Halesite Former Manufactured Gas Plant

HALESITE, SUFFOLK COUNTY, NEW YORK

Remedial Action Work Plan – Phase II

NYSDEC Order on Consent Index No. D1-0001-98-11

AKRF Project Number: 60101

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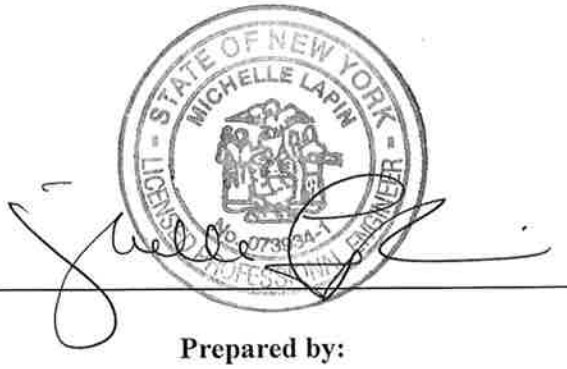

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LIST OF ACRONYMS

ACO – Administrative Consent Order
AMWP – Air Monitoring Work Plan
BTEX – Benzene, Toluene, Ethylbenzene, and Xylenes
CAMP – Community Air Monitoring Plan
CFH – Cubic Feet Per Hour
DNAPL – Dense Non Aqueous Phase Liquid
DO – Dissolved Oxygen
FER – Final Engineering Report
HASP – Health and Safety Plan
GCL – Geosynthetic Clay Liner
HASP – Health and Safety Plan
HVAC – Heating, Ventilation, and Air Conditioning
LILCO – Long Island Lighting Company
LIPA – Long Island Power Authority
LNAPL – Light Non Aqueous Phase Liquid
MGP – Manufactured Gas Plant
NAVD – North American Vertical Datum
NAPL – Non Aqueous Phase Liquid
NYCRR – New York Code of Rules and Regulations
NYSDEC – New York State Department of Environmental Conservations
NYSDOH – New York State Department of Health
O_2 – Oxygen
OM&M – Operation, Maintenance, and Monitoring
ORP – Oxidation-Reduction Potential
PAHs – Polycyclic Aromatic Hydrocarbons
PCBs – Polychlorinated Biphenyls
PPBV – Parts Per Billion-Volume
PPE – Personal Protective Equipment
PPM – Parts Per Million
QAPP – Quality Assurance Project Plan
QA/QC – Quality Assurance/Quality Control
RAOs – Remedial Action Objectives

RAP – Remedial Action Plan

RAWP – Remedial Action Work Plan

RDWP – Remedial Design Work Plan

RI – Remedial Investigation

RIR – Remedial Investigation Report

ROI – Radius of Influence

RSCOs – Recommended Soil Cleanup Objectives

SCGs – Standards, Criteria, and Guidance

SCOs – Soil Cleanup Objectives

SMP – Site Management Plan

SSSALs – Site Specific Soil Action Levels

SVOCs – Semivolatile Organic Compounds

SWPPP – Storm Water Pollution Prevention Plan

TAGM – Technical and Administrative Guidance Memorandum

TOH – Town of Huntington

VOCs – Volatile Organic Compounds

1.0 INTRODUCTION

The Halesite Former Manufactured Gas Plant (MGP) site is located in the Hamlet of Halesite, Town of Huntington, Suffolk County, New York (Figure 1). The site comprises approximately one acre located on the eastern side of North New York Avenue, south of the Halesite Post Office, and north of an office building property and a Town of Huntington Nature Preserve. The site is owned by the Long Island Power Authority (LIPA), and a portion of the site is used by LIPA as an electric system substation, which is currently operated and maintained by National Grid for LIPA. The remainder of the site is steeply sloped, was heavily vegetated at the start of remediation activities, but has been since cleared, and is vacant (Figure 2). An aerial photograph of the site, including the approximate site boundaries, is included as Figure 3. Remedial work at the site is being managed with the oversight of the New York State Department of Environmental Conservation (NYSDEC) and New York State Department of Health (NYSDOH) under Administrative Consent Order (ACO) Index No. D1-0001-98-11.

A Remedial Action Plan (RAP) submitted in March 2006 assessed remedial action options and outlined a general description of the remedy approved by NYSDEC. The preferred remedial alternative selected in the RAP consists of the following elements:

- Excavate soil in four dense non-aqueous phase liquid (DNAPL) tar on-site source areas, including any structures that may remain in place, with off-site thermal treatment of soils.
- Construct an engineered cap in the unsaturated zone across two DNAPL tar source areas in the Upland Area of the site.
- Establish institutional controls to prevent use of groundwater in the area affected by MGP-related contaminants and to prevent any disturbance of the engineered caps.
- Construct an engineered treatment barrier/zone along the Eastern and the Western property boundaries in the Lowland Area of the site.
- Recover DNAPL tar where feasible.
- Monitor groundwater for potential effects from MGP-related contaminants downgradient of the site and on the office building property south of the site.

A Remedial Action Work Plan (RAWP) – Phase I, which presented a design for the first two elements of the approved remedial approach, was submitted to and approved by the NYSDEC in August 2008. The objective of this RAWP – Phase II is to present a design for the remaining elements of the remedial approach, which include oxygen injection in the Lowland Area, non-aqueous phase liquid (NAPL) recovery, groundwater monitoring, and establishment of institutional controls. The RAWP was prepared in two phases to expedite completion of the active excavation and site restoration/stabilization prior to the end of 2008. A complete description of the Phase II remedial action is presented in Section 4.0.

2.0 SITE DESCRIPTION

2.1 SITE LOCATION

The Halesite former MGP site is located in Halesite, which is in the Town of Huntington in northwestern Suffolk County, New York. The approximately one-acre site is located along North New York Avenue, approximately 200 feet east of Huntington Harbor. A site survey is provided in Appendix A.

2.2 SITE AND VICINITY CHARACTERISTICS

An active LIPA electric substation is located on the western third, or Lowland Area, of the site. The remaining eastern two-thirds of the property, or Upland Area, is undeveloped land that is characterized by a steep slope. The substation and Upland Area of the site are fully enclosed and secured by a chain link fence.

The elevation of the site ranges from approximately 16 feet above mean sea level (msl – based on NAVD 1988) near the western boundary of the site in the Lowland Area to approximately 86 feet above msl at the eastern boundary of the site in the Upland Area. The topography in the Lowland Area of the site is relatively flat. The undeveloped Upland Area rises sharply eastward from approximately 20 feet to 60 feet above msl and continues to slope upward more gently to a highpoint of 86 feet above msl near the northeast corner of the property.

The surrounding area is primarily residential with a mixture of commercial properties along New York Avenue. A United States Postal Service post office is located north of the subject site, beyond which are residential properties. Residences are located east of the site. An office building property and the Town of Huntington (TOH) Nature Preserve are located south of the site. The Halesite Fire Department, TOH Marina and associated parking lot, and the Huntington Harbor are located west of the site across New York Avenue. The nearest surface water body is Huntington Harbor, located approximately 160 feet west of the western edge of the site. Surrounding land uses are shown on Figure 2.

2.3 SENSITIVE RECEPTORS

A Qualitative Human Exposure Assessment was completed as part of the March 2006 RAP to identify potential exposure of site contaminants to on-site or off-site receptors. Under current and future site use conditions, potential on-site receptors include possible trespassers and National Grid workers. Potential current and future off-site receptors include commercial workers, visitors to commercial establishments, off-site recreators, nearby off-site residents, and nearby off-site construction and utility workers.

2.4 SITE HISTORY

The Halesite former MGP (also known as the Huntington MGP) is believed to have operated from around 1892 to 1918. The water gas/carbureted gas or carbureted water-gas process and an oil-gas process were used on-site to manufacture gas. The plant was owned by the Standard Gas and Electric Light Company from 1892 to 1893. The Huntington Gas Company took over the site in 1900, followed by the Long Island Lighting Company (LILCO) in 1919. Structures that had been used for the manufacture of gas were later dismantled and removed from the site. Following the merger between LILCO and the Brooklyn Union Gas Company, the Halesite former MGP site became the property of LIPA, due to the presence of the electric substation

facility. The former MGP structures are depicted on Figure 2. Additional details regarding the history of the site are provided in the April 2004 Final Remedial Investigation Report (RIR).

2.5 DESCRIPTION OF CONTEMPLATED SITE USE

The future use is unlikely to change from the current use, and redevelopment is not anticipated.

2.6 SITE GEOLOGY, HYDROGEOLOGY, AND SUBSURFACE CHARACTERISTICS

Based on the results of the Remedial Investigation (RI), there are four primary stratigraphic units at the site. These units in order of increasing depth are as follows: topsoil/fill material, shallow sand unit, fine-grained unit, and glacial sand unit. The fine-grained unit primarily consists of silty sands and clay-rich silts with lesser amounts of clay. This unit is fairly continuous and encountered throughout the Lowland and Upland portions of the site. The unit is encountered between 8 and 10 feet below ground surface in the Lowland Area, and given its variable topography, at depths ranging from approximately 20 to 70 feet below ground surface, in the Upland Area. The unit is generally less than 5 feet thick, but grades to a thickness of up to 8 feet in areas of the Upland Area. Based on geotechnical analyses, the fine-grained unit acts as a partial confining unit, and where present, this unit has inhibited the vertical migration of MGP-related material released to the shallow subsurface environment. Geologic cross-sections of the Upland Area and Lowland Area are shown on Figures 4a and 4b, respectively.

Based on the results of the remedial investigation, and as summarized in the March 2006 RAP, the shallow groundwater in the Downgradient Area (i.e., the area between the site and Huntington Harbor, including New York Avenue) appears to be perched above the fine-grained unit, which acts as a partial confining layer. Shallow groundwater elevations at the site are tidally influenced. In a shallow groundwater study performed on July 15 and 16, 2003, groundwater elevations in the Lowland Area ranged from elevation +11.61 feet to +12.26 feet and groundwater elevations in the Upland Area ranged from elevation +11.95 feet to +13.53 feet on the eastern end of the site. The average hydraulic gradient in the shallow water table zone is relatively flat and increases in steepness as groundwater flows across the site from east to west towards Huntington Harbor. Groundwater elevations are depicted on the geologic cross-sections shown on Figures 4a and 4b.

2.7 NATURE AND EXTENT OF CONTAMINATION

Extensive remedial investigation was performed on the subject site from 2001 to 2004 with several phases of groundwater, soil and soil vapor sampling. Laboratory analytical reports and summary tables were included in the April 2004 RIR. The remedial investigation identified MGP-related contaminants in the subsurface beneath the former site and adjacent properties. The following sections describe the distribution of contaminants in the site area.

2.7.1 Soil Contamination

The remedial investigation identified three primary source areas of non-aqueous phase liquids (NAPL)-saturated soil at the site:

- Tar Deposit Area 3 in the Upland Area
- Small Crater/Tar Deposit Area 5 in the Upland Area
- Southeast of the former Gas House and MGP process area in the Lowland Area

Tar-saturated soil was observed in subsurface soil at and above the fine-grained unit in the vicinity of the three primary source areas. Additional impacts were identified below the fine-grained unit near two of these primary source areas: the Small Crater/Tar

Deposit Area 5; and the former Gas House and MGP process area. Tar-saturated soil was identified to depths of approximately 52 feet below ground surface, 54 feet below ground surface and 22 feet below ground surface, in the vicinity of Tar Deposit Area 3, the Small Crater/Tar Deposit Area 5, and the former Gas House and MGP process area, respectively. Within these primary source areas, the majority of the tar-saturated soil was present in the shallow unsaturated soil near Tar Deposit Area 3, the Small Crater/Tar Deposit Area 5, and in the shallow saturated soil in the vicinity of the active LIPA substation. The deeper impacts represent a relatively small proportion of the MGP-related impacts and appear to be distributed in thin, discrete lenses.

Off-site sampling indicated that dense non-aqueous phase liquid (DNAPL) tar had not migrated off-site in the Upland Area or north of the site in the Lowland Area. Tar-saturated soil was observed off-site to the west in the Downgradient Area and to the south in the Lowland Area. No significant MGP-related impacts were identified in soil borings advanced along the bulkhead of Huntington Harbor in the Downgradient Area, and groundwater analyses in the Downgradient Area indicated limited MGP-related compounds. Sediment probing activities in Huntington Harbor did not indicate NAPL impacts to harbor sediments. MGP-related impacts at the south-adjacent property appeared to be limited. Tar-saturated soil was observed in one soil boring limited to the 10- to 11-foot interval. Other MGP-related impacts on the south-adjacent property were limited to depths ranging from approximately 4 to 12 feet below ground surface.

2.7.2 Groundwater Contamination

Groundwater impacts discussed in the RIR are based on the hydrogeologic setting of the site, according to the following zones: water table, shallow, intermediate, and deep. In general, concentrations of dissolved benzene, toluene, ethylbenzene, and xylenes (BTEX) and polycyclic aromatic hydrocarbons (PAHs) in groundwater on-site and downgradient of the site are decreasing or have remained relatively stable from 2001 through to the present.

Water Table Groundwater

The water table groundwater zone includes samples collected from the water table to a maximum depth of 14 feet below ground surface within the Lowland Area and at depths of 22 to 57 feet below ground surface in the Upland Area.

The analytical results indicated that the groundwater samples with the highest concentrations of BTEX and PAHs in the water table groundwater zone above the fine-grained unit were obtained from monitoring wells located in the Lowland Area. These wells were generally located downgradient of Tar Deposit Area 3 and south of the former Gas House and MGP process area in the Lowland Area. In addition, the groundwater results indicated non-detectable to low concentrations of BTEX and PAHs in samples collected from the Downgradient Area.

During the April 2005 sampling round, a 0.4-foot thick layer of light non-aqueous phase liquid (LNAPL) was observed in monitoring well HHMW-12 located near the southern boundary of the site in the Upland Area adjacent to the TOH Nature Preserve. Laboratory forensic analysis of this LNAPL indicated that it primarily consisted of diesel or No. 2 heating oil, and included the presence of a weathered tar product from a separate release.

Shallow Groundwater

The shallow groundwater zone includes groundwater samples collected immediately below the fine-grained unit and within the glacial sand unit. This zone generally corresponds to a 15-foot interval of approximately 0 to 15 feet below the fine-grained unit.

The groundwater sample with the highest concentrations of BTEX and PAHs in the shallow groundwater zone was obtained from monitoring well HHMW-10, immediately southeast of the former Gas House and MGP process area located in the Lowland Area. DNAPL accumulated in monitoring well HHMW-10 and the high concentrations that were detected in the sample have been attributed to residual DNAPL in the groundwater sample. With the exception of well HHMW-10, monitoring wells sampled in July 2003 in the shallow zone generally exhibited non-detectable to low levels of BTEX and PAHs. HHMW-10 was paved over during subsequent upgrades to the substation. This well will be replaced as part of the long term groundwater monitoring program described in Section 4.3.7.

The analytical results of groundwater samples collected from monitoring wells in the Upland Area indicated non-detectable to low concentrations of BTEX and PAHs within the on-site and off-site portions of the Upland Area. This indicates that upgradient groundwater in the shallow zone beneath this area has not been significantly affected.

Intermediate Groundwater

The intermediate groundwater zone includes all groundwater data collected from the glacial sand unit from a depth of 30 to 60 feet below ground surface within the Lowland and Downgradient Areas. This zone generally corresponds to a 30-foot interval of approximately 15 to 45 feet below the fine-grained unit in these areas.

BTEX compounds were not detected in intermediate groundwater in the Lowland Area. Concentrations of PAHs were non-detectable to low, and carcinogenic PAHs were not detected in samples collected from the Lowland Area intermediate monitoring wells. In addition, the groundwater results indicated non-detect to low concentrations of BTEX and PAHs within the Upland Area, which indicates that groundwater within the intermediate zone beneath this area has not been significantly affected.

Deep Groundwater

The deep groundwater zone includes all groundwater data collected from the glacial sand unit greater than 60 feet below ground surface within the Lowland and Downgradient Areas. This zone generally corresponds to depths greater than 45 feet below the fine-grained unit in these areas. The deep groundwater results indicated non-detectable to low concentrations of BTEX and PAHs.

2.7.3 Soil Gas

The remedial investigation consisted of 14 soil vapor probes collected on-site and in the vicinity of the site. Concentrations of total BTEX in soil vapor ranged from non-detect to 30.3 parts per billion-volume (ppbv). Naphthalene, a compound associated with MGP waste, was not detected in any of the soil vapor samples.

3.0 SUMMARY OF REMEDIAL ACTION ASSESSMENT

3.1 REMEDIAL ACTION GOALS AND STANDARDS, CRITERIA, AND GUIDANCE

The remedial action goals for the site are: to be protective of public health and the environment given the intended use of the site and to remove or eliminate identifiable sources of contamination to the extent feasible. These two goals will be applied to the site as the site-specific Standards, Criteria, and Guidance (SCGs), in accordance with DER-10, 6 NYCRR §375-1.10(c)(1), and Technical and Administrative Guidance Memorandum (TAGM) 4030, for determining success of the final remedy. Specifically, the following Site Specific Soil Action Levels (SSSALs) have been developed for the site:

- Total semivolatile organic compound (SVOC) concentration of 500 parts per million (ppm) for shallow soil to a depth of 2' bgs between the Upland Area excavations outlined in the March 2006 RAP.
- Restricted Industrial Use Soil Cleanup Objectives (SCOs), as outlined in 6 NYCRR §375-6.8(b) for all other areas and intervals.

3.2 REMEDIAL ACTION OBJECTIVES

Implementation of the approved remedial alternative will achieve the following Remedial Action Objectives (RAOs) developed for the site in accordance with regulatory requirements:

Groundwater

- Prevent, to the extent practicable, contact with, or ingestion of, contaminated groundwater associated with the site.
- Prevent, to the extent practicable, the migration of contaminated groundwater into Huntington Harbor.
- Remove, to the extent practicable, the source of groundwater contamination.

Soil

- Prevent, to the extent practicable, ingestion/direct contact with contaminated soil.
- Prevent, to the extent practicable, the migration of DNAPL tar beyond the boundaries of the site.

Soil Vapor

- Prevent, to the extent practicable, inhalation of contaminants volatilizing from soil or groundwater into enclosed structures.

3.3 REMEDIAL ACTION PLAN

The March 2006 RAP assessed five potential response actions, considering the RI findings, the current and future exposure scenarios, the requirements of the Order, and the applicable regulatory requirements. The RAP included tables and figures documenting the location and depth of contamination and planned excavation areas. The NYSDEC-approved remedial action consisted of the following:

- Excavate shallow/unsaturated soil in the two pre-determined DNAPL tar source areas in the Upland Area and excavate shallow soil below the water table in two pre-determined DNAPL

source areas in the Lowland Area, including any structures that may remain in place, with off-site thermal treatment of soils;

- Construct an engineered cap in the unsaturated zone across the two DNAPL tar source areas in the Upland Area;
- Construct an engineered treatment barrier/zone along the eastern and the western property boundaries of the Lowland Area;
- Recover DNAPL tar where feasible;
- Establish institutional controls to prevent use of groundwater in the area affected by MGP-related contaminants and to prevent any disturbance of the engineered cap; and
- Monitor groundwater for potential effects from MGP-related contaminants in the Lowland Area and on the office building property south of the site.

As described previously, the objective of this RAWP – Phase II is to present a design for the last four elements of the approved remedial approach, which include oxygen injection in the Lowland Area, non-aqueous phase liquid (NAPL) recovery in the Lowland area, groundwater monitoring, and establishment of institutional controls. Details of these remedial elements are set forth in Section 4.0.

The RAP also identified a remedial alternative contingency to address off-site contamination identified on the office building property south of the subject site. Remedial options were presented for either: active remediation (i.e., excavation) under the office building parking lot; or establishment of an environmental easement restricting future site uses if vapor monitoring indicates that the off-site contamination is not affecting indoor air in the office building. Based on recent and on-going discussions with the office building property owner, it is National Grid's intent to implement the off-site option for active remediation. This option involves excavation of shallow/unsaturated soils in the pre-determined DNAPL tar source area to the extent possible given structural limitations, with off-site thermal treatment of the excavated soil. Specifications for the off-site contingency remediation work were included the RAWP- Phase I.

3.4 REMEDIAL DESIGN WORK PLAN

The February 2008 Remedial Design Work Plan (RDWP) established a protocol for characterization of shallow soil between the two areas of concern in the Upland Area, soil waste characterization analyses, and monitoring of groundwater in existing monitoring wells and soil vapor. The soil vapor and groundwater monitoring will be conducted prior to implementation of the Phase II RAWP (e.g., start-up of the oxygen injection system and NAPL recovery), as described in Sections 4.3.1 and 4.3.2. The shallow soil sampling and waste characterization was performed in July 2008. Results from this sampling are described in the RAWP - Phase I.

4.0 REMEDIAL ACTION ACTIVITIES

The Phase II portion of the selected remedial alternative involves oxygen injection in the Lowland Area, non-aqueous phase liquid (NAPL) recovery, groundwater monitoring, and establishment of institutional controls. All remediation work will be conducted in accordance with this RAWP – Phase II. The various elements of the proposed Phase II remedial alternative are described in more detail in the following sections.

4.1 SITE PREPARATION

Prior to conducting any intrusive activities required for groundwater remediation system installation, the work zone(s), designated entry points, staging areas, and decontamination zones, will be established, as applicable. The site plan will be updated as necessary to reflect any changes in operations during the course of the intrusive work. During remediation activities, construction fencing will be installed along the perimeter of the work areas at the Lowland Area. Additional details of site preparation activities are provided in the following sections.

4.1.1 Access and Staging

Site access during the Phase II remediation activities will be via the substation driveway and the temporary construction entrance established adjacent to the Post Office driveway during the Phase I remediation activities. Work and storage trailers will be located north of the substation, and the decontamination area will be located between the work trailers and the active work zone. Staging and storage of other materials, to the extent practicable, will be confined to the area east (rear) of the substation. By the nature of the work involved in this project, a certain amount of material and equipment staging and storage will be required adjacent to areas being worked on. These areas will move as work progresses.

4.1.2 Sediment and Erosion Control Measures

Sediment and erosion control measures will be installed at the site prior to conducting any ground-intrusive work required for the Phase II remediation (i.e., trenching for oxygen injection tubing). These measures will include silt fencing and/or hay bales around the perimeter of the work areas and a gravel tracking pad at the temporary construction entrance. Excavated soil will be placed on polyethylene sheeting on the upgradient side of open trenches so that any rainwater coming into contact with the soil will drain into the trenches. Any temporary stockpiles to remain overnight will be covered with polyethylene sheeting.

4.1.3 Permits

If required, appropriate permits (building, plumbing, electrical, and mechanical) will be obtained from the Town of Huntington Departments of Building & Housing for installation of the groundwater treatment piping and electrical connection. A Town of Huntington building permit is not required for placement of the remediation equipment enclosure at the site.

4.2 ENGINEERING CONTROLS

4.2.1 Groundwater Treatment System

An oxygen injection system will be installed in the Lowland Area to treat both groundwater contamination and residual soil contamination that cannot be excavated due to the accessibility issues associated with the steep slopes in the Upland Area and the active electrical substation in the Lowland Area. Oxygen injection enhances the biological degradation of organic contaminants, including petroleum hydrocarbons, by increasing dissolved oxygen concentrations in groundwater to stimulate the growth of indigenous aerobic microbes that degrade these contaminants. Oxygen injection is suitable for shallow groundwater conditions as well as areas with nearby sensitive

receptors, since there is no generation of vapors. The various elements of the system are described in more detail in the following sections.

Remediation Equipment Enclosure

The remediation equipment enclosure will be located northeast of the substation, within the permanent fencing surrounding the Upland Area, as shown on Figure 5. The enclosure will consist of an 8-foot by 12-foot skid-mounted, wood-frame shed, installed on a gravel pad. Access to the building will be provided by locking double steel doors. The building will be fully sound-proofed and will contain a wall-mounted air conditioner and heater. The oxygen generation/injection equipment housed within the remediation building will consist of the following items:

- Kaeser SM-7.5 rotary screw compressor (31 SCFM @ 110 PSI) with internal air dryer
- Kaeser particulate and coalescing filters, each with autodrain
- 60-gallon air receiver tank
- AirSep AS-E PSA oxygen generator (175 SCFH)
- 120-gallon oxygen receiver tank
- 46-leg injection manifold, with individual pressure gauges and flow meters for each leg
- 6 oxygen clean solenoid valves, each providing oxygen flow to a bank of 6 or 8 injection wells

Manufacturer specifications for the remediation equipment and a diagram illustrating the remediation equipment enclosure layout are provided in Appendix B.

Oxygen Injection Wells

The groundwater remediation system design includes 23 oxygen injection well clusters installed along the perimeter of the Lowland Area (surrounding the substation), spaced on approximately 20 foot centers, as shown on Figure 5. This spacing is based on the typical radius of influence achieved for oxygen injection at sites with subsurface conditions similar to this Halesite site. Each injection well cluster will consist of one shallow injection well (screened from 10 to 12 feet below the water table) and one deep injection well (screened from 18 to 20 feet below the water table). These injection depths were chosen to address groundwater contamination in the water table and shallow groundwater zones and residual soil contamination located predominately above the fine grained unit. Injection well depths are shown relative to the Lowland geologic cross section on Figure 4b. Screen elevations for individual injection wells will be determined based on historic water table elevation data for existing monitoring wells in the Lowland area, as summarized in Table 1.

The injection wells will be constructed of 1-inch diameter PVC casing with a 2-foot section of 0.01-inch slotted PVC well screen (a.k.a., diffuser), and a 1-foot bottom sump. A sand filter pack will be installed around the well screen to one foot above the screen, followed by a hydrated bentonite seal to above the water table, and cement grout to ground surface. The injection wells will be installed using either hollow-stem auger or direct push (e.g., Geoprobe) methods. Oxygen injection well installation and development will be conducted in accordance with detailed procedures specified in the Quality Assurance Project Plan (QAPP), included in Appendix C.

Oxygen injection hoses will be installed in trenches, as illustrated on Figure 6, to connect each oxygen injection well to the injection manifold located in the equipment shed. The injection hoses will be constructed of ½-inch diameter high-density polyethylene (HDPE) tubing for runs up to 350 feet, and ¾-inch diameter HDPE tubing for longer runs, and will be installed at approximately 2 feet below grade on a 6-inch layer of sand or pea-gravel. An additional 6-inch layer of sand or pea gravel will be placed on top of the tubing and the remainder of the trench will be backfilled with native soil that is free of large pieces of concrete, brick, wood or other sharp objects. The tubing will be installed in Schedule 80 PVC conduit along the western and northern sides of the substation to provide a barrier between the tubing and the underlying electrical feeders leading into the substation.

The end of each injection point will be provided with a PVC male adaptor and threaded tee for tubing connection to the ground surface and a ball valve to allow de-pressurization of the well for maintenance. Each well cluster will be provided with a 2-foot by 2-foot road box to protect the well-head equipment/instrumentation and provide access for future gauging, adjustments, and repairs. Demarcation fabric and/or utility tape and toning wire will be installed over the piping so it can be identified during future utility surveys/markouts. Typical injection well cluster construction is shown on Figure 7.

As shown on Figure 5, the 23 well clusters will be separated into 6 well banks, with each bank containing 3 or 4 well clusters. This will allow for cycling of oxygen injection to different portions of the site, as described in the following section (Process Flow).

Process Flow

The oxygen generator will produce 90% to 95% pure oxygen from clean, dry air (produced from the compressor, filters, and air dryer) by purging out nitrogen using a molecular sieve under high pressure conditions. The purged nitrogen will be vented to the atmosphere through vents in the wall of the remediation enclosure, and the oxygen will be routed to the oxygen receiving tank. The timer/relay system will be programmed to pulse oxygen to each injection well bank once every four hours (i.e., 6 times per day) for a period of 10 minutes per bank at an injection rate of 30 cubic feet per hour (CFH). Based on an oxygen density of 0.084 pounds per cubic foot at standard temperature and pressure, this would result in approximately 2.5 pounds of oxygen per point per day injected into the subsurface, as calculated in the following equation

$$\text{Daily } O_2 \text{ Load} = 30 \text{ ft}^3/\text{hr} \times 10 \text{ min} \times 6 \times 0.084 \text{ lbs } O_2/\text{ft}^3 = \underline{2.5 \text{ lbs}}$$

The system control panel can be adjusted to optimize oxygen injection flow rates/frequency if indicated, based on groundwater monitoring results. A schematic of the process flow for the proposed oxygen injection system is provided in Figure 8.

4.2.2 Non-Aqueous Phase Liquid (NAPL) Recovery Wells

NAPL recovery wells will be installed in the Lowland areas to facilitate passive NAPL recovery. The recovery wells will be installed using hollow-stem auger drilling methods, with hand or vacuum truck clearing conducted as required, based on proximity to underground and/or overhead utilities. The wells will be installed on approximately 40-foot centers around the perimeter of the Lowland, as shown on Figure 9. Wells will be constructed using 6-inch diameter well casing and well screen, two-foot sumps, and flush-mount manholes.

As described in Section 2.7.1, during the 2006 RI at the site, NAPL was generally observed at and above the fine-grained unit, which is present at approximately 8 to 10 feet below grade in the Lowland area. Therefore, the majority of the NAPL recovery wells (RW-1 through RW-11) will be constructed with the well screens set at the top of the fine-grained unit. Two additional recovery wells (RW-5D and RW-9D) will be installed with screens set below the fine-grained unit to address deeper NAPL observed in HHSB-46 (located under the substation) during the 2006 RI, and in HHMW-09S2 (located behind the southeastern corner of the substation) during on-going groundwater monitoring in the December 2008. Final recovery well screen depths will be determined in the field in consultation with National Grid and the on-site NYSDEC representative.

Typical NAPL recovery well construction is shown on Figure 10. NAPL recovery well installation will be conducted in accordance with the detailed procedures specified in the project QAPP, provided as Appendix C.

4.2.3 Waste Disposal

All waste generated during installation of the oxygen injection system and NAPL recovery wells (e.g., excess soil from trenching, drill cuttings, development water, etc.) will be containerized in DOT-approved 55-gallon drums or a roll-off container (solid waste only), or stockpiled on and covered with polyethylene sheeting to await off-site disposal. Drums containing solid or liquid waste would be sealed at the end of each work day and labeled with the date, the well or boring number(s), the type of waste, and the name of a point-of-contact. It is anticipated that waste generated during the Phase II remediation activities will be accepted at the designated disposal facilities based on waste characterization data collected during the Phase I Lowland remediation. If required, additional waste characterization samples will be collected as appropriate and analyzed in accordance with requirements for the intended disposal facility. All waste will be transported off-site and disposed of or treated according to applicable local, state and federal regulations.

4.3 ENVIRONMENTAL MONITORING

4.3.1 Baseline and Performance Soil Gas Sampling

Soil gas sampling will be conducted to document baseline conditions prior to and during start-up of the oxygen injection system. Samples will be collected from four monitoring points located along the northern property boundary, between the substation and the Post Office, and four monitoring points located along the southern property boundary, between the substation and the office building, as shown on Figure 5. Each monitoring point will consist of a stainless steel drive point and internal perforated sampling port connected to Teflon tubing. Monitoring points will be advanced using direct push methods, with the sampling port installed at approximately 4 feet below grade. The annulus around the Teflon sample tubing will be sealed with bentonite to prevent short-circuiting of ambient air into the sampling port during sample collection. Typical soil gas monitoring point construction is illustrated on Figure 11.

Soil gas samples will be collected using 6-liter Summa canisters equipped with 8-hour flow controllers and will be analyzed for VOCs plus naphthalene by EPA Method TO-15. Samples also will be field screened for VOCs using a photoionization detector (PID) and percent oxygen (O_2) and carbon dioxide (CO_2) using a landfill gas meter. The frequency for sample collection will be as follows:

- At least one complete round prior to system start-up;
- At least one complete round during system start-up and shakedown (e.g., 1-2 days after initial start-up); and
- At least two complete rounds per week for the first four weeks following system start-up

Sample results will be requested from the laboratory on an expedited turn-around time to allow the NYSDEC to review the data in a timely manner and determine whether off-site subslab vapor sampling (i.e., at the south-adjacent office building) is warranted. After the first four weeks of system operation, the frequency of vapor monitoring will be reduced to quarterly, contingent on NYSDEC review of baseline results,

Soil gas monitoring point installation will be conducted in accordance with the detailed procedures specified in the project QAPP, provided in Appendix C. Baseline and on-going soil gas sampling will be conducted by National Grid, through their consultant GEI Consultants, Inc. (GEI), in accordance with an NYSDEC-approved site Operation, Maintenance, and Monitoring (OM&M) Plan.

4.3.2 Baseline and Performance Groundwater Monitoring

Groundwater sampling will be conducted to document baseline conditions prior to the start-up of the oxygen injection system and monitor system performance during operation. The baseline and performance groundwater samples will be collected from four monitoring well "couplets", which will be installed upgradient and downgradient of the remediation system, as shown on Figure 5. Each couplet will consist of one well screened across the water table and one well screened across the shallow groundwater zone (i.e., below the fine-grained unit). The baseline samples will be collected prior to system start-up, and will be analyzed for the following parameters:

- VOCs by EPA Method 8260
- PAHs by EPA Method 8270
- Sulfate and Total Sulfide by EPA Method 375.4
- Nitrogen by EPA Method 351.2
- Nitrate/Nitrite by EPA Method 353.3
- Ammonia by EPA Method 350.1
- Target Analyte List (TAL) Metals
- Phosphate by EPA Method 3651
- Heterotrophic Plate Count (HPC)
- Dissolved Carbon Dioxide

Performance groundwater samples will be collected from the four monitoring well couplets once per month for a period of three months starting one to two weeks after system start-up, and on a quarterly basis thereafter. The samples will be analyzed for VOCs by EPA Method 8260, PAHs by EPA Method 8270, and HPC. In addition, groundwater will be analyzed for field parameters during sample collection, including Dissolved Oxygen (DO), Oxidation-Reduction Potential (ORP), pH, and Specific Conductance.

Baseline and performance groundwater monitoring will be conducted by GEI. Monitoring well installation, development, and sampling will be conducted in accordance with GEI's Well Installation Work Plan, dated March 11, 2009.

4.3.3 Soil Segregation

During trenching for installation of the oxygen injection tubing, an environmental professional will be on-site to direct the construction personnel in segregating soil that is obviously contaminated and/or otherwise unsuitable for use as backfill. Monitoring for contamination will include inspecting soil for heavy staining, sheen, odors, or other evidence of gross contamination, and field screening for the presence of VOCs with a photoionization detector (PID). Monitoring for suitability for backfill will include inspecting the soil for large pieces of concrete, brick or other fill material that would prevent adequate compaction or cause damage to the oxygen injection tubing/conduit. All segregated material will be containerized in a roll-off box or 55-gallon drums, or stockpiled on and covered with polyethylene sheeting (depending on volume), to await off-site disposal, as described in Section 4.2.3.

4.3.4 Air/Odor Monitoring and Mitigation

Work zone air monitoring will be performed in accordance with the site-specific Health and Safety Plan (HASP) provided as Appendix D. Air monitoring for organic vapors, particulates (PM_{10}), odors, and visible dust will be conducted at the site perimeter and in the surrounding community, in accordance the Air Monitoring Work Plan (AMWP) provided as Appendix E. Perimeter monitoring will be conducted using alternate air monitoring stations described in the AMWP at one upwind and two downwind locations during the Phase II remediation activities. Station locations will be determined at the start of work each day based on the planned activities for the day and observed/predicted wind direction.

To supplement the real-time monitoring data, perimeter walk-around air monitoring will be completed as necessary to document potential nuisance odors and visible dust and to implement controls during the remediation construction activities.

Odors will be controlled as necessary using odor-controlling foam and/or 6 to 10 mil polyethylene sheeting. Temporary stockpiles will be staged on plastic sheeting and covered each night. Open trenches will be tarped with polyethylene sheeting overnight if nuisance odors are anticipated. When nuisance odors are noted extending beyond the perimeter of the work area, the open trenches and stockpiles in the vicinity will be sprayed with odor controlling foam.

4.3.5 Surveying

All oxygen injection, monitoring, and NAPL recovery wells will be surveyed by a New York State-licensed surveyor. Top of casing at all monitoring and NAPL recovery wells will be determined to an accuracy of 0.01 feet.

4.3.6 Imported Backfill Sampling

Native material from a virgin quarry source will not be sampled prior to use as backfill in the oxygen injection tubing trenches. All other imported material will be tested via collection of one composite sample per 1,000 cubic yards of material from each source. Samples will be analyzed for VOCs using EPA Method 8260, SVOCs using EPA Method 8270, TAL metals using EPA Method 6000/7000 series, polychlorinated biphenyls (PCBs) using EPA Method 8082, pesticides using EPA Method 8081, and herbicides using EPA Method 8151. Soils will be considered appropriate for use as on-site imported backfill if contaminant concentrations are less than the 6 NYCRR Part 375

Residential Soil Cleanup Objectives. All sampling of imported backfill will be conducted in accordance with the QAPP included in Appendix C and approved by NYSDEC prior to being imported to the site.

4.3.7 Groundwater and Fluid Level Monitoring

Long term groundwater and fluid level monitoring will be conducted following installation of the engineering controls and start-up of the groundwater remediation system. Groundwater samples will be analyzed for VOCs, SVOCs, and water quality parameters (DO, ORP, pH, temperature, specific conductivity) to confirm the radius of influence of the oxygen injection wells, gauge the progress of remediation, and determine whether remediation system adjustments/enhancements are required. Fluid level monitoring will be conducted to determine groundwater flow direction and to schedule NAPL recovery at wells containing measurable product. Long term groundwater monitoring will be conducted in accordance with an NYSDEC-approved OM&M Plan.

4.3.8 Recordkeeping

A project logbook will be maintained during all remediation activities, and will be available for NYSDEC and NYSDOH inspection. The following information will be recorded in the project logbook:

- Date, weather, and site conditions;
- Names and companies of all on-site personnel;
- Makes, models, and calibration records for all monitoring equipment;
- Makes and models of remediation equipment;
- Sample numbers and descriptions; and
- Site sketches showing trenches, well/boring locations, and stockpile staging areas (if any).

Copies of all waste manifests and bills of lading will be maintained with the project logbook.

4.4 CITIZEN PARTICIPATION

A meeting was conducted on March 13, 2008 to facilitate discussions with the NYSDEC, NYSDOH, Town of Huntington, and the Suffolk County Department of Health Services regarding the remediation. This meeting included a presentation on the proposed remedial actions and a question and answer period. A public meeting was held on August 19, 2008 prior to implementation of the RAWP – Phase I. This meeting consisted of an availability session at which the public could review the RAWP – Phase I and ask questions of the NYSDEC, NYSDOH, National Grid and its consultants and contractor. A project fact sheet will be issued prior to the start of Phase II remediation activities.

4.5 INSTITUTIONAL CONTROLS

4.5.1 Site Management Plan

Upon completion of the Phase II remedial activities, a Site Management Plan (SMP) will be prepared to specify future soil handling requirements, operation and maintenance procedures, and site use restrictions. The Site Management Plan will include a Soil

Management Plan, HASP, and OM&M Plan. The OM&M Plan will include the following:

- As-built drawings and descriptions of all engineering controls implemented as part of the long-term remedy (i.e., oxygen injection system, NAPL recovery, site cap), including manufacturer cut sheets of any remediation equipment;
- Operation and maintenance procedures, including an inspection protocol, to ensure proper functioning of the remedy;
- A groundwater monitoring plan to evaluate the performance of the remedy;
- A soil vapor and indoor air sampling plan to evaluate the performance of the remedy;
- A NAPL monitoring/recovery plan to specify procedures for NAPL recovery;
- A contingency plan describing procedures to be conducted in the event of an emergency.

The OM&M Plan will be finalized after groundwater remediation system start-up and updated periodically during use to reflect changes in site conditions or the manner in which the remedy is operated and/or maintained.

4.5.2 Deed Restriction

Following completion of the Phase II remedial activities, a deed restriction will be recorded for the site to enforce the following use restrictions:

- Restriction of use of the property for industrial use only;
- The use of the groundwater underlying the project site will be prohibited without treatment rendering it safe for the intended purpose;
- All future soil disturbance activities (post-remediation), including building renovation/expansion, subgrade utility line repair/relocation, and new construction must be conducted in accordance with the SMP;
- Annual inspections and certifications must be conducted in accordance with the SMP;
- The site cap, including the impermeable barrier installed in the Upland Area, must be maintained in accordance with the SMP;
- Operation, maintenance, and monitoring of all engineering controls must be performed in a manner specified in the SMP;
- Annual inspection and reporting, including operational and monitoring data, must be performed in a manner specified in the SMP;
- Groundwater and other environmental or public health monitoring, and reporting of information obtained, must be performed in a manner specified in the SMP;
- On-site environmental monitoring devices, including but not limited to, groundwater monitor wells and vapor monitoring wells, must be protected and replaced as necessary to ensure continued functioning in the manner specified in the SMP; and

- Vegetable gardens shall be prohibited.

The deed restriction will be recorded in the Suffolk County Clerk's Office and will include: a description of the use restriction; a map showing the area of the restriction; a written agreement by the property owner to establish and maintain the institutional and engineering controls; and a copy of the Site Management Plan.

4.5.3 Annual Certification

An Annual Certification will be submitted to the NYSDEC to document the efficacy of the remedy. The Annual Certification will be signed by a professional engineer or other qualified environmental professional and will certify that: the institutional and/or engineering controls are unchanged from the previous certification; nothing has occurred that would impair the ability of the controls to protect public health and the environment; and no violations of the site management plan have occurred. If changes are noted, the Annual Certification will include documentation explaining why the certification cannot be rendered and a statement of proposed corrective measures with a proposed schedule for implementing the corrective action. The certification will include the monitoring data collected during the reporting period as specified in the Site Management Plan.

4.6 REPORTING/MEETINGS

4.6.1 Weekly Progress Meetings

Weekly progress meetings will be held at the site during Phase II remediation activities with on-site personnel. The meetings will include a summary of activities for the week, air sampling results (including any exceedances), and a description of any odor or dust problems and corrective actions taken. Any time-sensitive information (e.g., the occurrence of a spill or an emergency situation) will be communicated directly to the NYSDEC project manager via telephone or email.

4.6.2 Final Engineering Report

Upon completion of site remediation under the RAWP Phase I and Phase II, a Final Engineering Report will be prepared and submitted to the NYSDEC and NYSDOH. The Final Engineering Report will include:

- Photographs of remedial activities;
- As-built drawings for all constructed elements (e.g., excavation areas, oxygen injection system, NAPL recovery and other wells);
- Monitoring and documentation sampling results collected during implementation of the remedy;
- Site Management Plan (SMP) for the remedy;
- OM&M Plan for the oxygen injection system, NAPL recovery, groundwater monitoring, and site cap;
- Groundwater Monitoring Plan;
- Accounting of the destination of all material removed from the site and associated manifests/bills of lading and certificates of disposal from the respective receiving facilities;

- Documentation of source approval and sampling for backfill materials imported from off-site;
- Site survey showing locations of all primary contaminant sources identified during investigation and remediation activities; and
- Itemized description of costs incurred during site remediation.

4.7 SCHEDULE AND COSTS

Field work will be scheduled from 7:00 AM to 6:00 PM on weekdays. Appropriate approvals will be obtained for work conducted outside of these hours. The oxygen injection and NAPL recovery well installation is anticipated to commence in April 2009.

The anticipated schedule and estimated costs for the remedial program are provided in Appendix F.

5.0 REFERENCES

1. NYSDEC; *Draft DER-10 Technical Guidance for Site Investigation and Remediation*; Division of Environmental Remediation; December 2002.
2. Dvirka and Bartilucci (D&B); *Remedial Investigation Report*; Halesite Former Manufactured Gas Plant Site; December 2002.
3. Vanasse Hangen Brustlin, Inc.; *Final Remedial Investigation Report*, Halesite Former Manufactured Gas Plant Site, Town of Huntington, New York, April 2004.
4. GEI Consultants, Inc.; *Remedial Action Plan*, Halesite Former Manufactured Gas Plant Site; March 2006.
5. GEI Consultants, Inc.; *Additional/Replacement Monitoring Well Installation Work Plan, Halesite Former Manufactured Gas Plant Site*; March 11, 2006.
6. AKRF Engineering, P.C.; *Remedial Design Work Plan*, Halesite Former Manufactured Gas Plant Site, February 26, 2008.
7. AKRF Engineering, P.C.; *Remedial Action Work Plan – Phase I*, Halesite Former Manufactured Gas Plant Site, August 2008.
8. NYSDOH; *Generic Community Air Monitoring Plan*; from Draft DER-10 Technical Guidance for Site Investigation and Remediation, NYDEC, December 2002.

TABLES

FIGURES

APPENDICES

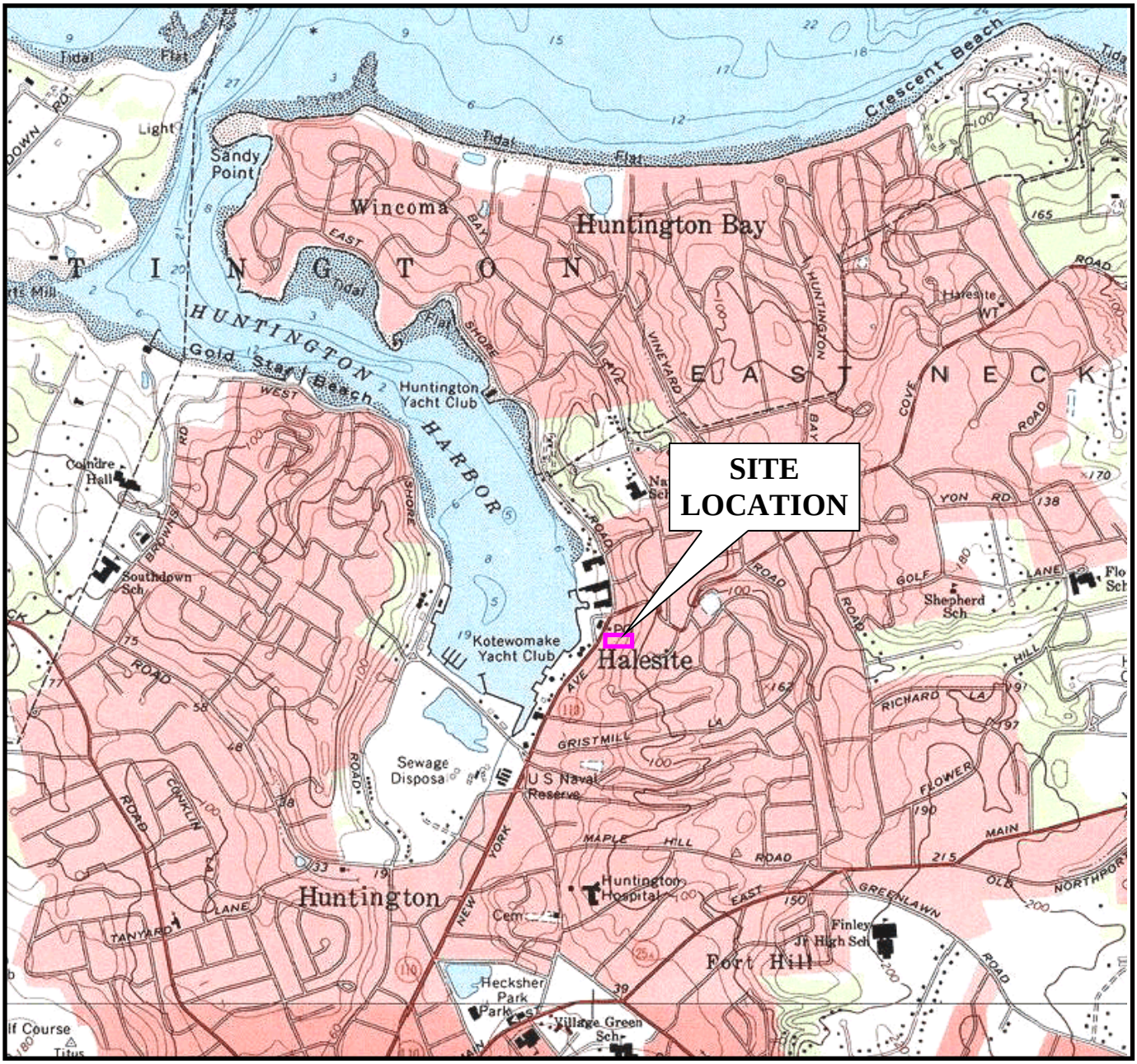
TABLES

TABLE 1
OXYGEN INJECTION WELL DESIGN DATA

O_2 Injection Well Cluster	Nearest Monitoring Well	Avg GW Elev[1]	Shallow Screen Interval		Deep Screen Interval		Nearest Boring[2]	Fine Grained Unit[3]			
			Top Elev	Bottom Elev	Top Elev	Bottom Elev		Top Elev	Bottom Elev	Top Elev2	Bottom Elev2
IW-1	MW-1	11.71	1.71	-0.30	-6.30	-8.30	HHMW-01I	13.64	12.14	7.64	7.14
IW-2	MW-1	11.71	1.71	-0.30	-6.30	-8.30	HHMW-01I	13.64	12.14	7.64	7.14
IW-3	MW-2	12.22	2.22	0.22	-5.78	-7.78	HHSB-23	14.5	13	8.5	8
IW-4	MW-2	12.22	2.22	0.22	-5.78	-7.78	HHMW-09	10.63	8.63	8.13	6.63
IW-5	MW-09S1	11.93	1.93	-0.07	-6.07	-8.07	HHMW-09	10.63	8.63	8.13	6.63
IW-6	MW-09S1	11.93	1.93	-0.07	-6.07	-8.07	HHSB-24	11.65	9.65	8.65	7.65
IW-7	MW-09S1	11.93	1.93	-0.07	-6.07	-8.07	HHSB-24	11.65	9.65	8.65	7.65
IW-8	MW-09S1	11.93	1.93	-0.07	-6.07	-8.07	HHSB-45	19.9	18.9	10.9	8.9
IW-9	MW-05S1	11.51	1.51	-0.49	-6.50	-8.50	HHSB-40	9.78	7.78	NA	NA
IW-10	MW-05S1	11.51	1.51	-0.49	-6.50	-8.50	HHSB-40	9.78	7.78	NA	NA
IW-11	MW-3	11.42	1.42	-0.58	-6.58	-8.58	HHMW-05	9	5	NA	NA
IW-12	MW-3	11.42	1.42	-0.58	-6.58	-8.58	HHMW-05	9	5	NA	NA
IW-13	MW-3	11.42	1.42	-0.58	-6.58	-8.58	HHSB-43	10.11	6.11	4.61	3.61
IW-14	MW-3	11.42	1.42	-0.58	-6.58	-8.58	HHSB-43	10.11	6.11	4.61	3.61
IW-15	MW-3	11.42	1.42	-0.58	-6.58	-8.58	HHSB-39	NA	NA	NA	NA
IW-16	MW-4	11.36	1.36	-0.65	-6.65	-8.65	HHSB-39	NA	NA	NA	NA
IW-17	MW-4	11.36	1.36	-0.65	-6.65	-8.65	HHSB-39	NA	NA	NA	NA
IW-18	MW-4	11.36	1.36	-0.65	-6.65	-8.65	HHSB-20	17.74	14.74	NA	NA
IW-19	MW-4	11.36	1.36	-0.65	-6.65	-8.65	HHSB-20	17.74	14.74	NA	NA
IW-20	MW-4	11.36	1.36	-0.65	-6.65	-8.65	HHSB-21	19.87	18.87	7.87	3.87
IW-21	MW-4	11.36	1.36	-0.65	-6.65	-8.65	HHSB-21	19.87	18.87	7.87	3.87
IW-22	MW-1	11.71	1.71	-0.30	-6.30	-8.30	HHSB-22	19.87	15.87	11.87	10.87
IW-23	MW-1	11.71	1.71	-0.30	-6.30	-8.30	HHSB-22	19.87	15.87	11.87	10.87

Notes:
Elevations are in feet above mean sea level.
[1] Average of water table elevations measured by GEI, Inc. during 2008 quarters 2, 3, and 4 groundwater monitoring.
[2]Nearest boring reported in Halesite Former MGP Site Final Remedial Investigation Report; VHB, Inc.; April 2004.
[3]Top and bottom elevations of fine grained uint. Fine grained unit encountered at two depth intervals in some borings.

FIGURES



SCALE IN FEET

0’ 1000’ 2000’ 4000’

SCALE: 1”=2000’

N

SOURCE:

7.5 MINUTE SERIES USGS TOPOGRAPHIC MAP
QUADRANGLE: Lloyd Harbor, NY 1992

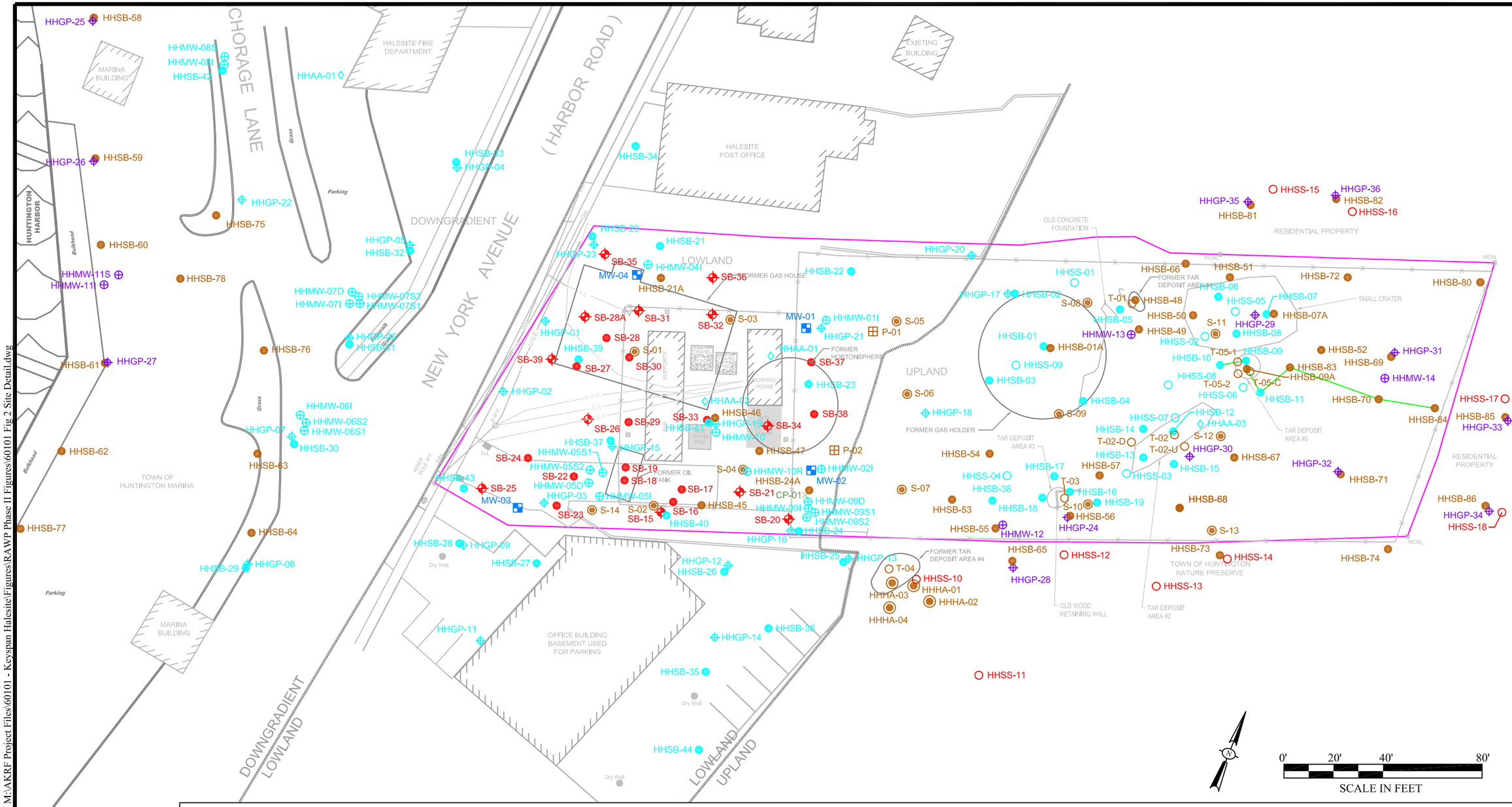
HALESITE FORMER MGP SITE
HALESITE, NEW YORK

SITE LOCATION MAP

AKRF Engineering P.C.

Environmental Consultants
440 Park Avenue South, New York, N.Y. 10016

DATE **4.9.09**
PROJECT No. **60101**
SCALE **AS SHOWN**
FIGURE **1**



LEGEND:

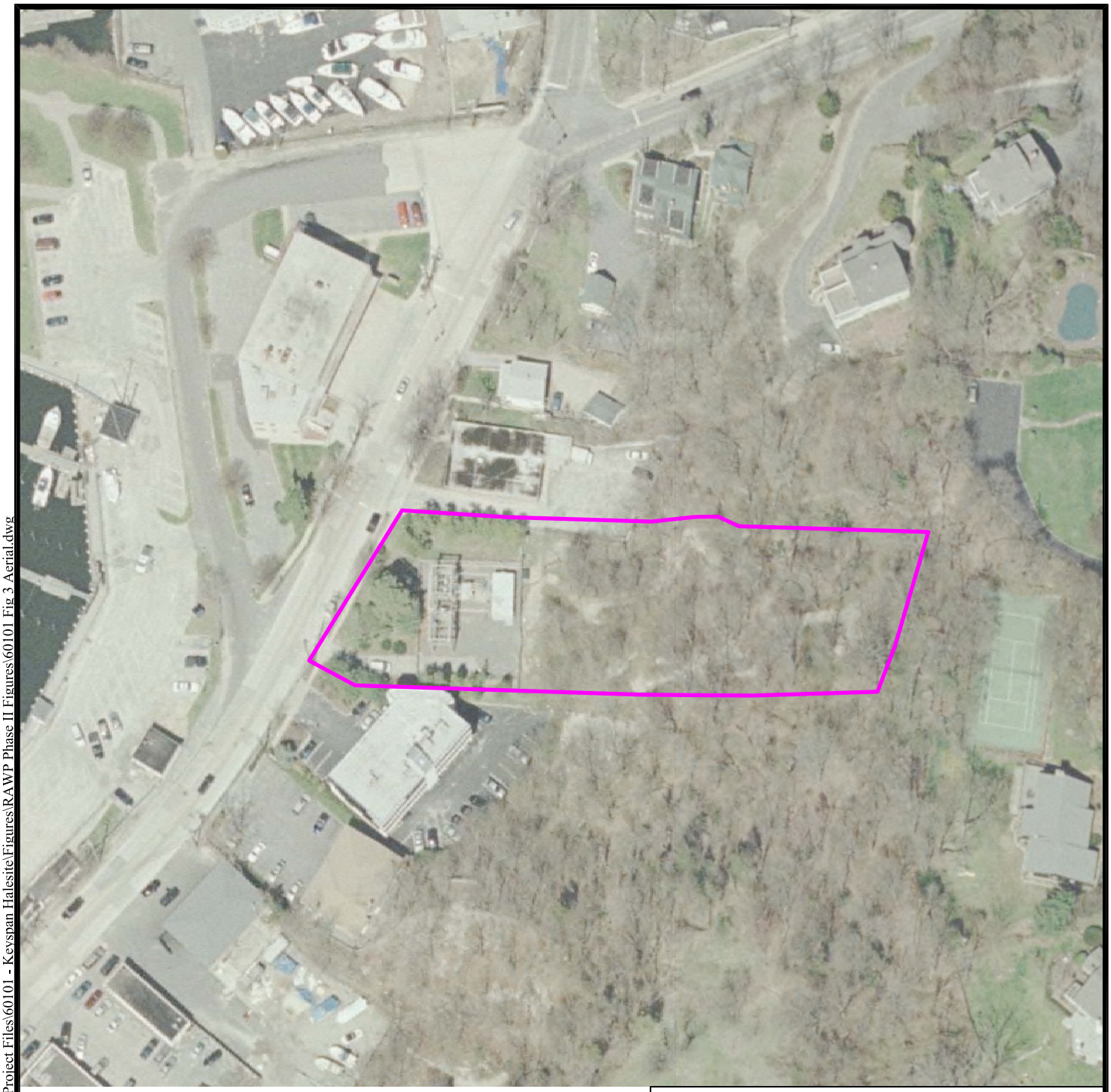
- HHSB-45 — FINAL RI SUBSURFACE SOIL SAMPLING LOCATION
- HHSS-10 — FINAL RI SURFACE SOIL SAMPLING LOCATION
- HHHA-01 — FINAL RI HAND AUGER SOIL SAMPLING LOCATION
- HHGP-24 — FINAL RI GROUNDWATER PROBE LOCATION
- HHMW-12 — FINAL RI GROUNDWATER MONITORING WELL LOCATION S, S1, S2 = SHALLOW ZONE (WATER TABLE) I = INTERMEDIATE ZONE D = DEEP ZONE
- HHSB-01 — INITIAL RI SUBSURFACE SOIL SAMPLING LOCATION
- HHSS-01 — INITIAL RI SURFACE SOIL SAMPLING LOCATION
- HHAA-01 — INITIAL RI AMBIENT AIR SAMPLING LOCATION
- HHGP-01 — INITIAL RI GROUNDWATER PROBE LOCATION
- CP-01 — SOIL SAMPLING LOCATION FROM CUT AND PLUG IRM
- SB-15 — GEOPROBE LOCATION USED FOR SUBSURFACE SOIL AND GROUNDWATER SAMPLING FROM FLUOR DANIEL GTI PHASE I SITE INVESTIGATION
- SB-16 — GEOPROBE SUBSURFACE SOIL SAMPLING LOCATION FROM FLUOR DANIEL GTI PHASE I SITE INVESTIGATION
- S-01 — HAND AUGER SURFACE AND/OR SUBSURFACE SOIL SAMPLING LOCATION FROM FLUOR DANIEL GTI PHASE I SITE INVESTIGATION
- T-01 — SURFACE SOIL AND/OR ENDPOINT SAMPLING LOCATION FROM FLUOR DANIEL GTI PHASE I SITE INVESTIGATION
- MW-01 — SOIL BORING CONVERTED TO MONITORING WELL LOCATION USED FOR SUBSURFACE SOIL AND/OR GROUNDWATER SAMPLING FROM FLUOR DANIEL GTI PHASE I SITE INVESTIGATION
- P-01 — MICROWELL LOCATION (INSTALLED IN ANGLE BORINGS) FROM FLUOR DANIEL GTI PHASE I SITE INVESTIGATION
- PROJECT SITE BOUNDARY

AKRF Engineering P.C.
Environmental Consultants
440 Park Avenue South, New York, NY 10016

HALESITE FORMER MGP SITE
HALESITE, SUFFOLK COUNTY, NEW YORK

SITE DETAIL MAP

DATE **4.09.09**
PROJECT NO. **60101**
SCALE **1"=40'**
FIGURE **2**



0' 100' 200' 400'

SCALE IN FEET

N

LEGEND:

PROJECT SITE BOUNDARY

HALESITE FORMER MGP SITE

HALESITE, NEW YORK

2004 AERIAL PHOTO

AKRF Engineering P.C.

Environmental Consultants

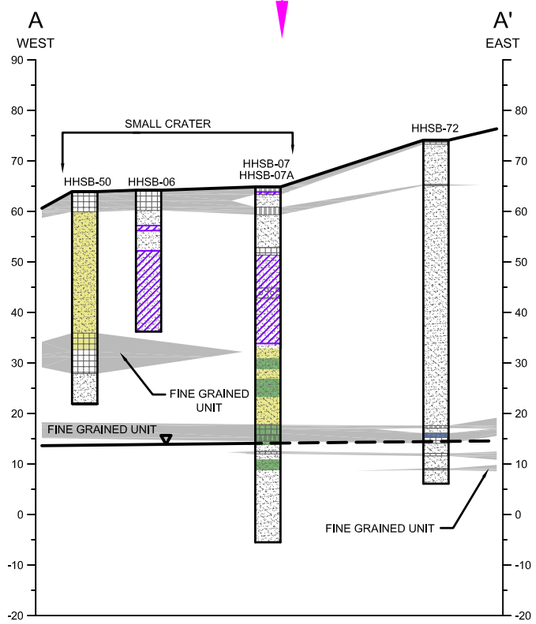
440 Park Avenue South, New York, N.Y. 10016

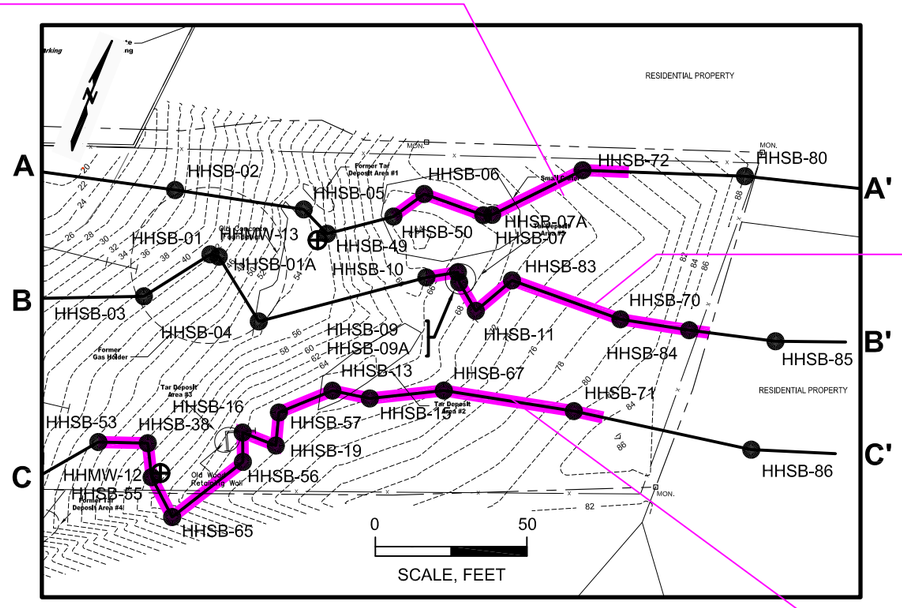
DATE **4.9.09**

PROJECT No. **60101**

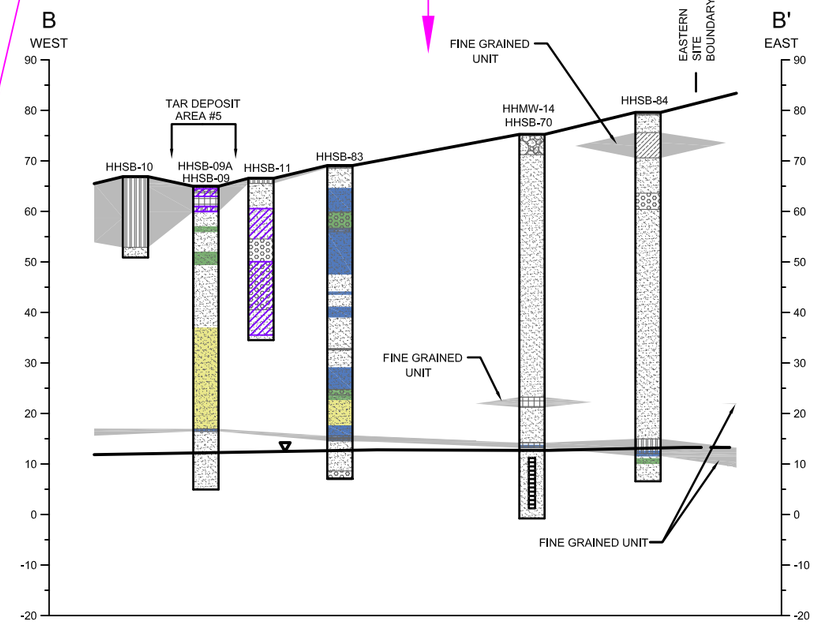
SCALE **as shown**

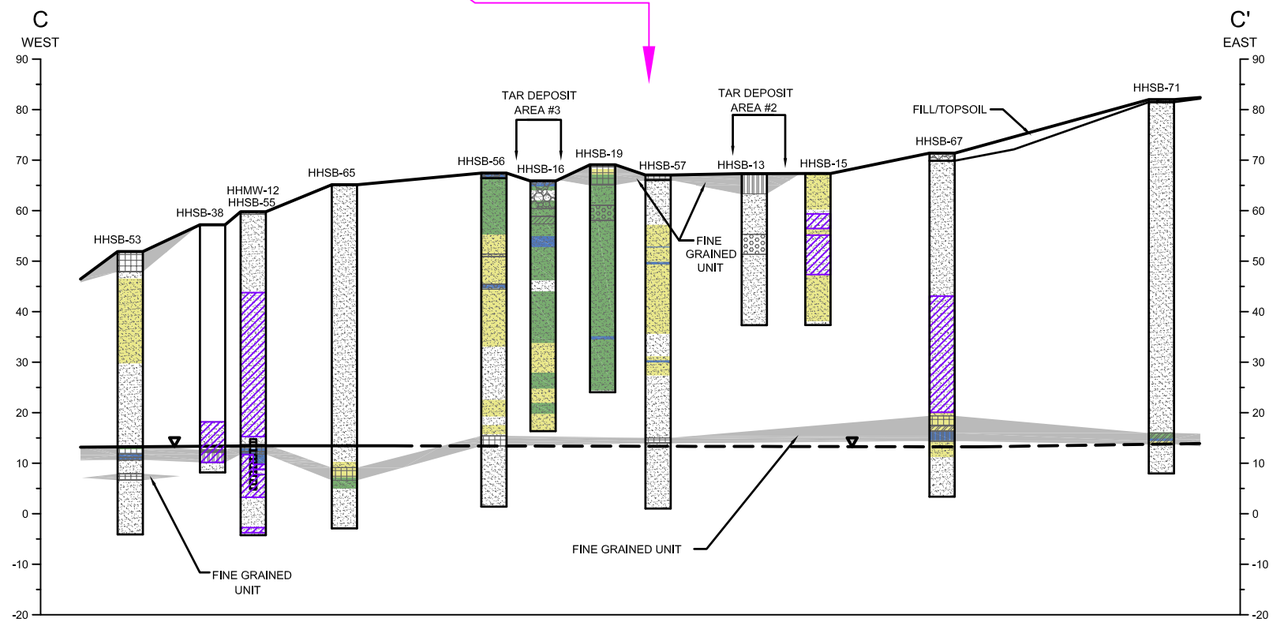
FIGURE **3**





UPLAND CROSS SECTION LOCATION MAP





LEGEND

GEOLOGICAL CLASSIFICATIONS

- TOPSOIL AND/OR FILL
- FINE, MEDIUM TO COARSE SANDS TO FINE, MEDIUM TO COARSE SANDS WITH GRAVEL
- GRAVEL, GRAVEL WITH SAND, GRAVELY SANDS
- SILTY SANDS TO SILT WITH SAND
- SILTS TO CLAY RICH SILTS
- CLAYS WITH SANDS
- CLAYS
- PEAT

PHYSICAL DESCRIPTIONS

- TAR/NAPHTHA ODORS
- TAR STAINING, BLEBS, GLOBS, LENSES GRAIN-COATING, SHEENS
- TAR SATURATED
- PETROLEUM-LIKE STAINING, SHEENS AND ODORS
- MONITORING WELL SCREEN INTERVAL
- APPROXIMATE ELEVATION OF WATER TABLE GIVEN IN FEET ABOVE MEAN SEA LEVEL, DASHED WHERE INFERRED
- GROUND SURFACE
- O_2 INJECTION WELL SCREEN INTERVAL

SOURCES:

BASED ON Figure 3-1, *UPLAND AREAS REMEDIAL INVESTIGATION CROSS SECTION EXERPTS*, PREPARED BY GEI CONSULTANTS IN THE REMEDIAL ACTION PLAN DATED MARCH 2006, WHICH WERE IN TURN BASED UPON *GEOLOGIC CROSS SECTIONS A-A', B-B'* FINAL REMEDIAL INVESTIGATION, HALESITE FORMER MGP SITE, PREPARED BY VANASSE HANGEN BRUSTLIN, INC., MIDDLETOWN, CT, HORIZONTAL SCALE: 1"=20'; VERTICAL SCALE: 1"=20', DATE: APRIL 2004.

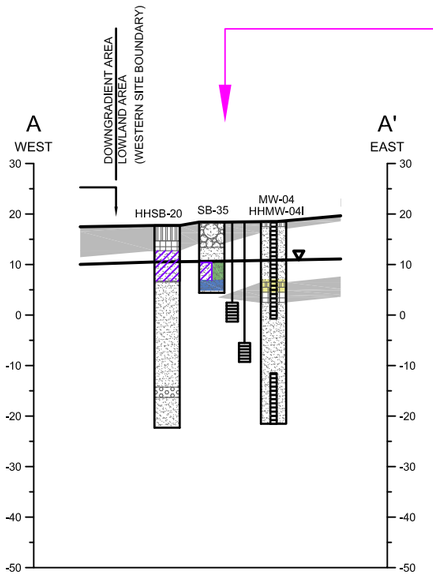
30
0
VERTICAL SCALE, FEET

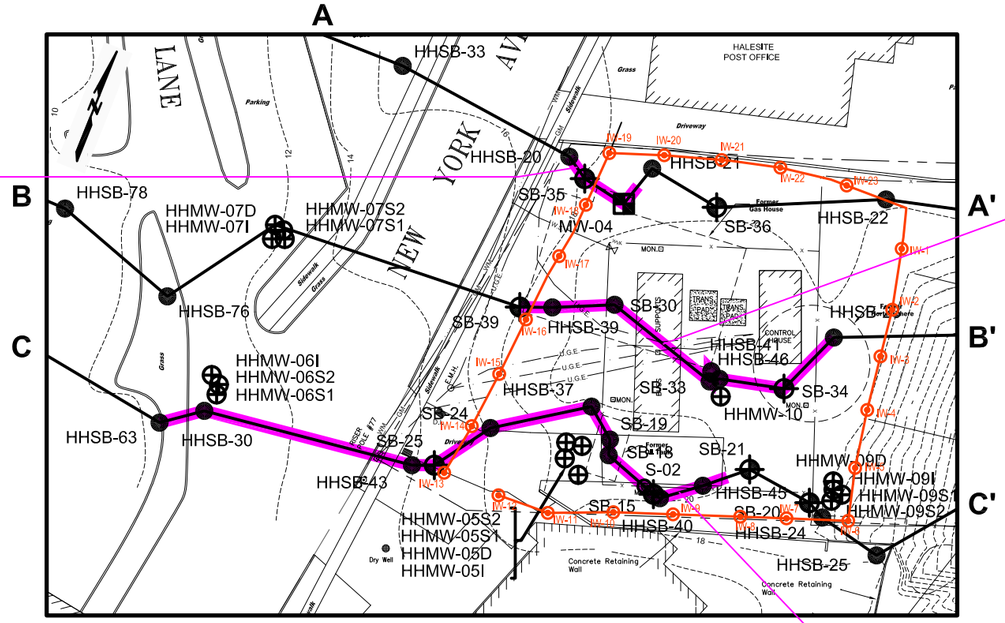
0 30
HORIZONTAL SCALE, FEET

AKRF Engineering P.C.
Environmental Consultants
440 Park Avenue South, New York, NY 10016

HALESITE FORMER MGP SITE
HALESITE, SUFFOLK COUNTY, NEW YORK
UPLAND AREAS REMEDIAL INVESTIGATION CROSS SECTION EXERPTS

DATE **4.9.09**
PROJECT NO. **60101**
SCALE **as shown**
FIGURE **4a**

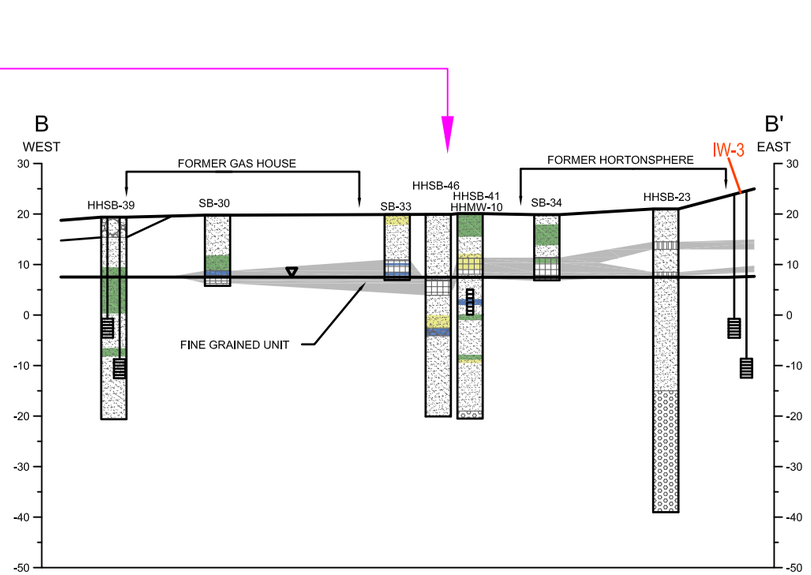




LOWLAND CROSS SECTION LOCATION MAP

0 50

SCALE, FEET



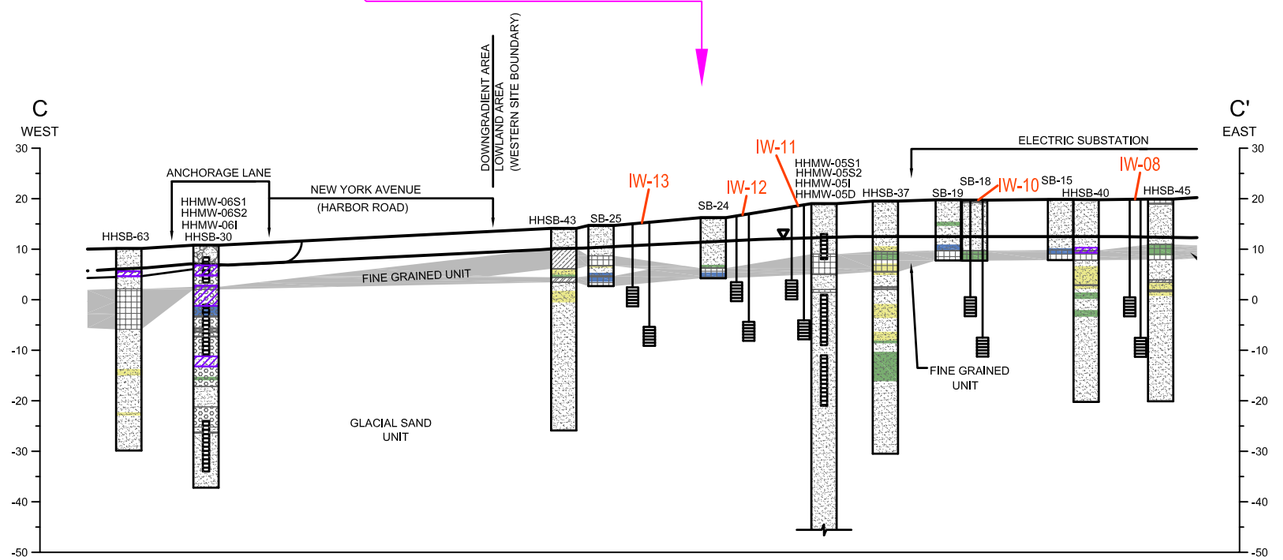
LEGEND

GEOLOGICAL CLASSIFICATIONS

- TOPSOIL AND/OR FILL
- FINE, MEDIUM TO COARSE SANDS TO FINE, MEDIUM TO COARSE SANDS WITH GRAVEL
- GRAVEL, GRAVEL WITH SAND, GRAVELY SANDS
- SILTY SANDS TO SILT WITH SAND
- SILTS TO CLAY RICH SILTS
- CLAYS WITH SANDS
- CLAYS
- PEAT

PHYSICAL DESCRIPTIONS

- TAR/NAPHTHA ODORS
- TAR STAINING, BLEBS, GLOBS, LENSES GRAIN-COATING, SHEENS
- TAR SATURATED
- PETROLEUM-LIKE STAINING, SHEENS AND ODORS
- MONITORING WELL SCREEN INTERVAL
- APPROXIMATE ELEVATION OF WATER TABLE GIVEN IN FEET ABOVE MEAN SEA LEVEL, DASHED WHERE INFERRED
- GROUND SURFACE
- O_2 INJECTION WELL SCREEN INTERVAL



30 0

VERTICAL SCALE, FEET

0 30

HORIZONTAL SCALE, FEET

SOURCES:

BASED ON Figure 3-1, *LOWLAND AREAS REMEDIAL INVESTIGATION CROSS SECTION EXERPTS*, PREPARED BY GEI CONSULTANTS IN THE REMEDIAL ACTION PLAN DATED MARCH 2006, WHICH WERE IN TURN BASED UPON *GEOLOGIC CROSS SECTIONS A-A', B-B'* FINAL REMEDIAL INVESTIGATION, HALESITE FORMER MGP SITE, PREPARED BY VANASSE HANGEN BRUSTLIN, INC., MIDDLETOWN, CT, HORIZONTAL SCALE: 1"=20'; VERTICAL SCALE: 1"=20', DATE: APRIL 2004.

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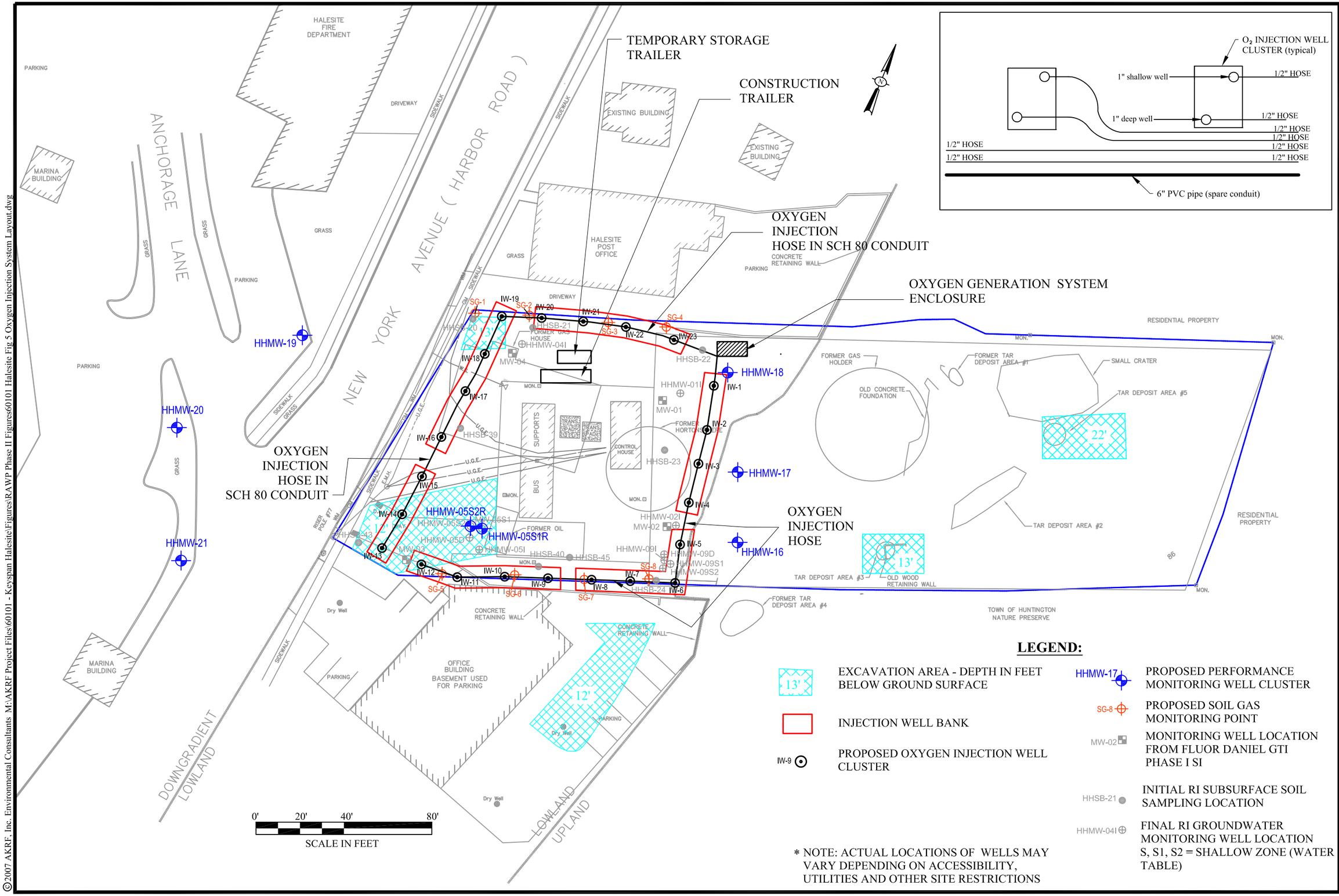
HALESITE FORMER MGP SITE
HALESITE, SUFFOLK COUNTY, NEW YORK
LOWLAND CROSS SECTIONS AND PROPOSED 0_2 INJECTION WELLS

DATE **4.9.09**

PROJECT NO. **60101**

SCALE **as shown**

FIGURE **4b**



LEGEND:

- 13' — EXCAVATION AREA - DEPTH IN FEET BELOW GROUND SURFACE
- INJECTION WELL BANK
- IW-9 — PROPOSED OXYGEN INJECTION WELL CLUSTER
- HHMW-17 — PROPOSED PERFORMANCE MONITORING WELL CLUSTER
- SG-8 — PROPOSED SOIL GAS MONITORING POINT
- MW-02 — MONITORING WELL LOCATION FROM FLUOR DANIEL GTI PHASE I SI
- HHSB-21 — INITIAL RI SUBSURFACE SOIL SAMPLING LOCATION
- HHMW-04I — FINAL RI GROUNDWATER MONITORING WELL LOCATION S, S1, S2 = SHALLOW ZONE (WATER TABLE)

* NOTE: ACTUAL LOCATIONS OF WELLS MAY VARY DEPENDING ON ACCESSIBILITY, UTILITIES AND OTHER SITE RESTRICTIONS

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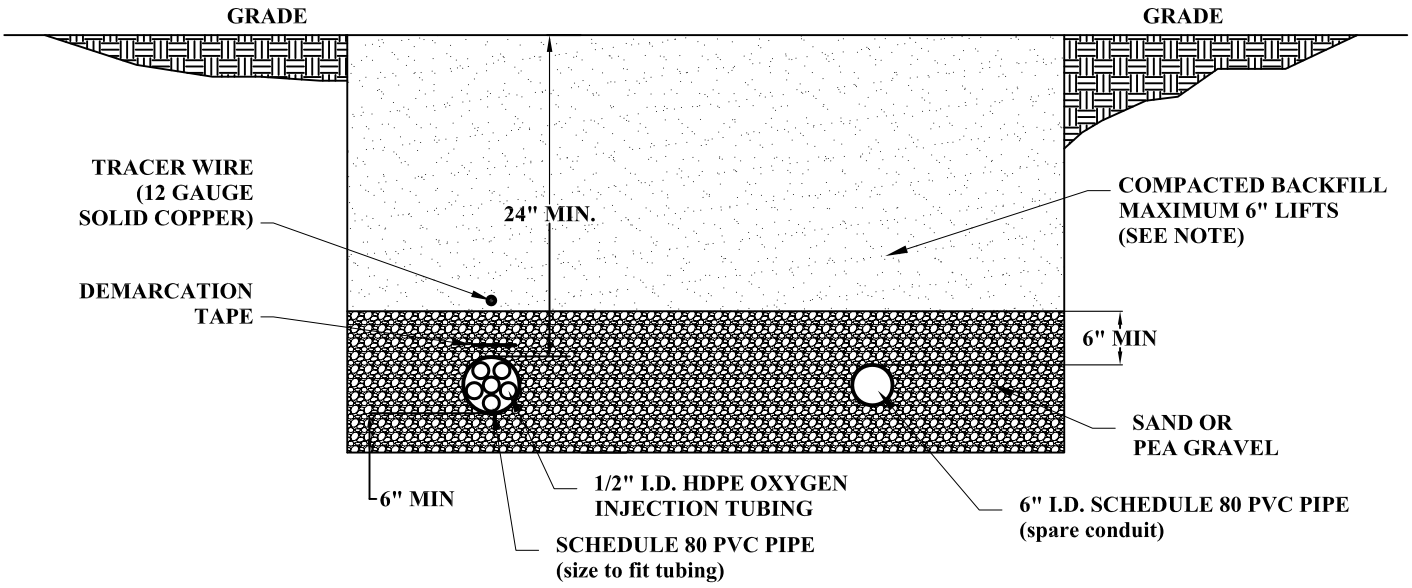
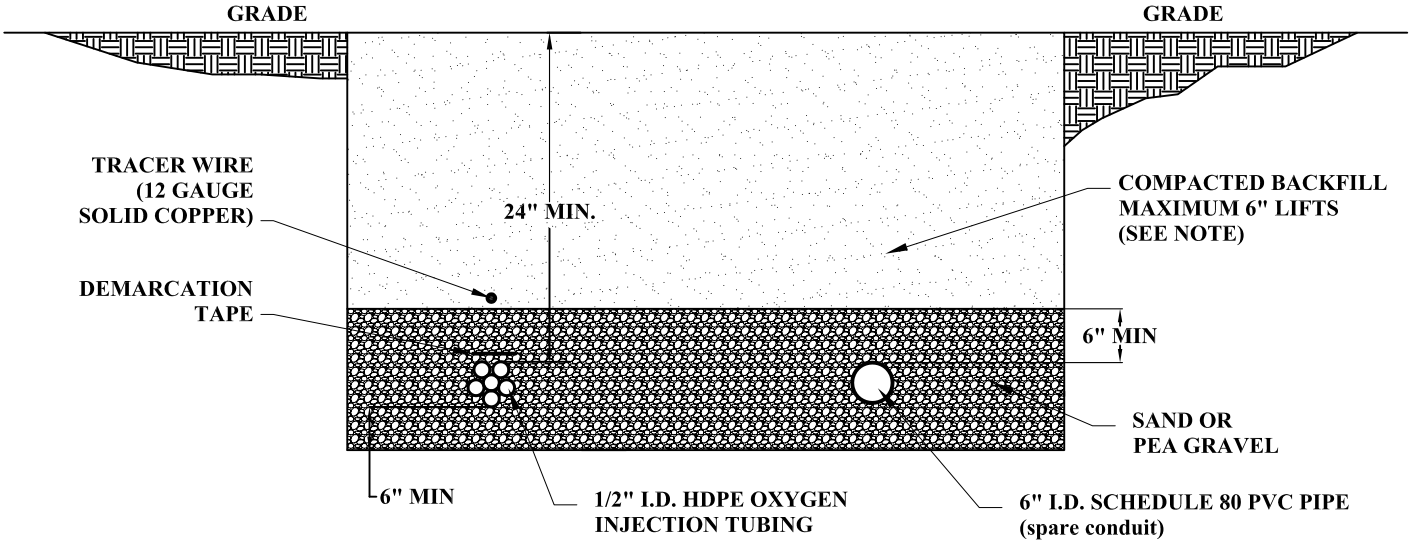
HALESITE FORMER MGP SITE
HALESITE, SUFFOLK COUNTY, NEW YORK

OXYGEN INJECTION SYSTEM LAYOUT

DATE **4.9.09**
PROJECT NO. **60101**
SCALE **1"=40'**
FIGURE **5**



A) TYPICAL TRENCH DETAIL (TUBING IN CONDUIT)
NOT TO SCALE



B) TYPICAL TRENCH DETAIL (DIRECT BURIAL)
NOT TO SCALE

NOTE:
BACKFILL SHALL BE SUITABLE EXCAVATED MATERIALS OR GRANULAR SELECT FILL FREE OF LARGE PIECES OF BRICK AND STONE.

HALESITE FORMER MGP SITE
HALESITE, SUFFOLK, NEW YORK

TYPICAL TRENCH DETAILS

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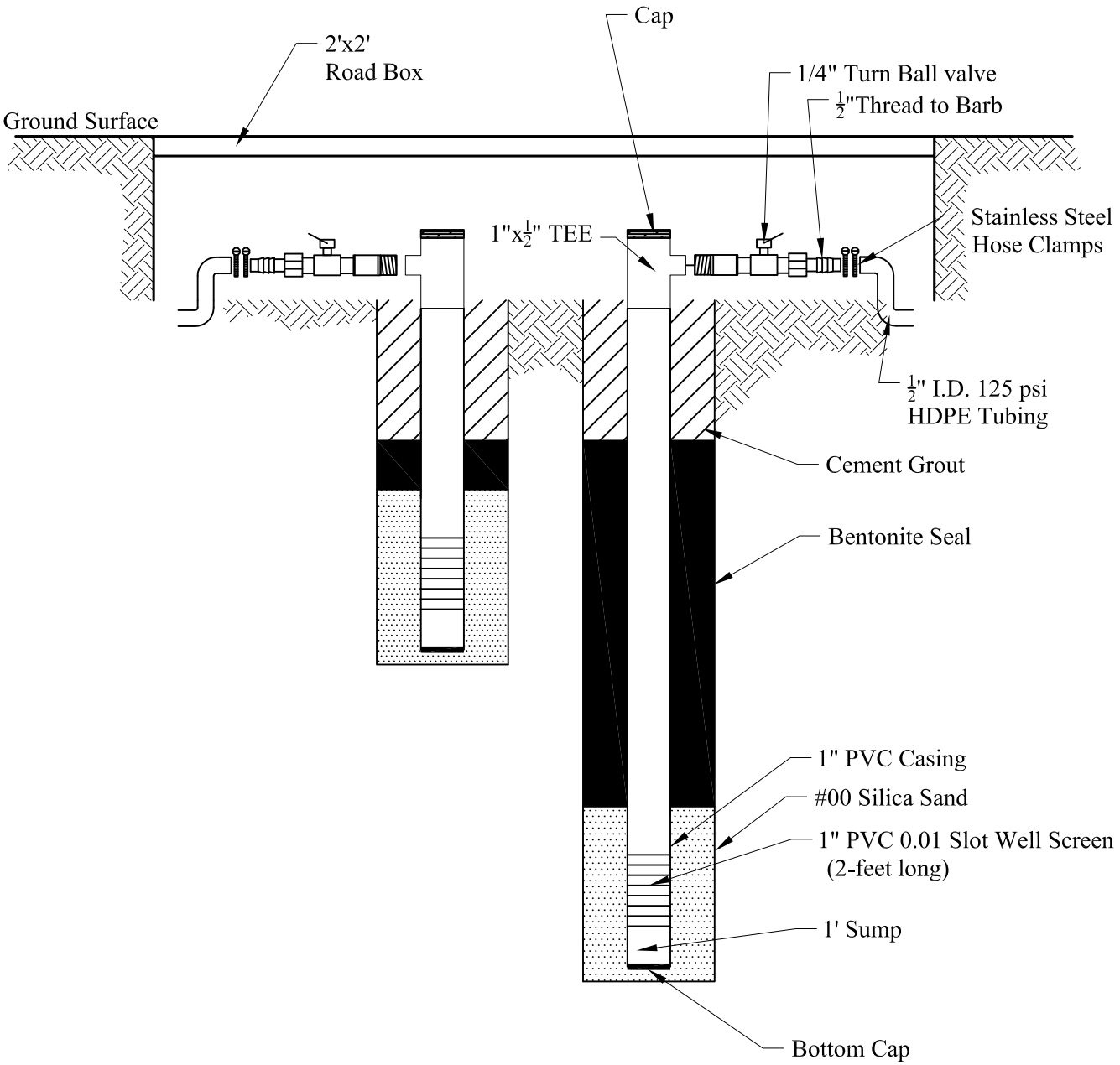
DATE **4.9.09**
PROJECT No. **60101**
SCALE **NTS**
FIGURE **6**



HALSITE FORMER MGP SITE

HALESITE,SUFFOLK, NEW YORK

TYPICAL OXYGEN INJECTION WELL CONSTRUCTION

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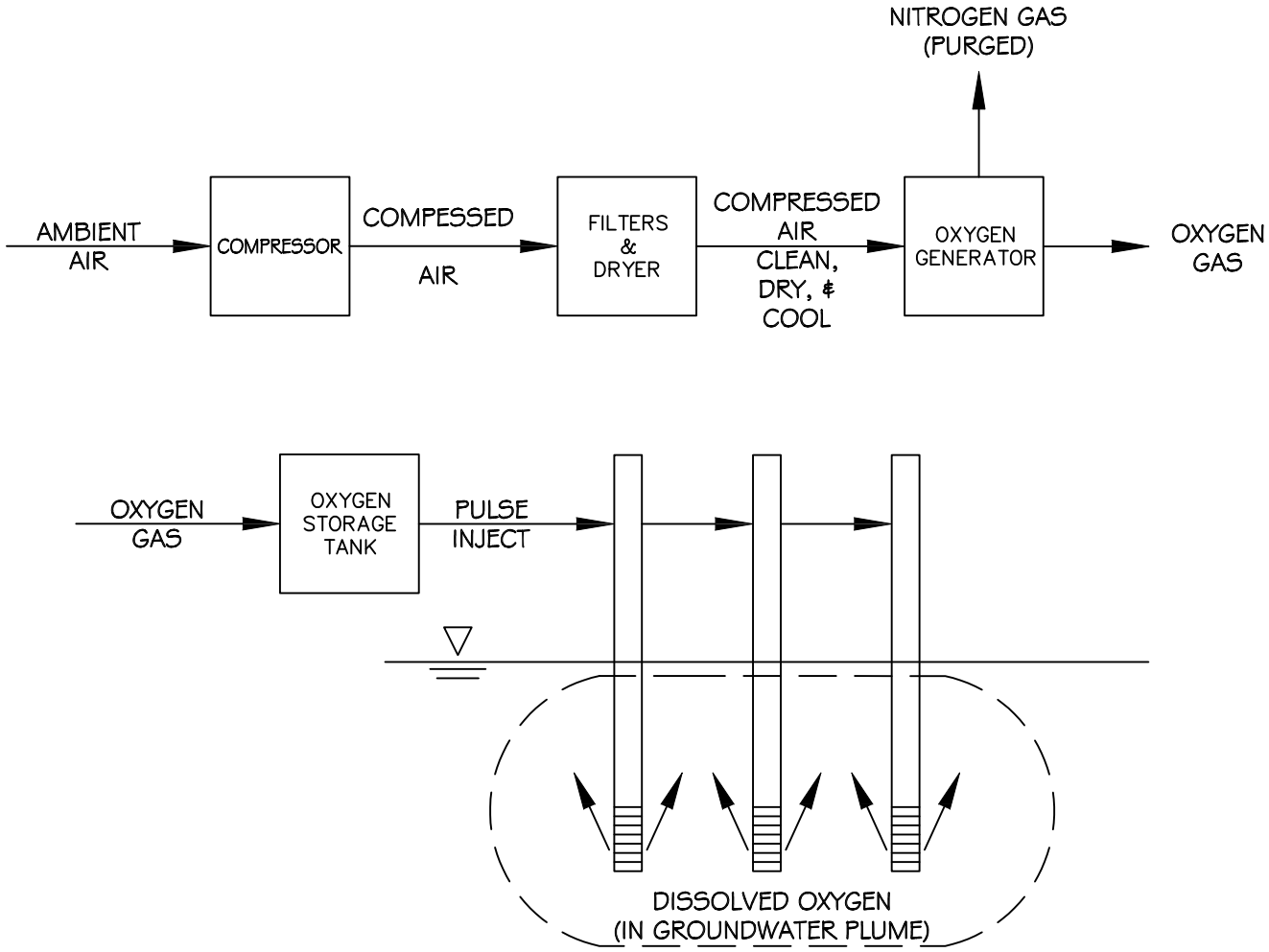
DATE	4.9.09
PROJECT No.	60101
SCALE	nts
FIGURE	7



Source: Matrix Environmental Technologies, Inc., Orchard Park, NY; U.S. Patent No. 5,874,001.

HALESITE FORMER MGP SITE

HALESITE, NEW YORK

OXYGEN INJECTION SYSTEM PROCESS FLOW DIAGRAM

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DATE	4.9.09
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SCALE	nts
FIGURE	8

HALESITE FIRE DEPARTMENT
PARKING
DRIVEWAY
SIDEWALK
ANCHORAGE LANE
NEW YORK AVENUE (HARBOR ROAD)
MARINA BUILDING
GRASS
EXISTING BUILDING
HALESITE POST OFFICE
CONCRETE RETAINING WALL
RESIDENTIAL PROPERTY
RW-1
RW-2
RW-3
RW-4
RW-5/RW-5D
RW-6
RW-7
RW-8
RW-9/RW-9D
RW-10
RW-11
13'
12'
22'
FORMER GAS HOUSE
FORMER GAS HOLDER
FORMER TAR DEPOSIT AREA #1
SMALL CRATER
TAR DEPOSIT AREA #5
TAR DEPOSIT AREA #2
TAR DEPOSIT AREA #3
FORMER TAR DEPOSIT AREA #4
OLD CONCRETE FOUNDATION
OLD WOOD RETAINING WALL
FORMER HORTONSPHERE
SUPPORTS
TRANS GRADE
GAS
CONTROL HOUSE
BUS
FORMER OIL TANK
MON.
Dry Well
OFFICE BUILDING BASEMENT USED FOR PARKING
TOWN OF HUNTINGTON NATURE PRESERVE
DOWNGRADIENT
LOWLAND
UPLAND
0' 20' 40' 80'
SCALE IN FEET

LEGEND:

- 13' — EXCAVATION AREA - DEPTH IN FEET BELOW GROUND SURFACE
- × — PROPOSED SHALLOW NAPL RECOVERY WELL
- ⊗ — PROPOSED SHALLOW & DEEP NAPL RECOVERY WELL

* NOTE: ACTUAL LOCATIONS OF WELLS MAY VARY DEPENDING ON ACCESSIBILITY AND OTHER SITE RESTRICTIONS

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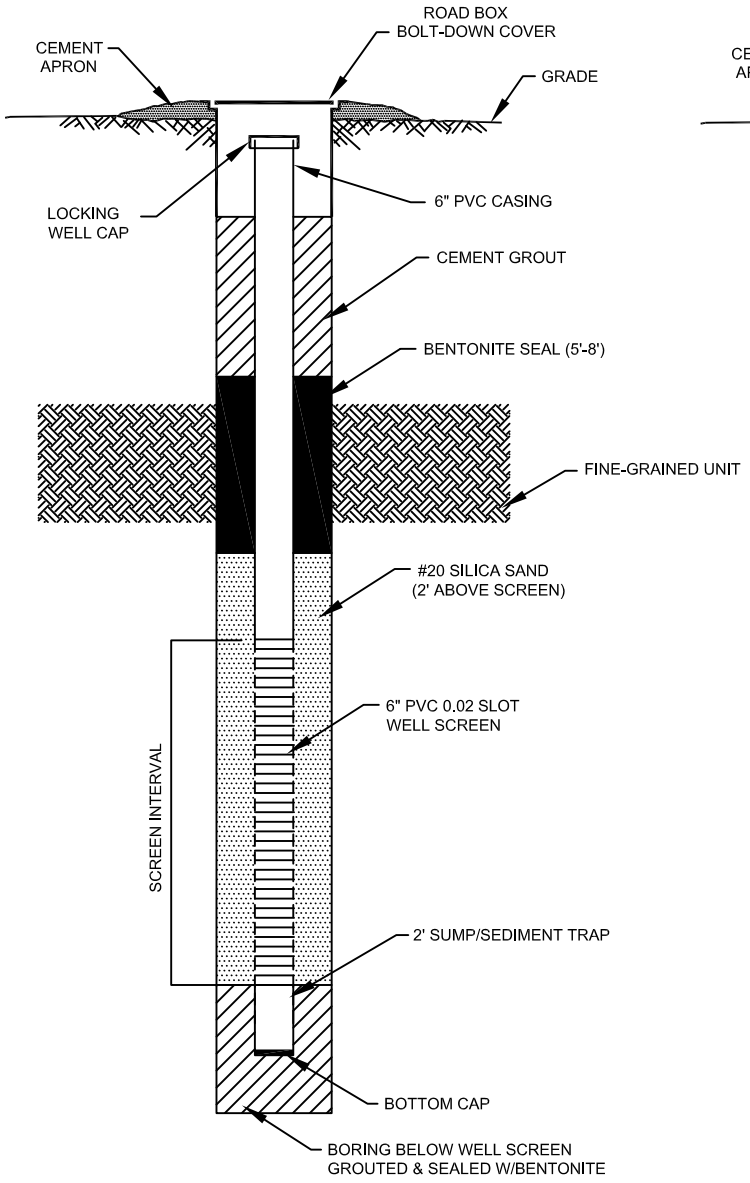
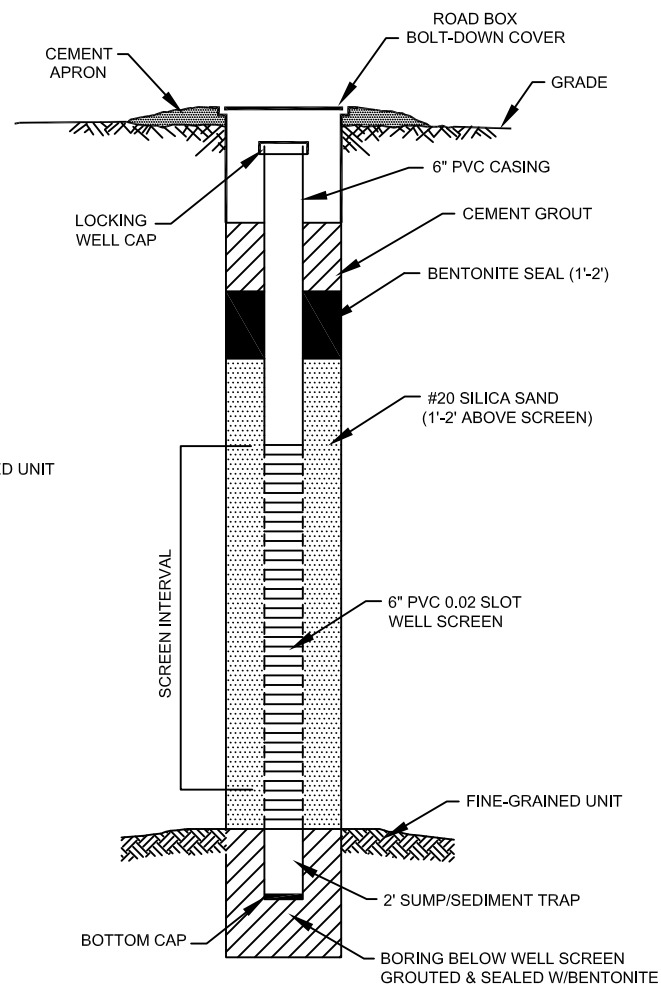
HALESITE FORMER MGP SITE
HALESITE, SUFFOLK COUNTY, NEW YORK
NAPL RECOVERY WELLS IN LOWLAND AREA

DATE **4.9.09**
PROJECT NO. **60101**
SCALE **1"=40'**
FIGURE **9**



A. TYPICAL RECOVERY WELL CONSTRUCTION (WELLS BELOW FINED-GRAINED UNIT)

NOT TO SCALE



B. TYPICAL RECOVERY WELL CONSTRUCTION (WELLS ABOVE FINE GRAINED UNIT)

NOT TO SCALE

HALESITE FORMER MGP SITE
HALESITE, SUFFOLK, NEW YORK

TYPICAL NAPL WELL CONSTRUCTION

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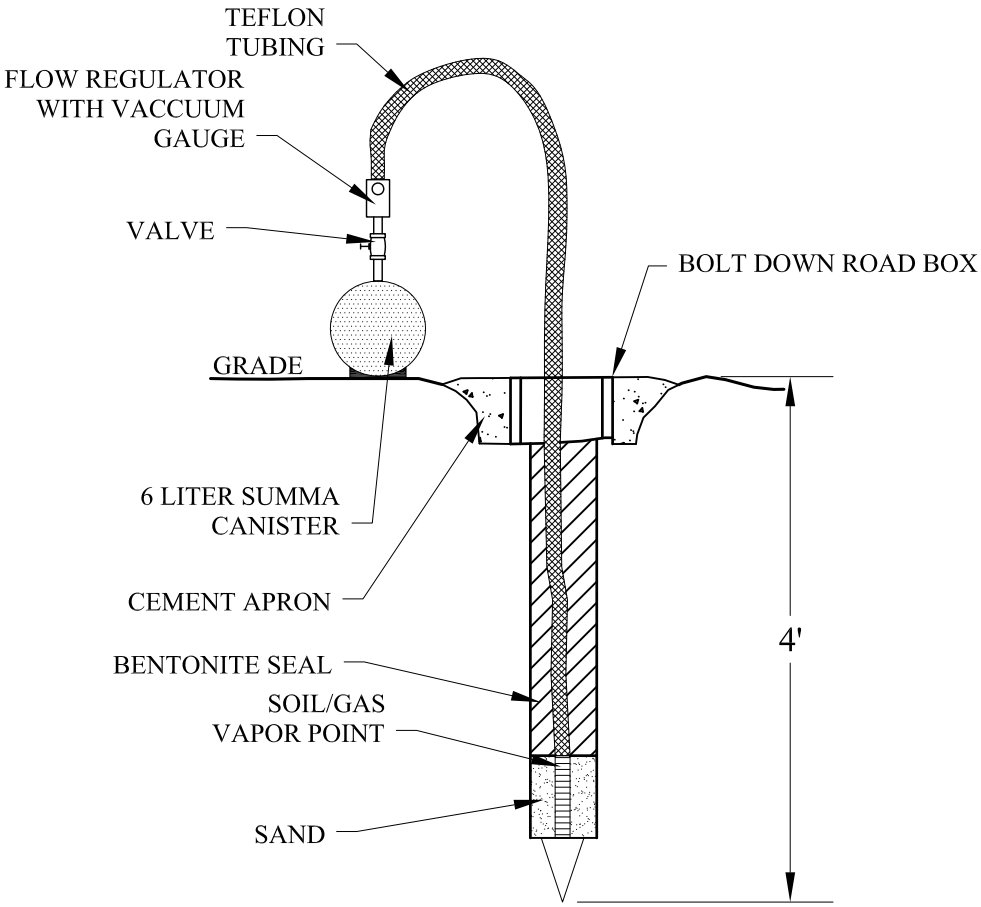
DATE **4.9.09**
PROJECT No. **60101**
SCALE **NTS**
FIGURE **10**



SOIL GAS MONITORING POINT ASSEMBLY

HALESITE FORMER MGP SITE
HALESITE, SUFFOLK, NEW YORK

TYPICAL SOIL GAS MONITORING POINT CONSTRUCTION

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DATE **4.9.09**
PROJECT No. **60101**
SCALE **NTS**
FIGURE **11**

APPENDIX A
SITE SURVEY

APPENDIX B
OXYGEN INJECTION SYSTEM SPECIFICATIONS

APPENDIX C
QUALITY ASSURANCE PROJECT PLAN

APPENDIX D
SITE SPECIFIC HEALTH AND SAFETY PLAN

APPENDIX E
AIR MONITORING WORK PLAN

APPENDIX F
ESTIMATED REMEDIATION COSTS AND SCHEDULE