law and is not inconsistent with the National Oil and Hazardous Substances Pollution Contingency Plan of March 8, 1990 (40CFR300), as amended.

This decision is based on the Administrative Record of the New York State Department of Environmental Conservation (NYSDEC) for Operable Unit 2 of the 93B Maple Avenue, Haverstraw, Former MGP inactive hazardous waste disposal site, and the public's input to the Proposed Remedial Action Plan (PRAP) presented by the NYSDEC. A listing of the documents included as a part of the Administrative Record is included in Appendix B of the ROD.

Assessment of the Site

Actual or threatened release of hazardous waste constituents from this site have been addressed by implementing the interim remedial measure identified in this ROD. The removal of contaminated soil and waste from the site has significantly reduced the threat to public health and the environment. Therefore, a site management plan will be developed to monitor the remedy and ensure it continues to remain effective in the future.

Description of Selected Remedy

Based on the results of the Remedial Investigation (RI) for the O&R 93B Maple Avenue, Haverstraw, Former MGP site, the remedial measures taken to date, and the criteria identified for evaluation of alternatives, the NYSDEC has selected No Further Action. The components of the remedy are as follows:

- For tax parcels 73, 74 and 75 with the exception of the limited area noted in Figure 5, the excavation and off-site disposal of structures and contaminated soil above the 25 ppm total

PAHs remedial goal. Since the remedial cleanup goals were achieved for these parcels, no use restrictions will be required.

- For the portions of tax parcel 77 and 75 as identified on Figure 5, excavation was not possible and in situ chemical oxidation was utilized, but was unable to achieve the remedial goal. As excavation in this area is precluded by the building's presence, a site management plan will be developed to monitor the remedy and ensure it continues to remain effective in the future.

New York State Department of Health Acceptance

The New York State Department of Health (NYSDOH) concurs that the remedy selected for this site is protective of human health.

Declaration

The selected remedy is protective of human health and the environment, complies with State and Federal requirements that are legally applicable or relevant and appropriate to the remedial action to the extent practicable, and is cost effective. This remedy utilizes permanent solutions and alternative treatment or resource recovery technologies, to the maximum extent practicable, and satisfies the preference for remedies that reduce toxicity, mobility, or volume as a principal element.

MAR 24 2006

Date

Dale A. Desnoyers, Director
Division of Environmental Remediation

TABLE OF CONTENTS

SECTION **PAGE**

RECORD OF DECISION

O&R 93B Maple Avenue, Haverstraw MGP Site
Operable Unit No. 2: Former Stream Channel and Off-Site Building Area
Village of Haverstraw, Rockland County, New York
Site No.3-44-044
March, 2006

SECTION 1: SUMMARY AND PURPOSE OF THE RECORD OF DECISION

The New York State Department of Environmental Conservation (NYSDEC), in consultation with the New York State Department of Health (NYSDOH), has selected a remedy for Operable Unit 2 of the former Manufactured Gas Plant (MGP) Site located at 93B Maple Avenue in Haverstraw, NY. Operable Unit #2 (OU 2) of the site consists of the parcels on which a former stream passed through (lots 74, 75, and 76) after flowing through the former plant site and the property where the concrete block building at 93B Maple (lot 77) is located.

As more fully described in Sections 3 and 5 of this document, the production of manufactured gas and the generation of related byproducts have resulted in the disposal of hazardous wastes, including benzene, ethylbenzene, toluene, and xylene (BTEX), various polycyclic aromatic hydrocarbons (PAHs) and cyanide (CN). These wastes contaminated the soils and groundwater at the off-site building property and the historic stream channel of an unnamed stream that passed adjacent to the former plant site and discharged to a former ice pond. The discharge of these wastes resulted in:

- a significant threat to human health associated with potential exposure to contaminated subsurface soils and wastes.

- a significant environmental threat associated with the impacts from the contaminants to subsurface soils, surface water and groundwater.

During the course of the investigation certain actions, known as interim remedial measures (IRMs), were undertaken at the 93B Maple Avenue site in response to the threats identified above. An IRM is conducted at a site when a source of contamination or exposure pathway can be effectively addressed before completion of the remedial investigation/feasibility study (RI/FS). The IRMs undertaken at this site included removal of all of the former structures and contaminated overburden soils from operable unit 1, followed by OU2 which included a second excavation effort to remove all of the contaminated materials from the historic stream channel and bed, and the In Situ Chemical Oxidation (ISCO) of contaminated soils and NAPL underlying the 93B building.

Based on the implementation of the above IRMs, the findings of the investigation of this site indicate that the site no longer poses a significant threat to human health or the environment. Therefore, No Further Action with a Site Management Plan (SMP) was selected as the remedy for this operable unit of the site.

The selected remedy, discussed in detail in Section 6, is intended to attain the remediation goals identified for this site in Section 6. The remedy must conform with officially promulgated standards and criteria that are directly applicable, or that are relevant and appropriate. The selection of a remedy must also take into consideration guidance, as appropriate. Standards, criteria and guidance are hereafter called SCGs.

SECTION 2: SITE LOCATION AND DESCRIPTION

The 93B Maple Avenue site is located in the Village of Haverstraw, Rockland County, New York. The site is a rectangular, flat 0.21 acre parcel. The property is bounded by residential lots on Maple Avenue to the southwest, residential lots on Tor Avenue to the northwest, an alley to the northeast and residential lots to the southeast. The area is zoned for light industrial usage, it is predominately residential with some light industrial use nearby. Haverstraw Bay of the Hudson River is located approximately 800 feet to the east of the site. Please refer to Figures 1 and 2 for the above features.

An operable unit represents a portion of the site remedy that for technical or administrative reasons can be addressed separately to eliminate or mitigate a release, threat of release or exposure pathway resulting from the site contamination. Operable Unit 1 (OU 1), consists of the tax parcel on which the former manufactured gas plant (MGP) existed (lot 78) and the adjacent lots where remedial excavation activities were completed that successfully removed the contaminants. Please refer to Figures 4 and 5, which shows the extent of the completed remedial excavation which generally constitutes OU 1.

The remaining operable unit for this site, which is the subject of this document, is identified as Operable Unit 2 (OU2) and consists of the contamination underlying the concrete building at 93B (lot 77) Maple Avenue, and the contaminated former stream channel that extends through the properties with street addresses of 95, 99, and 103 Maple Avenue (lots 75, 74 and 73 respectively). Please refer to Figures 4 and 5.

SECTION 3: SITE HISTORY

3.1: Operational/Disposal History

A former manufactured gas plant (MGP) is a facility where gas for lighting and heating homes and businesses was produced. The plant at 93B Maple Avenue was constructed and began initial operation circa 1859. Manufactured gas was produced at this site using the coal gas process. Coal gas was produced by heating coal in retorts or beehive ovens, carbonizing the coal in the absence of air. The gas produced was then condensed and purified prior to distribution.

A New Historical Atlas of Rockland County (1876) and an 1884 lithograph shows the presence of a gas plant and a single gas holder. The plant was located on the northeastern side of the site along a railroad line and the holder was located along a small stream at the southwestern side of the site. This stream continued to the south, discharging into an ice pond, and then into an embayment of the Hudson River. According to the Haverstraw Department of Public Works (DPW), the stream was culverted and relocated by 1940. This culvert is located underneath the alleyway that runs parallel to Maple and West Avenues.

The site was acquired by Haverstraw Light and Fuel Company in 1894. The plant was believed to have shut down in 1893 or 1894, when operations shifted to the Clove and Maple Avenue site.

3.2: Remedial History

In 1997, Orange and Rockland Utilities (O&R) completed site assessments for both of the former manufactured gas plant sites in Haverstraw, New York. The results of this screening are presented in the, "Preliminary Site Assessment Report for Two Former Manufactured Gas Plant Sites, Haverstraw, New York", which identified the need for additional investigation and remediation of the site.

SECTION 4: ENFORCEMENT STATUS

Potentially Responsible Parties (PRPs) are those who may be legally liable for contamination at a site. This may include past or present owners and operators, waste generators, and haulers.

The NYSDEC and Orange and Rockland Utilities Inc. entered into a Consent Order on Jan. 2, 1996. The order obligates O&R to investigate the former MGP sites in their service area. This order was superceded by a second order (#D3-0001-99-01) dated March 11, 1999, which clarified the obligation to investigate, and as necessary, remediate the 93B Maple Avenue, Haverstraw manufactured gas plant site.

SECTION 5: SITE CONTAMINATION

A remedial investigation study (RI) has been completed to determine the nature and extent of any contamination by hazardous substances at this site.

5.1: Summary of the Remedial Investigation

The purpose of the RI was to define the nature and extent of any contamination resulting from previous activities at the site. The RI for the site was conducted between September 1998 and February 1999. The field activities and findings of the investigation are described in the draft RI report.

During the IRM for OU 1, from November 2002 to November 2003 on the former plant parcel, excavation activities located the former stream channel and the wastes contained within it. These activities also identified the contamination underneath the concrete block building (lot 77).

The following activities were conducted to define the alignment and wastes contained within the former stream channel:

- Research of historical information;

- Excavation and disposal of contaminated soils and waste from parcel 75 (95 Maple Avenue);

- Installation of approximately 112 soil borings to observe subsurface geologic conditions and collect subsurface soil samples;

- Collection and analysis of approximately 137 subsurface soil samples, and 36 confirmation subsurface soil samples during the IRM, for a total of approximately 173 subsurface soil samples;

- Installation of 4 additional monitoring wells to evaluate groundwater flow, and dewater the phase II IRM excavation;

- Collection of 3 groundwater samples from temporary well points for analytical analysis to confirm groundwater quality near several private residences.;

The following activities were also conducted after the IRM for OU 1, to define the contamination observed under the concrete block building (lot 77);

- Approximately 34 borings were installed to observe subsurface geologic conditions and collect subsurface soil samples;

- Collection and analysis of approximately 15 subsurface soil samples.

- Collection and analysis of approximately 8 subsurface soils samples after the in situ chemical oxidation effort.

To determine whether the soil and groundwater contains contamination at levels of concern, data from the investigation were compared to the following SCGs:

- Groundwater, drinking water, and surface water SCGs are based on NYSDEC “Ambient Water Quality Standards and Guidance Values” and Part 5 of the New York State Sanitary Code.

- Soil SCGs are based on the NYSDEC "Technical and Administrative Guidance Memorandum (TAGM) 4046; Determination of Soil Cleanup Objectives and Cleanup Levels".

- Background surface soil samples were taken from 17 locations, as shown on Figures 2 and 3, as part of the OU1 RI. The results of the analyses were compared to data from the RI (see Table 1) and a site remedial goal of 25 ppm total PAHs was defined to achieve unrestricted use.

Based on the RI results, in comparison to the SCGs and potential human and environmental exposure pathways, certain media and areas of the site required remediation. These are summarized below. More complete information can be found in the RI report, the Phase I IRM Construction Certification Report, the Phase II IRM Work Plan, and the Phase II IRM Construction Certification Report.

5.1.1: Site Geology and Hydrogeology

The site geology includes a fill layer at the current ground surface, underlain by layers of alluvium deposits and then a dense glacial till. The alluvium unit consists of loose materials deposited by running water, such as clay, silts, sands and gravels. The layer of fill material consists of gravel, loamy soil with cobbles, brick fragments, ash, cinders, coal, clinker, pottery and glass shards. The fill thickness ranges from approximately 8 to 15 feet.

Descending below the fill layer, the first subunit of the alluvium unit is a course-grained sand and gravel with some fine-grained material and cobbles. It ranges in thickness from 1 to 5 feet.

The second subunit is a clay unit. Its upper horizon is a massive gray and brown clay, which ranges in thickness from 1 to 16 feet. This layer grades at times to a clayey/silt, which ranges in thickness from 5 to 16 feet. This layer forms an effective confining unit beneath the site and was found to be continuous across the site and beneath the former stream channel area.

The groundwater at the site consists of a shallow, unconfined to semi-confined system due to the clay unit. Groundwater was encountered at the site within the upper alluvium and fill layers at a depth of 6 to 10 feet below ground surface. This shallow groundwater unit has approximately 11 to 15 feet of depth.

5.1.2: Nature of Contamination

As described in the design documents and final engineering certification report for the OU2 excavation, several groundwater, air, and soil samples were collected to characterize the nature and extent of contamination. These results were consistent with the data from the remedial investigation of the site and the Phase I excavation effort.

As summarized in Table 1, the main categories of contaminants which exceed their SCGs are volatile organic compounds (VOCs), and semivolatile organic compounds (SVOCs). These contaminants have contaminated the overburden soils and groundwater on the site.

Specific VOCs of concern are benzene, toluene, ethylbenzene, and xylenes. These are referred to collectively as BTEX in this document. Benzene is a known human carcinogen.

The specific semivolatile organic compounds of concern in soil and groundwater are the following polycyclic aromatic hydrocarbons (PAHs):

acenaphthene	acenaphthylene
anthracene	*benzo(a)anthracene*
benzo(a)pyrene	*benzo(b)fluoranthene*
benzo(g,h,i)perylene	*benzo(k)fluoranthene*
dibenzo(a,h)anthracene	*chrysene*
fluoranthene	fluorene
indeno(1,2,3-cd) pyrene	2-methylnaphthalene
naphthalene	phenanthrene
pyrene	

PAH concentrations referred to in this document are the summation of the individual PAHs listed above (i.e. total PAHs or TPAHs). The italicized PAHs are probable human carcinogens. The summation of the italicized PAHs is referred to in this document as cPAHs.

Tar is the major type of waste present at this site, and is typically found at former MGP sites. This tar is the predominant source of the BTEX, PAHs, and cyanide identified in various media at the site and discussed further in Section 5.1.3. MGP tars contain high levels of PAH compounds, often greater than 100,000 parts per million. These tars also may exceed SCGs for BTEX by several orders of magnitude.

These tars are reddish brown to black, oily liquids which do not readily dissolve in water. Materials such as this are commonly referred to as a non-aqueous phase liquid, or NAPL. Although most MGP tars are slightly more dense than water (DNAPL), the difference in density is slight. Consequently, they typically sink when in contact with water but can be found floating on top of the water surface, or suspended in the water column.

Typically site groundwater that comes into contact with the NAPL or impacted media, such as soil, results in the contamination of the groundwater and aqueous phase migration of the contaminants.

Certain metals were also found in excess of SCGs. Generally, these metal values were consistent with typical background concentrations or coincided with areas of identified site impacts (BTEX/PAHs).

In certain tar or heavily contaminated soil samples, enough benzene or other constituents may be present to require that the material be managed as a hazardous waste. During the design of the IRM, 13 samples were collected to make this determination for disposal purposes. The analyses performed included the Toxicity Characteristic Leaching Procedure (TCLP) and reactivity. The analytical results did not exceed hazardous threshold criteria.

5.1.3: Extent of Contamination

This section describes the findings of the investigation for all environmental media that were investigated.

Chemical concentrations are reported in parts per billion (ppb) for groundwater and parts per million (ppm) for waste and soil. For comparison purposes, where applicable, SCGs are provided for each medium.

Table 1 summarizes the degree of contamination for the contaminants of concern in the soils and groundwater of OU 2.

The following are the media which were investigated and a summary of the findings of the investigation. Additional detail relative to the contamination attributable to the MGP site are available in the RI report and the ROD for OU 1.

Waste Materials

The NAPL observed was limited in volume, and appeared to have a consistency of used motor oil. Generally, the NAPL was observed as a DNAPL that was present in the former stream channel and certain more permeable soil units in contact with this channel, and a permeable soil unit under the 93B building that connected to the former holder on the site addressed by OU1. Figures 4 and 5 illustrate the extent of the NAPL observations in the former stream channel area, and the extent of the contamination under the 93B building.

The NAPL under the 93B building is limited to the southern half of the building and appears to have originated from the former holder structure, which was removed by the OU1 excavation. The NAPL migrated as fingers through the porous fill and sand lenses at the site.

The OU1 excavation was unable to access the contamination observed underneath the 93B building and an area of soil adjacent to this building on the 95 Maple lot.

A second area of NAPLwas identified between the concrete block building (93B) and 93A Maple. This area appears to be associated with a former stream channel that contains DNAPL and debris. The stream itself was relocated into the culvert to the immediate east of the site, sometime after the plant ceased to operate. The DNAPL present in the historic trace of this stream may be the result of historic plant discharges into the former stream.

The course of this former stream channel, and the waste within it, are shown on Figures 4 and 5. The channel was observed at times to be trapezoidal and cut into the top of the clay unit. The stream flowed to the south and discharged to a former ice pond located immediately to the south east of 103 Maple.

Potential contaminants in the remainder of the former ice pond that are associated with the 93B Maple site, will be addressed by future remedial efforts for the Clove and Maple Former MGP site. This site is located adjacent to the former ice pond, across Maple Avenue.

Surface Soil

Numerous samples were collected during the remedial investigation of the site from 0 to 2 inches in depth to define surface soil conditions on site, off site and in the general area (background). No additional surface soil sampling was performed as part of the OU 2 excavation effort.

These samples found the site and local area soils to contain PAHs as further detailed in Table 1A and 1G (Background Samples).

Subsurface Soil

BTEX and PAHs were identified as contaminants of concern in the subsurface soils. Analytically, the subsurface soils under the 93B building and the former stream channel area contained PAHs that ranged from non detect (ND) to 11,790 ppm. Table 1 presents a summary of the analytical results for these compounds.

Generally, the distribution of these compounds in the subsurface soils coincide with the presence of DNAPL or fill materials. The fill materials on and around the site were observed to contain ash, coal, clinker and other anthropogenic (resulting from the influence of human beings) materials which contain PAHs. However, the levels of PAHs found in this fill is an order of magnitude below those observed in NAPL, and NAPL contaminated fill and soils.

The distribution of NAPL in the subsurface is discussed under the previous heading of MGP Waste Material. As noted in that discussion, the clay layer underlying the site is effectively containing the contamination.

Groundwater

BTEX, PAHs and cyanide have been identified as contaminants in the groundwater on the site. As part of the OU 2 work, three temporary well points and 4 dewatering wells were installed in the former stream chase area. The results in the former stream channel area are in Table 1B.

All of the exceedances for groundwater standards for site related compounds are from on site monitoring well MW-1 and temporary well point SC-1F, located in close proximity to NAPL that was removed. The other 5 site wells and temporary well points did not have any exceedances of groundwater criteria for BTEX, PAHs, or cyanide compounds.

5.2: Interim Remedial Measures

An interim remedial measure (IRM) is conducted at a site when a source of contamination or exposure pathway can be effectively addressed before completion of the RI/FS.

As detailed in the Phase I IRM Construction Certification Report and the Operable Unit 1 Record of Decision, this excavation removed all of the MGP contaminated soils from the following parcel lots: 80 and 85 (87 Maple Ave.), 79 (91 Maple Ave.), 76 (93A Maple Ave.), 86.1 (6 Tor Ave.) and 78 to a level of 25 ppm of total PAHs. This excavation resulted in approximately 6,100 tons of soil being removed and sent for off site treatment and disposal.

As part of the OU 1 IRM additional NAPL contamination was observed underneath a portion of the concrete block building at the site (93B), and within the former stream trace. As a result of these observations, the OU 1 excavation was extended to 95 Maple Ave.

Based on those observations, additional investigation was completed and a second operable unit (OU2) with a separate IRM was initiated. This OU2 IRM included in situ chemical oxidization to remediate the residual NAPL that could not be excavated or extracted from underneath the 93B building by the first IRM. This work also targeted an area of soil on 95 Maple, tax parcel 75, that also could not be excavated due to the block building. Additional excavation was also implemented to remove the contamination in the former stream channel on parcels 74 and 73. Please refer to Figure 5.

The confirmatory samples for the excavation on parcel 75 were below the 25 ppm total PAH site remedial action objective for unrestricted residential use. The total PAH values in the 6 confirmatory samples ranged from ND to 13.8 ppm.

The confirmatory samples for the excavation on parcels 73 and 74 were effectively below the 25 ppm total PAH site remedial action objective for unrestricted residential use. Of the 36 confirmatory samples collected, 34 were below 25 ppm, and two were slightly above the objective at 29 and 31 ppm of Total PAHs.

Both of the samples that were over the cleanup objective, were collected at the bottom of the deep cofferdam excavation (approximately 15 feet below grade). As these samples appeared to be visually unimpacted, and the small value of the exceedances over the objective are within the statistically variation expected from the sampling and analytical procedures; the samples are believed to conform to the remedial action objective.

Additionally, individual levels of benzene and xylene were detected in 8 of the 36 confirmatory samples collected on parcels 73 and 74. These detections ranged from .13 to 2.5 ppm and 1.2 to 2.3 ppm respectively. However, all of the confirmatory samples met the SCG of 10 ppm for total BTEX. As residual levels of BTEX will be expected to bioremediate naturally in the near term, these samples indicate a successful removal of contamination associated with the subsurface soils.

The in situ portion of the Phase II IRM was focused on the contamination that remained under the 93B building, and those soils on the 95 Maple Avenue parcel which could not be excavated due to stability concerns for the concrete block building at 93B Maple.

Approximately 26 injection wells were installed in these areas to provide access to the subsurface contamination. Over 20,000 pounds of sodium persulfate, a chemical oxidant, and

catalyst were then injected over three separate dosing events. Confirmation samples were taken after the first and third events, to assess the effectiveness of the treatment. The results of these samples, as well as the pre-treatment characterization samples are included in Tables 1E and 1F.

Although some reduction in the overall values was observed, the treatments did not achieve the remedial action objective of 25 ppm for total PAHs. Additionally, the reductions observed for each treatment were much lower than anticipated, which indicated that multiple rounds of additional treatment were unlikely to achieve the remedial goal. Hence no further applications were made and the injection wells and downgradient collection trench were decomissioned.

5.3: Summary of Human Exposure Pathways:

This section describes the types of human exposures that may present added health risks to persons at or around the site. A more detailed discussion of the human exposure pathways can be found in Section 7 of the RI report.

An exposure pathway describes the means by which an individual may be exposed to contaminants originating from a site. An exposure pathway has five elements: [1] a contaminant source, [2] contaminant release and transport mechanisms, [3] a point of exposure, [4] a route of exposure, and [5] a receptor population.

The source of contamination is the location where contaminants were released to the environment (any waste disposal area or point of discharge). Contaminant release and transport mechanisms carry contaminants from the source to a point where people may be exposed. The exposure point is a location where actual or potential human contact with a contaminated medium may occur. The route of exposure is the manner in which a contaminant actually enters or contacts the body (e.g., ingestion, inhalation, or direct contact). The receptor population is the people who are, or may be, exposed to contaminants at a point of exposure.

An exposure pathway is complete when all five elements of an exposure pathway exist. An exposure pathway is considered a potential pathway when one or more of the elements currently do not exist, but could in the future.

Prior to implementation of the previous IRM for OU 1 of this site, and the implementation of additional remedial measures by the second phase IRM, the potential existed for exposure to site related contaminants in surface and sub-surface soil.

Given the completion of these IRMs, the potential for exposure to site related soil contaminants in concentrations that may represent a health concern has been eliminated, except for those chemically oxidized soils remaining under the 93B building and a limited area on 95 Maple. However, the institutional controls proposed for these areas will address the potential for exposure to the remaining contaminants in these areas as well.

5.4: Summary of Environmental Impacts

This section summarizes the existing and potential future environmental impacts presented by the site prior to the IRM. Environmental impacts include existing and potential future exposure pathways to fish and wildlife receptors, as well as damage to natural resources such as aquifers and wetlands.

The Fish and Wildlife Impact Analysis, which is included in the March 2002 Fish and Wildlife Impact Analysis Report, presents a detailed discussion of the existing and potential impacts from the site to fish and wildlife receptors.

Due to the urban nature and small size of the site, it provides no wildlife habitat. The closest habitat of significance is Haverstraw Bay, in the Hudson River. The river is located approximately 1000 feet east and south east of the site, as shown on Figures 1 and 2. No pathways or negative impacts were identified from OU 1 or OU 2 to Haverstraw Bay. The potential for significant impacts are considered unlikely, due to the limited site size and available data from groundwater and the storm sewer system.

SECTION 6: SUMMARY OF THE REMEDIATION GOALS AND SELECTED REMEDY

Goals for the remedial program have been established through the remedy selection process stated in 6 NYCRR Part 375-1.10. At a minimum, the remedy selected must eliminate or mitigate all significant threats to public health and/or the environment presented by the hazardous waste disposed at the site through the proper application of scientific and engineering principles.

The proposed future use of the parcels is expected to continue to be residential for tax parcels 73, 74 and 75. Tax parcel 77 is expected to remain commercial.

Prior to the completion of the IRM described in Section 5.2, the remedial goals for this site were to eliminate or reduce to the extent practicable:

- exposures of persons at or around the site to BTEX and PAHs in subsurface soils, and former structures;

- the potential release of contaminants from subsurface soil and former plant structures into groundwater;

The NYSDEC believes that the IRM has accomplished these remediation goals by the complete excavation and off site treatment and disposal of contaminants from this operable unit of the site, specifically tax parcels 73, 74 and the majority of tax parcel 75, and the placement of institutional controls on the residual contaminants that remain after the in situ chemical oxidation for tax parcels 77 and a small portion of tax parcel 75.

The main SCGs applicable to this project are as follows:

- ambient groundwater quality standards are being met as the sources of groundwater contamination have been removed from the site, the primary groundwater contaminants of BTEX are readily biodegradable, and several volumes of contaminated groundwater were removed from the impacted area as part of the IRM dewatering efforts;

- no future wells will be installed at the site without the review and approval of the Rockland County Health Department, this existing institutional control will assure appropriate review of future groundwater use at the operable unit; and

- soil quality has been restored to conditions that will provide for unrestricted residential use as all of the contaminated site soils and contaminated structures have been removed and replaced with backfill that meets NYSDEC generic soil cleanup objectives for tax parcels 73, 74 and a majority of parcel 75.

- soil quality has been improved by multiple treatments of in situ chemical oxidation for a small portion of tax parcel 75 and tax parcel 77.

- soil vapor intrusion is not a concern for the existing building since indoor air monitoring before and during the in-situ oxidation did not identify detectable levels of contamination, the oxidation significantly decreased the volatile levels in the impacted soil remaining and clean groundwater is present beneath the building.

The following elements of the IRM have achieved the remediation goals and satisfy SCGs for the site:

- For tax parcels 73, 74 and 75 with the exception of the limited area noted in Figure 5, the excavation and off-site disposal of structures and contaminated soil above the 25 ppm total PAHs remedial goal. Based upon the achievement of the remedial goal, no site use restrictions are required.

- For tax parcels 77 and the small area of subsurface soil on parcel 75, identified on Figure 5, the multiple treatments via in situ chemical oxidation of those soils and NAPL where excavation was not possible. The treatment was not able to fully achieve the 25 ppm goal. However, since excavation in this area is precluded by the building's presence and the area of contamination is at least 8 feet below ground surface, as well as below the groundwater table, the potential for exposure to the remaining contamination is addressed and the current use of the site may continue.

Based on the results of the investigations at the site, the IRM that has been performed and the evaluation presented here, the NYSDEC has selected No Further Action as the preferred alternative for the site .

The basis for this selection is the NYSDEC's conclusion that No Further Action will be protective of human health and the environment and will satisfy all SCGs, as described above. Overall protectiveness is achieved through meeting the remediation goals listed above.

1. Since the site remedial cleanup goals were achieved or exposure to areas beneath the building and the area of parcel 75 identified on Figure 5 is addressed, for tax parcels 73, 74, 75 and 77 no use restrictions will be required.

2. A site management plan (SMP) will be developed and implemented which will: (a) require Orange and Rockland seek a formal agreement with the owners of parcels 75 and 77 to allow the removal of the remaining contamination, identified by Figure 5, should the building be demolished in the future; and (b) require Orange & Rockland provide a certification that the site management plan is being followed, on a periodic basis, until such time as the remaining contamination should be removed from parcels 75 and 77.

Therefore, the NYSDEC concludes that No Further Action is needed with the noted site management plan.

SECTION 7: HIGHLIGHTS OF COMMUNITY PARTICIPATION

As part of the remedial investigation process, a number of Citizen Participation activities were undertaken to inform and educate the public about conditions at the site and the potential remedial alternatives. The following public participation activities were conducted for the site:

- Repositories for documents pertaining to the site were established.

- A public contact list, which included nearby property owners, elected officials, local media and other interested parties, was established.

- This contact list has been regularly updated to include interested parties and current mailing addresses.

- Fact sheets were mailed to the contact list, in english and spanish, to keep the community informed of site activities and public meetings.

- Door to door outreach was undertaken to supplement the mailings and local media.

- Public information meetings were held in December 2004 and October 2002 to keep the public abreast of upcoming site work and investigation results.

- A public meeting was held on March 15, 2005 to present and receive comment on the PRAP for Operable Unit 1.

- A public meeting was held on February 28, 2006, to present and receive comment on the PRAP for Operable Unit 2.

- A responsiveness summary (Appendix A) was prepared to address the comments received during the public comment period for the PRAP for Operable Unit 2.

In general, the public comments received were supportive of the selected remedy.

TABLE 1 A
On Site (Operable Unit 1) Surface Soil Concentrations
93B Maple Avenue Former MGP Site
May 1997

SURFACE SOIL	Contaminants of Concern	Concentration Range Detected (ppm)[a]	SCG[b] (ppm)[a]	Frequency of Exceeding SCG
Volatile Organic Compounds (VOCs)	Benzene	ND	0.06	0/2
	Toluene	ND	1.5	0/2
	Ethylbenzene	ND	5.5	0/2
	Xylene	ND	1.2	0/2
	BTEX	ND	10	0/2
Semivolatile Organic Compounds	Total cPAHs	8 - 45	10	1/2
	Total PAHs	15 - 75	25	1/2
Inorganic	Cyanide	.39 - .75	NA	0/2

TABLE 1 B
Nature and Extent of Shallow Groundwater Contamination
Former Stream Channel Area (Operable Unit 2)
93B Maple Avenue Former MGP Site
October 2004

GROUNDWATER	Contaminants of Concern	Concentration Range Detected (ppb)[a]	SCG[b] (ppb)[a]	Frequency of Exceeding SCG
Volatile Organic Compounds (VOCs)	Benzene	ND - 2 J	1	1/3
	Toluene	ND	5	0/3
	Ethylbenzene	ND	5	0/3
	Xylene	ND	5	0/3
	BTEX	ND - 2 J	NA	0/3
Semivolatile Organic Compounds	Total cPAHs	ND	NA	0/3
	Total PAHs	ND - 1	NA	0/3
Inorganic	Cyanide	ND - 4.8	200	0/3

TABLE 1 C
Nature and Extent of Subsurface Soil Contamination Pre IRM
Former Stream Channel Area (Operable Unit 2)
93B Maple Avenue Former MGP Site
June 2004 - October 2004

SUBSUBFACE SOIL	Contaminants of Concern	Concentration Range Detected (ppb)[a]	SCG[b] (ppb)[a]	Frequency of Exceeding SCG
Volatile Organic Compounds (VOCs)	Benzene	ND - 4.4	0.06	25/124
	Toluene	ND - 15	1.5	6/124
	Ethylbenzene	ND - 190	5.5	8/124
	Xylene	ND - 230	1.2	19/124
	BTEX	ND - 438	10	10/124
Semivolatile Organic Compounds	Total cPAHs	ND - 2,650	10	32/124
	Total PAHs	ND - 11,790	25[d]	34/124
Inorganic	Cyanide	ND - 2.3	NA	0/124

TABLE 1 D
Post IRM Subsurface Soil Contamination
Operable Unit 2, Former Stream Channel Area
93B Maple Avenue Former MGP Site
April 2005 - May 2005

EXCAVATION BOTTOM SAMPLE	Contaminants of Concern	Concentration Range Detected (ppm)[a]	SCG[b] (ppm)[a]	Frequency of Exceeding SCG
Volatile Organic Compounds (VOCs)	Benzene	ND - 2.5	0.06	8/36
	Toluene	ND - .43	1.5	0/36
	Ethylbenzene	ND - .26	5.5	0/36
	Xylene	ND - 2.3	1.2	3/36
	BTEX	ND - 3.5	10	0/36
Semivolatile Organic Compounds	Total cPAHs	ND - 10.7	10	1/36
	Total PAHs	**ND - 31.1**	**25[d]**	**2/36**
Inorganic	Cyanide	NA	NA	0/3

TABLE 1 E
Nature and Extent of Subsurface Soil Contamination Pre IRM
In Situ Chemical Oxidation Area (Operable Unit 2)
93B Maple Avenue Former MGP Site
October 2003 - March 2004

SUBSURFACE SOIL	Contaminants of Concern	Concentration Range Detected (ppm)[a]	SCG[b] (ppm)[a]	Frequency of Exceeding SCG
Volatile Organic Compounds (VOCs)	Benzene	ND - .12	0.06	3/8
	Toluene	ND - 5.7	1.5	3/8
	Ethylbenzene	ND - 71	5.5	3/8
	Xylene	.004 J - 230	1.2	3/8
	BTEX	.004 - 306	10	3/8
Semivolatile Organic Compounds	Total cPAHs	ND - 1,464	10	10/15
	Total PAHs	0.1 - 7,543	25[d]	10/15
Inorganic	Cyanide	NA	NA	NA

TABLE 1 F
Post IRM Subsurface Soil Contamination
Operable Unit 2, In Situ Chemical Oxidation Area
93B Maple Avenue Former MGP Site
May 2005

SUBSURFACE SOIL	Contaminants of Concern	Concentration Range Detected (ppm)[a]	SCG[b] (ppm)[a]	Frequency of Exceeding SCG
Volatile Organic Compounds (VOCs)	Benzene	NA	0.06	NA
	Toluene	NA	1.5	NA
	Ethylbenzene	NA	5.5	NA
	Xylene	NA	1.2	NA
	BTEX	NA	10	NA
Semivolatile Organic Compounds	Total cPAHs	21 - 1,514	10	8/8
	Total PAHs	**41 - 9,774**	**25[d]**	**8/8**
Inorganic	Cyanide	NA	NA	NA

TABLE 1 G
Background Soil Concentrations
93B Maple Avenue Former MGP Site
June 1997 - December 2001

SURFACE SOILS	Contaminants of Concern	Concentration Range Detected (ppm)[a]
Volatile Organic Compounds (VOCs)	Benzene	ND
	Toluene	ND
	Ethylbenzene	ND
	Xylene	ND - .001
	BTEX	ND - .001
Semivolatile Organic Compounds	Total cPAHs	5 - 45
	Total PAHs	3.7 - 117
Inorganic	Cyanide	ND

For Table 1A-D

[a] ppb = parts per billion, which is equivalent to micrograms per liter, µg/l, in water;
ppm = parts per million, which is equivalent to milligrams per kilogram, mg/kg, in soil;
µg/m^3 = micrograms per cubic meter
ppbv = parts per billion by volume

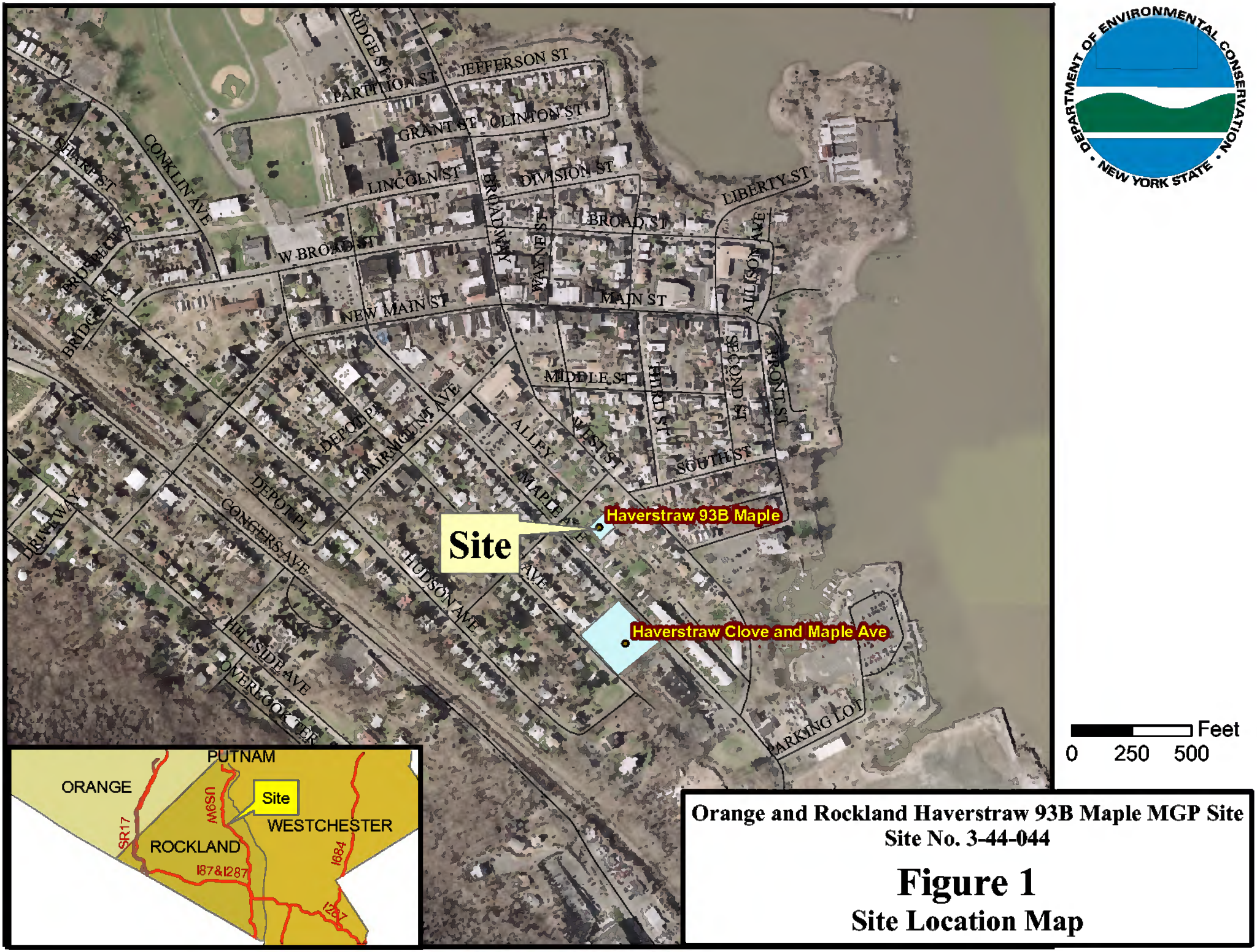
[b] SCG = standards, criteria, and guidance values;

[c] LEL = Lowest Effects Level and SEL = Severe Effects Level. A sediment is considered to be contaminated if either of these criteria is exceeded. If both criteria are exceeded, the sediment is severely impacted. If only the LEL is exceeded, the impact is considered to be moderate.

[d] A local background value was used to establish unrestricted residential use

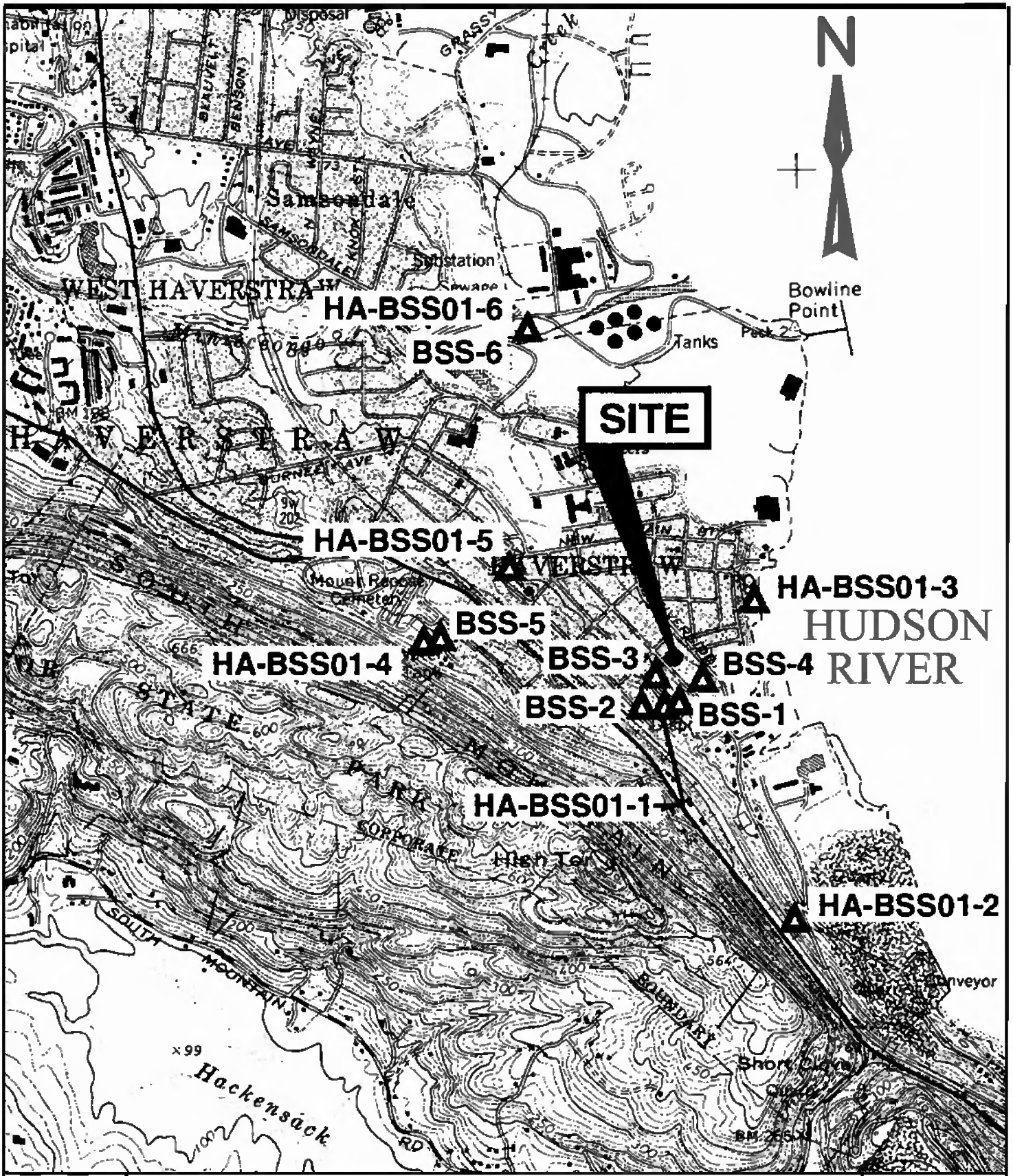
NT - Not tested for this parameter
ND - Not Detected
NA - None Available
J - Estimated value

BTEX indicates the summation of benzene, toluene, Ethylbenzene and xylene
Total PAH indicates the total of all PAH compounds identified
Total cPAH indicates the total of the seven PAH compounds that are considered carcinogenic



Orange and Rockland Haverstraw 93B Maple MGP Site
Site No. 3-44-044

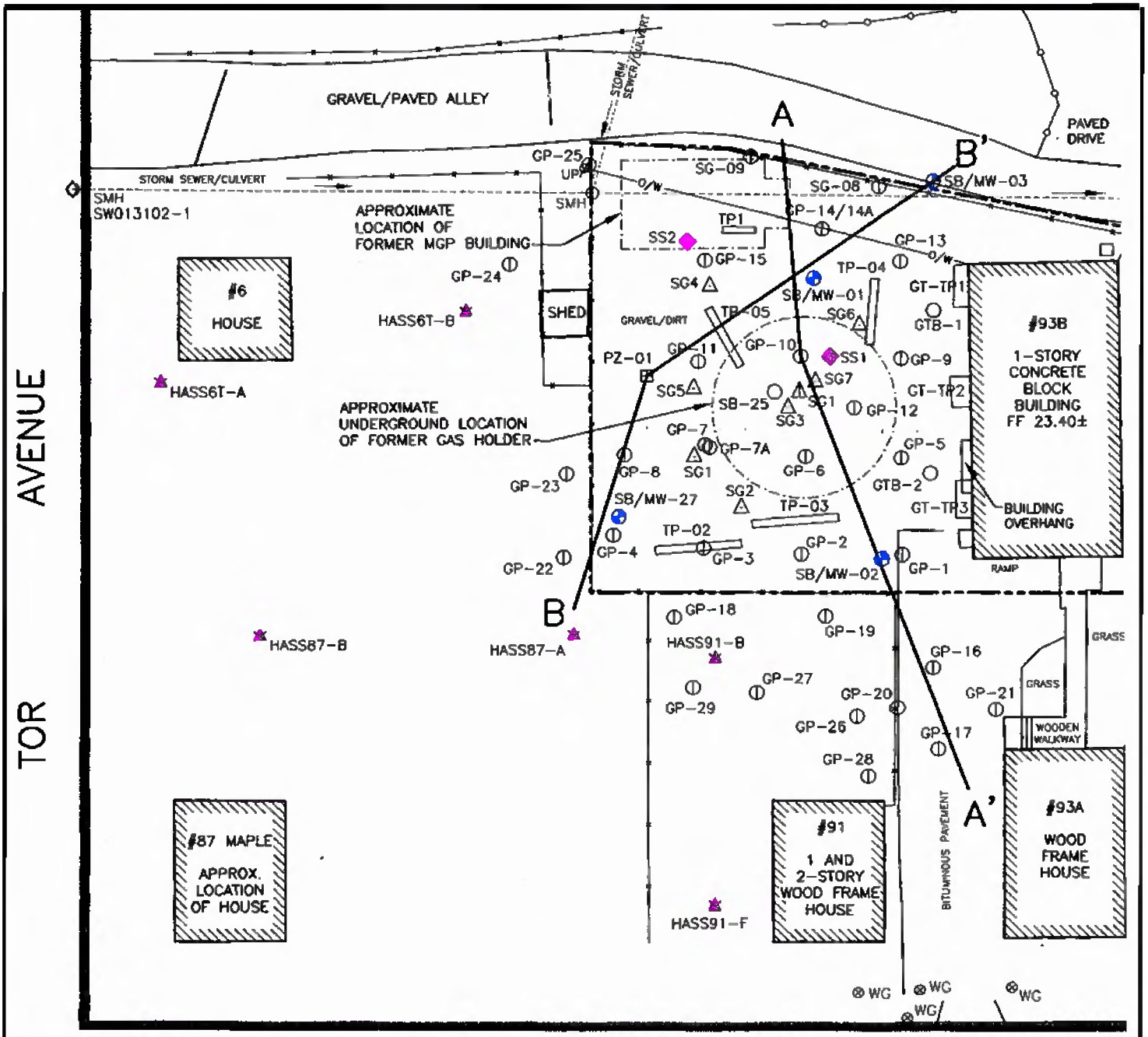
Figure 1
Site Location Map



O&R 93B MAPLE AVENUE, HAVERSTAW MGP SITE, 3-44-044
HAVERSTRAW (V), ROCKLAND COUNTY, NEW YORK

SITE LOCATION AND REGIONAL BACKGROUND SAMFLE LOCATIONS

FIGURE 2



NOTES:

XX-SSXX-X SURFACE SOIL SAMPLE

GP-XX/SG-X GEOPROBE SUBSURFACE SOIL SAMPLE

SB/MW-XX SOIL BORING/MONITORING WELL LOCATION

SWXXXXXX-X SURFACE WATER SAMPLE LOCATION

GTB-X GEOTECHNICAL BORING LOCATION

GT-X GEOTECHNICAL TEST PIT LOCATION

TP-XX TEST PIT LOCATION

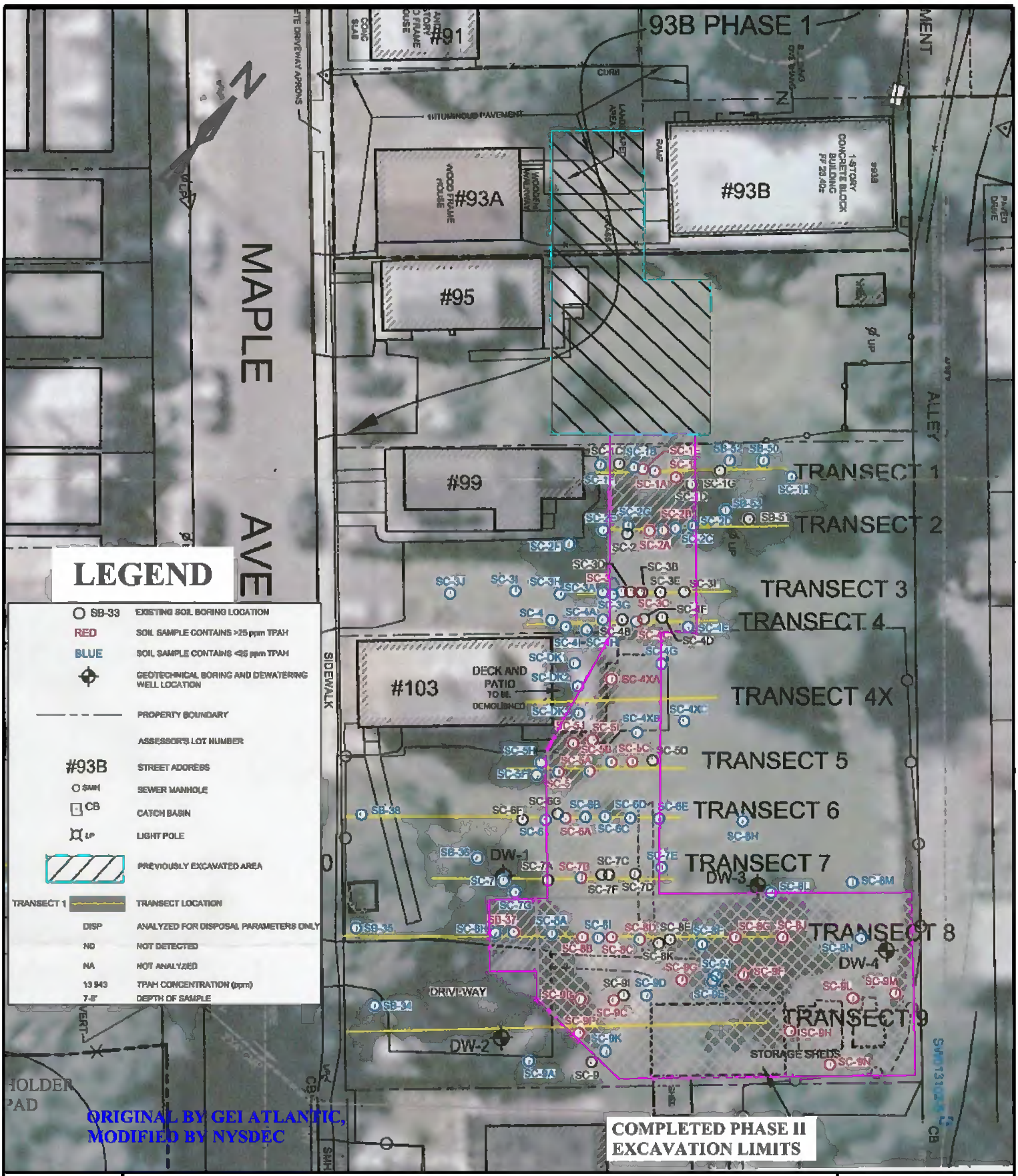
SG-1 SOIL GAS SAMPLE LOCATION

PZ-XX PIEZOMETER LOCATION

O&R 93B MAPLE AVENUE, HAVERSTRAW MGP SITE, 3-44-044
HAVERSTRAW (V), ROCKLAND COUNTY, NEW YORK

SAMPLE LOCATIONS

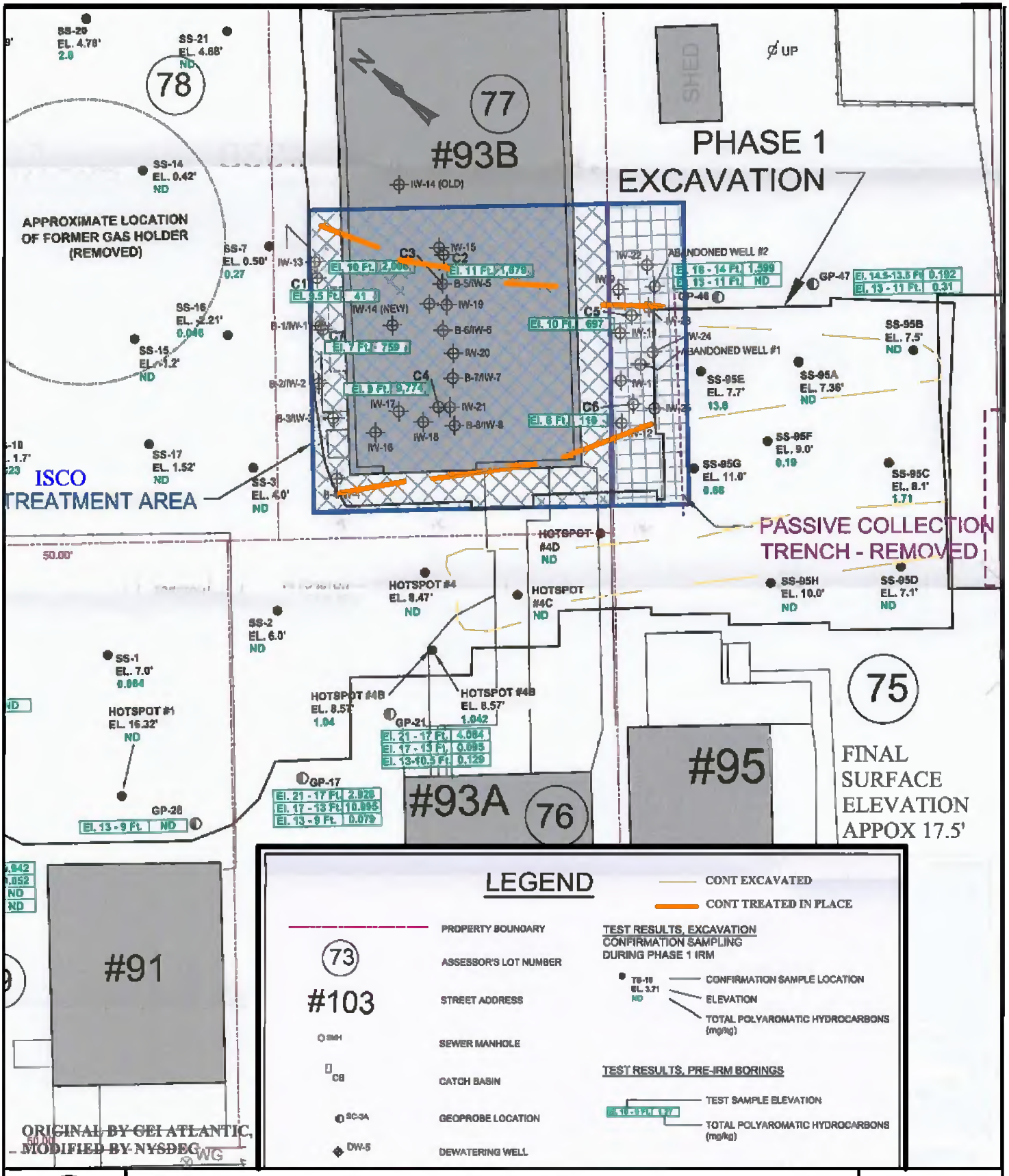
FIGURE 3



O&R 93B MAPLE AVENUE, HAVERSTRAW MGP SITE, 3-44-044
HAVERSTRAW (V), ROCKLAND COUNTY, NEW YORK

SITE LOCATION AND STREAM CHASE REMOVAL

FIGURE 4



O&R 93B MAPLE AVENUE, HAVERSTRAW MGP SITE, 3-44-044
HAVERSTRAW (V), ROCKLAND COUNTY, NEW YORK

IN SITU CHEMICAL OXIDATION CLOSEUP

FIGURE 5

APPENDIX A

Responsiveness Summary

RESPONSIVENESS SUMMARY

O&R 93B Maple Avenue Former MGP Site
Operable Unit 2: Former Stream Channel and Off Site Building Area
Village of Haverstraw, Rockland County, New York
Site No. 3-44-044

The Proposed Remedial Action Plan (PRAP) for Operable Unit 02 of the O&R 93B Maple Avenue Former Manufactured Gas Plant (MGP) site, was prepared by the New York State Department of Environmental Conservation (NYSDEC) in consultation with the New York State Department of Health (NYSDOH) and was issued to the document repositories on February 7, 2006. The PRAP outlined the remedial measures proposed for the contaminated soils and groundwater at Operable Unit 2 of the O&R 93B Maple Avenue Former MGP site. The release of the PRAP was announced by sending a notice to the public contact list, informing the public of the opportunity to comment on the proposed remedy.

A public meeting was held on **February 28, 2006**, which included a presentation of the Remedial Investigation (RI) and Interim Remedial Measure (IRM), as well as a discussion of the proposed remedy. The meeting provided an opportunity for citizens to discuss their concerns, ask questions and comment on the proposed remedy. The public comment period for the PRAP ended on March 10, 2006.

This responsiveness summary responds to all questions and comments raised during the public comment period. The following are the comments received, all of which were provided during the public meeting, with the NYSDEC's responses:

Comment 1: What about the area under the 93B building, will there be more digging?

Response 1: We are unable to excavate the soils under the building without demolishing the building. In situ chemical oxidation was employed as an alternate means of remediating the contamination under the building, but this method did not fully achieve our remedial goal of 25 ppm for total PAH levels. As the remaining contamination cannot be excavated without demolishing the existing building and does not present any current exposure to the public; the Record of Decision (ROD) provides for the existing building to remain and institutional controls be developed to ensure the contamination remains inaccessible to preclude any future exposures to the contaminants.

Comment 2: Our driveways from the alleyway are the only parking we have. Will any future work interfere with our parking, or cause vibration damage to our homes.

Response 2: The work for the 93B Maple Avenue Site is considered complete, with the

finalization of the ROD. It is unclear at this time, what remedial work will be required for the nearby Clove and Maple Site. However, the completed phases of IRM work successfully incorporated measures to minimize traffic problems with the alley way, as well as to prevent damage to any surrounding properties. Any future work would also be designed and operated in a similar manner.

Comment 3: Some of the vibrations were very loud and would rattle my dinner plates, but I could not feel them when I put my hands on the window sill.

Response 3: Vibrations and noise during major construction activities or in an urban environment are common. The IRM work utilized common construction equipment and was monitored with specialized equipment to not exceed industry standard values of vibration for construction to surrounding structures. Generally, buildings are not affected by noise and can tolerate a certain degree of vibration. At some level above this threshold, minor cosmetic damage could occur. There is the potential for more significant damage to possibly occur as these levels increase.

Comment 4: My house (private residence on West Street) had a preconstruction survey but I never received a copy of the video tape. Now I have cracks and leaking pipes. Who do I talk to about this?

Response 4: Regarding construction damage, the work was designed to prevent this. However, O&R will provide the video tape for the prework inspection of this specific residence, visit the building in question, and review the available monitoring data in an attempt to assess the issue. Any time there is concern with any aspect of the project, you can contact the NYSDEC project manager. The NYSDEC project manager will connect you with the appropriate person or information.

Comment 5: Was there any digging at 111 Maple Ave.?

Response 5: Only a small area of shallow excavation was necessary on this property to facilitate the remedial work at 104 Maple Ave. Landscaping work to restore the lawn was also completed on the 111 Maple avenue property.

Comment 6: Will the parking lot behind 111 Maple Ave. need to be dug up (remediated)? Will there be any future digging (remediation) at 111 Maple?

Response 6: This parcel, as well as all of the parcels associated with the former ice pond, are part of the O&R Clove and Maple MGP site. The need for any remedial work will be dependent on the results of the ongoing remedial investigation for that site.

Comment 7: When will this investigation (Clove and Maple MGP site) be completed?

Response 7: Field work is scheduled for 2006 with the goal of completing the remedial investigation of the site.

Comment 8: What were the probe holes in the parking lot behind 111 Maple that I observed?

Response 8: No remedial investigation work associated with either MGP site was performed in the parking lot area last year. The small probe holes may be from utility work for gas line leak detection.

Comment 9: Regarding the "Ice Pond", which is now the parking lot and apartments. What are the details on the "pond area". The parking lot there can flood for 3 or 4 days.

Response 9: The passage of more than 100 years makes it difficult to know the full details. Historic maps of the area, circa 1880, show an ice pond occupied a significant amount of the area between Maple and West Avenues to the south east of 104 Maple. Later maps indicate this area having been filled in and the borings logs from this area have confirmed up to 8 feet of fill. However, the drainage pattern of the neighborhood still flows to the former pond area.

Comment 10: My mother has lung cancer. Could her illness have resulted from exposure to contamination at this site? My mother was a smoker.

Response 10: Since the contamination associated with this site was present in the sub surface, the potential for casual exposure to site-related contamination was minimal. When there is minimal to no potential for exposure to a contaminant, there is little to no risk of an adverse health effect. The institutional and engineering controls discussed in Comment/Response #1 above, eliminates/prevents any potential for future exposures should any excavation be conducted. As you may be aware, individuals who smoke are at an increased risk of developing lung cancer. Based on information provided by the National Cancer Institute, 87 percent of all lung cancers are attributable to smoking.

Comment 11: There are concerns about prior or future use of contaminated water from local wells. What about the properties on West St.? When was public water supply started?

Response 11: We have no information indicating any wells are or were present in the areas where site contamination has been found. Public water has been available in the village since at least 1903. Today, public water is supplied from sources located outside of the area of concern. Public water is also required to be regularly tested for chemical contamination to confirm that it meets drinking

water standards. No new wells could be installed in the area of concern as the Rockland County Health Department would need to be notified and approve of any new water sources that are to be constructed.

Comment 12: What about the Head Start property?

Response 12: The data available from both MGP sites indicate that the Head Start property has not been impacted. However, the O&R property adjacent to the Head Start property is the Clove and Maple MGP site, which is contaminated.

Comment 13: When will it be known if other properties are affected?

Response 13: The Clove and Maple MGP Site is the subject of an ongoing Remedial Investigation (RI), which has identified contamination on the site. More data is needed to complete the remedial investigation and properly identify the extent of contamination, both on-site and off-site, associated with the Clove and Maple MGP site. Please see Comment/Response #7.

Comment 14: There is still concern about the parking situation. What about the alley and parking lot area? At least five houses are involved if it needs remediation?

Response 14: The NYSDEC has noted these concerns, please refer back to Comment/Response #2. Additionally, the NYSDEC will address concerns relative to the Clove and Maple site as that remedial program proceeds.

Administrative Record

O&R 93B Maple Avenue Former MGP Site
Site No. 3-44-044

1. Order on Consent, Index No. D3-0001-99-01, between NYSDEC and Orange and Rockland Utilities (O&R), executed on March 3, 1999.

2. "Preliminary Site Assessment Report for Two Manufactured Gas Plant Sites, Haverstraw, New York", August 1997, Remedial Technologies Inc.

3. "Draft Remedial Investigation Report, 93B Maple Avenue, Former Manufactured Gas Plant Site, Haverstraw, New York", March 29 2002, GEI Consultants Inc.

4. "Interim Remedial Measure Work Plan, 93B Maple Avenue Former Manufactured Gas Plant Site, Haverstraw, New York", August 2002, GEI Consultants Inc.

5. "Proposed Remedial Action Plan for the O&R 93B Maple Avenue Former MGP Site, Haverstraw, Rockland County, New York, Site Number 3-44-044", February 2005, New York State Department of Environmental Conservation.

6. "Interim Remedial Measures Certification Report, 93B Maple Avenue, Former Manufactured Gas Plant Site, Haverstraw, New York", March 2005, GEI Consultants, Inc.

7. "Interim Remedial Measure Certification Report, Phase II IRM, Operable Unit 02, 93B Maple Avenue, Former Manufactured Gas Plant Site, Haverstraw, New York", March 31, 2006, GEI Consultants.

APPENDIX K – O&M MANUAL

APPENDIX K – O&M MANUAL

The remedy does not require the operation and maintenance of a remedial system.

Should the NYSDEC require a remedial system to be installed, an O&M Manual will be prepared and include all as-built drawings and catalog-cuts on all fixed and mobile equipment necessary to operate and maintain the remedial system.