FINAL REPORT

1-5 Holland Avenue Site
Alternatives Analysis/Remedial Action Work Plan

Brownfield Cleanup Program No. C360115
1-5 Holland Avenue
White Plains, NY
14206 / 47376

Prepared for:

One Holland Avenue Development, LLC

Prepared by:

O'Brien & Gere Engineers, Inc.

November 2014

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I, Douglas M. Crawford, certify that I am currently a NYS registered professional engineer and that this Remedial Alternative Analysis and Remedial Action Work Plan was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the DER Technical Guidance for Site Investigation and Remediation (DER-10).

O'BRIEN & GERE ENGINEERS, INC.

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VICE PRESIDENT

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1. INTRODUCTION

1.1 GENERAL

This Alternatives Analysis/ Remedial Action Work Plan (AA/RAWP) has been developed by O'Brien & Gere Engineers, Inc. (O'Brien & Gere) on behalf of One Holland Avenue Development, LLC. (OHAD) for the 1-5 Holland Avenue Site (Site) located in White Plains, New York. The AA/RAWP was prepared in accordance with the New York State Department of Environmental Conservation (NYSDEC) Brownfield Cleanup Agreement (BCA) Index # C36-0115-11-10 under the Brownfield Cleanup Program (BCP). The BCP site identification number is C360115. A site location map is provided as **Figure 1**.

1.2 PROJECT SCOPE AND PURPOSE

The purpose of the AA/RAWP is to document the development and evaluation of remedial alternatives, as well as provide a recommendation and description of the Site remedy. The Site consists of the 1-5 Holland Avenue property which contains four buildings and paved areas for parking. As depicted on **Figure 2**, adjacent off-site properties include 7-11 Holland Avenue (located to the east, hydraulically upgradient of the Site) and 2 Holland Avenue (located to the north, hydraulically side gradient of the Site), the White Plains Rural Cemetery (located to the south, hydraulically side gradient to the Site) and the Metro North Parking lot (located to the west/southwest, hydraulically downgradient of the Site).

1.3 ORGANIZATION OF REPORT

The AA/RAWP is organized as follows:

- Section 2 presents a brief discussion of the history of the Site.
- Section 3 provides a description of the remedial investigation and interim measures that have been implemented at the Site and includes a discussion of the human health exposure assessment.
- Section 4 describes the development of remedial alternatives and includes the identification of Standards, Criteria and Guidance (SCGs), Remedial Action Objectives (RAOs), and the assembly of remedial alternatives.
- Section 5 presents the detailed analysis of alternatives, which includes both the individual and comparative alternatives analysis.
- Section 6 presents the AA summary and recommendations.
- Section 7 provides the proposed RAWP for the recommended remedial alternative. Specifically, Section 7 provides a description of remedial actions, a description of institutional and engineering controls, and recommended maintenance and monitoring for the remedy.

2. SITE HISTORY AND DESCRIPTION

2.1 SITE LOCATION AND DESCRIPTION

The Site is located at 1-5 Holland Avenue in White Plains, New York. The property, depicted on **Figure 1**, is zoned light industrial and comprises 0.72 acres. Four buildings, identified as Building # 1 through Building #4 are located on the property. OHAD purchased the subject property in 2009. Previously, the property was owned by 1 Holland Avenue Associates, Inc., a real estate company that purchased the property in October 2000 from an unrelated entity. Feintool New York, Inc. ("Feintool") leased the property from 1971 to 2009 and conducted manufacturing of metal parts at the property from 1971 through June 2008. The property is located in an area surrounded by properties of mixed use (see **Figure 2**), consisting of:

- White Plains Rural Cemetery to the south
- Harlem Line of Metro North Railroad tracks and parking area immediately to the west
- Commercial buildings immediately to the east and north
- Commercial and residential buildings further to the north and east

The Bronx River is located approximately 400 feet west of the Site.

2.2 SITE HISTORY

As described above, Feintool leased the 1-5 Holland Avenue property from 1971 to 2009 and conducted manufacturing of metal parts for the automotive, electrical, and cutlery industries at the property from 1971 through June 2008. Prior to 1971, the property was used by several owners or tenants. Use of the property prior to 1971 included:

- Sheridan Motors, Inc. (1930's) - operated as a garage, repair shop, and an auto paint shop
- Modern Swimming Pool Company, Inc (1950's) - multiple buildings used as a warehouse, office and showroom and for manufacturing, as well as leased space used to operate a photography company
- EES Gee, Inc. and Stoffel Fine Flow Stamping (1960's) - used by an electronics company and for metal parts machining.
- Feintool New York (1971 – 2008) – manufacturing of precision metal parts.

From June 2008 to October 2011, the property was vacant. From October 2011 through June 2013, the northern half of Building #3 was occupied for use by a car detailing business (Puffs Auto Salon). During this period, the remainder of the property was marketed for sale or lease, but remained vacant. The property was sold by OHAD in October 2013, to the current owner identified as 1 Holland LLC. The current owner renovated and redeveloped the entire property for use as a self-storage facility (White Plains Self Storage). OHAD remains responsible as the Participant under the BCP for completing environmental work under the BCP. 1 Holland LLC requested to be added to the BCA as a Volunteer pursuant to a BCA Amendment Application submitted on July 28, 2014.

The property was primarily used for the manufacturing of metal parts. Feintool's historic manufacturing activities consisted of the following:

- Activities in Building#1, a 5,100 square foot building, included storage, metal stamping, a machine shop, and cutting oil storage
- Activities in Building #2, a 1,350 square foot building, included storage, office space, and a small printing business
- Activities in Building #3, the main 4,200 square foot manufacturing building, included large metal stamping, a machine shop, shipping, and waste oil storage

- Activities in Building #4, a 5,750 square foot manufacturing building, included small metal stamping operation, a machine shop, and office space.

Buildings #1 through #4 are depicted on **Figure 3**.

3. SUMMARY OF REMEDIAL INVESTIGATION, INTERIM REMEDIAL MEASURES, AND EXPOSURE ASSESSMENT

3.1 REMEDIAL INVESTIGATION

The Remedial Investigation (RI) was conducted from March 2011 through May 2013 and included the investigation and characterization of the overburden soil, bedrock, groundwater, surface water, and potential for vapor intrusion (VI). Results of the RI are detailed in the RI Report (O'Brien & Gere 2014a). A summary of the conceptual site model for the Site is presented below.

The Site is underlain by 0.5 feet to 5 feet of sandy fill followed by a well sorted fine to medium grained sand to a depth between 15 and 17 feet below grade (fbg). A poorly sorted sandy-gravel believed to be till is present below this depth. The bedrock (Inwood Marble) surface is present between 20 and 24 fbg and is characterized as a calcitic-dolomitic marble with the majority of fractures occurring in the upper 10 feet that act as the principal pathway for horizontal groundwater flow through the bedrock. Bedrock becomes increasingly competent and unfractured with depth.

Groundwater is generally encountered in the overburden at approximately 12 to17 fbg with primary flow from the east to the west/northwest. Approximate *in situ* hydraulic conductivity values for the overburden, shallow bedrock, and suspected source area wells were as follows:

- Overburden range – 0.3 feet/day (ft/day) to 58 ft/day
- Shallow bedrock range – 0.0003 ft/day to 5 ft/day
- Suspected source Area: MW-4S, Overburden – 10 ft/day
- Suspected source Area: MW-4D, Shallow bedrock – 5 ft/day

3.1.1 Soil

Soil analytical results from the suspected source area did not indicate the presence of tetrachloroethylene (PCE) at concentrations above 6 NYCRR Part 375-6 restricted commercial or protection of groundwater soil cleanup objectives (SCOs). However, the groundwater results from the Site, discussed below, suggest that a residual source of PCE is present.

Surface soil analytical results from three of the four on-site areas having exposed soils (*i.e.,* areas not paved or covered by structures) indicated detectable concentrations of Semi-Volatile Organic Compounds (SVOCs) and/or metals at concentrations exceeding applicable SCOs. Surface soil concentrations above SCOs are summarized on **Figure 4**.

Subsurface fill with concentrations exceeding the SCOs were limited to metals. These exceedances were observed in fill samples throughout the Site footprint and are considered to be related to the historic urban fill under the entire Site, and not related to Site activities. Subsurface soil concentrations above SCOs are summarized on **Figure 5**.

3.1.2 Groundwater

Results of groundwater sampling indicated the presence of PCE in overburden groundwater, on-site and along the hydraulically downgradient western edge of the property, at concentrations above the NYS Class GA groundwater standard of 5 ug/l. Downgradient groundwater concentrations in the bedrock also exceeded the NYS Class GA groundwater standard for PCE. PCE and PCE degradation products trichloroethylene (TCE), cis-1,2-dichloroethylene (cis-1,2-DCE) and vinyl chloride were also present in downgradient monitoring wells at concentrations above NYS Class GA groundwater standards. The order of magnitude decline in groundwater PCE concentrations between the potential source area and downgradient monitoring wells suggests that natural attenuation of PCE in groundwater is occurring. The presence of PCE degradation products only in off-site downgradient groundwater suggests that degradation of PCE is occurring. VOC concentrations in groundwater are illustrated on **Figure 6**.

During the June 2013 groundwater sampling event, the suspected source area wells MW-4S (overburden) and MW-4D (shallow bedrock) exhibited concentrations of PCE at 1,040 ug/l and 5,500 ug/l, respectively.

Iron, magnesium, manganese, and sodium concentrations at each well location were commonly found to exceed the NYS Class GA groundwater standards. Metals concentrations observed in the RI study area (on-Site and off-Site) are consistent with the regional surficial and bedrock geology and the urban environment in the vicinity of the Site, and are not considered related to Site activities.

3.1.3 Surface Water

Surface water data indicated that PCE concentrations observed in the Bronx River are from an unidentified, upstream source that is unrelated to the Site. In general, the PCE and PCE degradation product concentrations are highest at the upgradient sampling locations and decrease in concentration downstream.

3.1.4 Vapor Intrusion

PCE has been detected in soil vapor in the two potential source areas under the on-site structures and under off-site structures at 7-11 Holland Avenue to the east, and at 2 Holland Avenue to the north. Soil vapor concentrations are summarized on **Figure 7**. No structures are located within the floodplain to the west of the Site. Based on the NYSDOH Guidance matrices (NYSDOH 2006) and the PCE concentrations in the sub-slab and indoor samples, mitigation was recommended for the Site (1-5 Holland Ave building) and off-site property 7-11 Holland Ave. The most recent VI sampling data collected in January 2014 for 2 Holland Avenue indicated that sub-slab concentrations of PCE were below 100 ug/m^3 and indoor air analytical results for PCE were below detectable concentrations. Based on a comparison of these results to the corresponding matrix presented in the NYSDOH VI guidance (NYSDOH 2006), no further action is warranted. At the request of NYSDOH, additional monitoring will be conducted to confirm these findings.

3.1.5 Suspected Source Area

Based on historical reports and data collected during the RI, the source of PCE is believed to be from historical degreasing operations at the Site and possible releases through cracks in floor drains, which discharged to the sanitary sewer. Soil sampling, membrane interface probe (MIP) testing, and groundwater sampling conducted inside the building indicated elevated concentrations of PCE in groundwater in the suspected source area. These data suggest that a residual source of PCE may be present in the soil and bedrock in this area. However, no apparent source of PCE was observed in on-site subsurface soils during the RI. MIP readings are summarized on **Figure 8**.

3.2 EXPOSURE ASSESSMENT

The qualitative human health exposure assessment identified contaminants present at the Site, migration pathways, potential human receptors, and the exposure pathways for each receptor. A qualitative human health exposure assessment for the Site was presented in Section 9 of the RI Report (O'Brien & Gere 2014a). The relevant current/future receptor exposure scenario included trespassers, maintenance workers (landscapers), utility/sewer line workers, commercial/industrial workers, and off-site office workers. The following potentially complete exposure pathways were identified for these receptors:

- Direct contact, incidental ingestion, and inhalation of VOCs, SVOCs and metals in surface soil
- Direct contact, incidental ingestion, and inhalation of VOCs, SVOCs and metals in subsurface soil
- Direct contact, incidental ingestion, and inhalation of VOCs in groundwater
- Potential inhalation of soil vapor impacted with VOCs in both on-site and off-site buildings.

The findings of the fish and wildlife impact assessment (FWIA) indicated that Site-related impacts to on-Site and off-Site ecological receptors are minimal or non-existent and further assessment of potential ecological impact is not warranted.

3.3 INTERIM REMEDIAL MEASURES

IRM activities that were completed as part of remedial or exposure control activities have consisted of VI mitigation activities, surface soil excavation and disposal, and groundwater treatment using *in situ* chemical oxidation (ISCO) technology. These IRMs are described in the *IRM Construction Completion Report* (O'Brien & Gere 2014b) and summarized in the following sections.

3.3.1 Vapor Mitigation System

A VI mitigation system was installed to address the potential for VI into the on-site structures at 1-5 and 7-11 Holland Avenue properties. Overall SSD at 1-5 and 7-11 Holland Avenue is achieved using five separate SSD systems installed in 2009 and 2013, respectively. The SSD systems consist of a network of piping and vacuum blowers that extract sub-slab soil vapor from a series of system suction points (SSPs) that penetrate the floor slab. The SSD systems for on-site structures at the1-5 Holland Avenue property were installed in April 2009 by Enviro Testing (Division of KMT, LLC) prior to the Site entering the BCP program. In 2013, a horizontal sub-slab vapor extraction point was installed underneath the western portion of the neighboring 7-11 Holland Avenue building and connected to the existing VI mitigation system at 1-5 Holland Avenue. Each separate system includes a fan and two SSPs, totaling five vacuum blowers and ten SSPs with the exception of one system having an additional horizontal suction point under 7-11 Holland Avenue. Installation of the original VI mitigation system in 2009 was completed prior to the Site entering into the BCP.

Post-IRM installation indoor air samples collected in 2013 indicate that the VI mitigation system is effective at mitigating VI potential for the Site and 7-11 Holland Avenue. The most recent VI sampling data collected in January 2014 for 2 Holland Avenue indicated that sub-slab concentrations of PCE were below 100 ug/m^3 and indoor air results for PCE were below detectable concentrations. Based on a comparison of these results to the corresponding matrix presented in the NYSDOH VI guidance (NYSDOH 2006), no further action is warranted. At the request of NYSDOH, additional monitoring will be conducted to confirm these results.

3.3.2 Soil IRM

Consistent with correspondence with NYSDEC, surface soil excavation activities were conducted as part of the IRMs at the Site to remove exposed surface soil exhibiting concentrations greater than NYSDEC Part 375 SCOs for commercial use. The areas of surface soil removal consisted of two areas (Southeast [SE] and Southwest [SW] Corners) at the rear of the facility and the Northeast flower bed in the front of the building along Holland Avenue near the loading dock. A total of approximately 24 cubic yards of surface soils were excavated and disposed off-site.

Southeast Corner Drainage Project

In September 2013 surface soils in the South East Corner area were excavated to a depth 6 inches below the first floor elevation of the building, requiring removal of 1 to 2 feet of soil. A perforated drain system and two sumps with electric pumps were installed for discharge of collected storm water to the roof drain on the east side of the building. Landscape fabric was used to separate underlying soils from the drainage system piping. Backfill comprising approximately 12 cubic yards of ¾-inch bluestone gravel sourced from CASA Building Materials of Elmsford was backfilled to a depth of greater than 1 foot to approximate the original surface contour in the SE Corner area. The gravel fill contains less than 10% by weight material which would pass through a size 80 sieve and consists of clean material from Tilcon New York Inc.'s, Clinton Point, NY quarry (NYSDOT Source #8-9R). Drainage project work was completed for 1 Holland LLC by its contractor, Xtreme Construction.

Southwest Alley Drainage Project

In February 2014 the new owner completed a drainage project in the Southwest (SW) Alley, similar to the project completed in the SE Corner, to mitigate the potential for storm water to seep through the CMU block wall of the building. The SW Alley is about 3.5-feet wide and 76-feet long running between the back of the building and the retaining wall next to the White Plains Rural Cemetery. Soils were excavated to a depth of at least 12 inches. Landscape fabric was placed over the entire length of the SW Alley. Perforated drain pipe running the length of the SW Alley was connected below ground surface to the storm water discharge from the roof drain at the southwest corner of the building. The SW Alley was then backfilled with approximately 12 cubic yards of ¾-

inch bluestone on top of the soil and drainage system to a depth of greater than 12 inches. Drainage project work was completed by Xtreme Construction. Backfill gravel was obtained from CASA Building Materials of Elmsford.

Northeast Flower Bed Access Ramp Project

To provide access to the front of the building, 1 Holland LLC removed an existing set of stairs and constructed a concrete access ramp. The access ramp was built over the existing stairs adjacent to the Northeast (NE) Flower Bed. In connection with this work, 1 Holland LLC removed the NE Flower Bed and covered the area with an asphalt parking surface in July 2013. The NE Flower Bed was a rectangular area approximately 7 by 12 feet. Surface soils in the NE Flower Bed were excavated to a depth of approximately 12 inches and asphalt sub-base and paving applied over the top. Excavated soils were used as fill material under the ramp. The asphalt surface integrates with the adjacent asphalt parking and completely covers the NE Flower Bed area. Construction work on the access ramp and asphalt surfacing was completed by Xtreme Construction.

3.3.3 Groundwater Treatment IRM

Consistent with the *Interim Remedial Measures Work Plan* (O'Brien & Gere 2013), a groundwater treatment IRM was implemented to address chlorinated VOCs in groundwater detected at concentrations greater than the NYS Class GA groundwater standards. The groundwater treatment consisted of *in situ* chemical oxidation (ISCO) and was implemented by In-situ Oxidative Technologies, Inc. (ISOTEC) to treat PCE in subsurface soil, bedrock, and groundwater. Ten injection well (IW) clusters were installed in the suspected source area between May and June 2013 by Aquifer Drilling and Testing (ADT). ISOTEC implemented the ISCO groundwater treatment program in June 2013 using an activated sodium persulfate process. A total of 7,200 gallons of Base activated sodium persulfate (BASP) reagent (3,600 gallons each into both the overburden and shallow bedrock zones) was injected during the ISCO IRM to treat an approximately 1,100 square ft area. Although the groundwater treatment has not resulted in groundwater concentrations below NYS Class GA standards, a review of post-IRM groundwater data initially indicated over 20% decrease in groundwater PCE concentrations, based on data collected through July 2014.

The July data indicated increased PCE concentrations compared to the January 2014 data. This "rebound" of contaminant concentrations following ISCO treatment is common and PCE concentrations did not "rebound" back to pre-ISCO concentrations. A second round of oxidant injection under the IRM was completed the week of September 8-12, 2014 and results will be documented in an Addendum to the IRM Construction Completion Report (CCR). A Site Management Plan (SMP) will provide for monitoring groundwater conditions to evaluate long-term performance of the ISCO/monitoring remedy for the Site. The SMP will also provide for eventual monitoring well decommissioning/abandonment in accordance with NYSDEC Groundwater Monitoring Well Decommissioning Policy CP-43.

4. DEVELOPMENT OF REMEDIAL ALTERNATIVES

This section documents the development of remedial alternatives for the Site:

4.1 IDENTIFICATION OF STANDARDS, CRITERIA AND GUIDANCE (SCGS)

There are three types of SCGs: chemical-, location-, and action-specific SCGs.

- Chemical-specific SCGs are health- or risk-based numerical values or methodologies which, when applied to site-specific conditions, result in the establishment of numerical values. These values establish the acceptable amount or concentration of a chemical that may be found in, or discharged to the ambient environment.
- Location-specific SCGs set restrictions on activities based on the characteristics of the facility or immediate environs.
- Action-specific SCGs set controls or restrictions on particular types of remedial actions once the remedial actions have been identified as part of a remedial alternative.

The identification of potential SCGs is documented in **Table 1**.

4.1.1 Site Use and the Selection of SCGs

The current, intended, and reasonably anticipated future land uses of the site were considered when selecting SCOs. It is anticipated that the primary future use of the Site will be commercial use. The Site consists of approximately 0.72 acres of paved parking lot and buildings that are zoned light industrial. The Site is surrounded by commercial buildings to the east and north, the White Plains Rural Cemetery to the south, and the Harlem Line of the Metro-North Train tracks to the west. Given the anticipated future Site use is commercial the 6 NYCRR Part 375-6 SCOs for Commercial Use are identified as appropriate SCOs for the Site. In addition due to the presence of Constituents of Concern (COCs) in the overburden and bedrock groundwater at the Site, and as required by 6 NYCRR Part 375-1.8(d) and the Commissioners Policy Soil Guidance (NYSDEC 2010), Protection of Groundwater SCOs were also considered applicable for the Site.

As a result of a comparison to the Commercial Use and Protection of Groundwater SCOs, the following COCs for soil were identified for the Site:

- SVOCs
  - benzo[a]anthracene
  - benzo[a]pyrene
  - benzo[b]fluoranthene
  - benzo[k]fluoranthene
  - chrysene
  - dibenz[a,h]anthracene
- Metals
  - arsenic
  - copper
  - lead
  - mercury

As described in the RI Report and as documented in **Table 1**, an applicable SCG for groundwater is the 6 NYCRR Part 703 - Class GA Groundwater Quality Standards. As a result of a comparison to the Class GA groundwater standards, the following COCs for groundwater were identified for the Site:

- VOCs
  - PCE
  - TCE
  - cis-1,2-DCE
  - vinyl chloride

As described in the RI Report and as documented in **Table 1**, an applicable SCG for soil vapor is the New York State Department of Health (NYSDOH) *Guidance for Evaluating Soil Vapor Intrusion in the State of New York* (NYSDOH 2006). As a result of a comparison to NYSDOH matrices, the following COC for soil vapor was identified for the Site:

- VOCs
  - PCE

4.2 REMEDIAL ACTION OBJECTIVES

RAOs are medium-specific goals for protecting human health and the environment. RAOs form the basis for the AA by providing overall goals for Site remediation. The RAOs are considered during the development and evaluation of remedial alternatives for the Site.

NYSDEC's DER-10 (NYSDEC 2010a) specifies that NYSDEC's generic RAOs be used where applicable for Site media. Accordingly, based on the findings of the RI, applicable generic RAOs are presented below for soil, groundwater and soil vapor at the Site.

4.2.1 Soil

RAOs for Public Health Protection

- Prevent ingestion/direct contact with soil exhibiting concentrations of COCs above SCGs
- Prevent inhalation of or exposure to contaminants volatilizing from soil

RAOs for Environmental Protection

- Prevent migration of contaminants that would result in groundwater or surface water contamination.

4.2.2 Groundwater

RAOs for Public Health Protection

- Prevent ingestion of groundwater with COC concentrations exceeding SCGs
- Prevent contact with, or inhalation of, volatiles from groundwater exhibiting concentrations of COCs above SCGs

RAOs for Environmental Protection

- Restore groundwater to pre-disposal/pre-release conditions, to the extent practical
- Prevent the discharge of contaminants to surface water
- Remove the source of groundwater contamination, to the extent practical

4.2.3 Soil Vapor

RAOs for Public Health Protection

- Mitigate impacts to public health resulting from existing, or the potential for, soil vapor intrusion into buildings at the Site

4.3 ASSEMBLY OF REMEDIAL ALTERNATIVES

In addition to the no further action alternative, two active remedial alternatives were developed to address the RAOs. In addition to addressing RAOs, a goal of the AA, as stated in the NYSDEC DER-10 (NYSDEC 2010a) Section 4.4 (d) and consistent with 6 NYCRR Part 375-4.8(c), is to identify and evaluate alternatives that include restoration of the facility to pre-disposal or unrestricted conditions (with respect to soil), to the extent feasible. Alternative 3 is intended to represent the alternative that provides for restoration of the property to unrestricted conditions by addressing soil exceeding unrestricted SCOs.

Active and passive treatment technologies which address VOCs (ISCO and natural attenuation) were considered to address groundwater exceedances of SCGs. The removal technology (excavation) was considered to address soil exceedances of SCGs. These technologies were assembled into remedial alternatives. Remedial alternative components are presented in **Table 2**. The alternatives are summarized in the following subsections.

4.3.1 Alternative 1 – No Further Action

Alternative 1 consists of no further action at the Site. This alternative is required to be evaluated by the National Contingency Plan ([NCP] 40 CFR Part 300.430) and NYSDEC DER-10 Section 4.4(d) 1 (2012) and serves as a benchmark for the evaluation of other action alternatives. Under this alternative, the following existing controls are present:

- Existing building and paved parking areas serve as a cover over contaminated soil
- A public water supply for the Site and surrounding properties negates the need to use Site groundwater as a source of potable water

4.3.2 Alternative 2 - Natural Attenuation and Monitoring, and Engineering/Institutional Controls

Alternative 2 consists of the following remedial alternative components:

- *In situ* Passive Treatment
  - » Groundwater natural attenuation with monitoring
  - » Assumes 30 years of groundwater sampling from the Site's seventeen existing monitoring wells and associated reporting.
- Engineering Controls
  - » Continued operation of existing VI mitigation system.
  - » Maintenance of a site cover meeting 6 NYCRR Part 375 3.8(e)(4)(b)comprising, at a minimum, soil or granular stone to a thickness of at least 1-ft (completed by IRM; 2013 and 2014), asphalt paving, or building slabs.
- Institutional Controls/Limited Actions
  - » Implementation of an environmental easement as a means of restricting future Site groundwater and land use
  - » Periodic site reviews, which would include review of monitoring data, inspection findings, and verification of continued institutional controls
  - » Development and implementation of a Site Management Plan (SMP), including provisions for soil management and groundwater monitoring, as well as requirements to limit untreated groundwater use and exposure to soil and groundwater during site redevelopment and future construction activities until such a time as groundwater meets groundwater SCGs.
- These remedial components are in addition to the activities already completed by IRMs as discussed in section 3.3. These include:
  - » Limited soil removal by excavation and off-site disposal

- Chemical treatment of VOCs in the residual source area using ISCO
- Installation of Vapor Mitigation System

The locations of the remedial elements included in Alternative 2 are illustrated on **Figure 9**.

4.3.3 Alternative 3 - Pre-disposal / Unrestricted Use: Building Demolition, Soil Excavation, Bedrock Grouting, Passive Treatment, and Institutional Controls

Alternative 3 consists of the following remedial alternative components:

- Complete demolition and off Site disposal of the existing 2-story 16,400 square foot building (Buildings No. 1-4)
- Excavation and off Site disposal of subsurface soil exceeding unrestricted SCOs from grade to top of bedrock.
  - Excavation of approximately 1,950 cubic yards of subsurface soil to bedrock in the suspected source area (assumes a depth of 21-ft over a 50-ft square area)
  - Excavation of approximately 4,900 cubic yards of subsurface soil to an average depth of 5 feet (assumes the footprint of the property)
  - Restoration and seeding of area.
- Grouting of bedrock fractures
  - Once the bedrock surface is exposed in the source area excavation, fractures would be grouted to a depth of approximately 60 ft to mitigate potential migration of residual sources in the bedrock.
- *In situ* Passive Treatment
  - Groundwater natural attenuation with monitoring
  - Assumes 30 years of groundwater sampling from the Site's seventeen existing monitoring wells and associated reporting.
- Institutional Controls/Limited Actions
  - Implementation of an environmental easement as a means of restricting use of future Site groundwater until such a time that groundwater meets groundwater SCGs
  - Periodic site reviews, as necessary, until such a time that groundwater meets groundwater SCGs
  - Development and implementation of a SMP, including provisions for groundwater monitoring, as well as requirements to limit groundwater use and exposure to untreated groundwater until such a time as groundwater meets groundwater SCGs.

5. DETAILED ANALYSIS OF REMEDIAL ALTERNATIVES

This section documents the analysis of the three remedial alternatives that were developed during the AA. The detailed analysis of the alternatives was conducted consistent with NYSDEC DER-10, Section 4.2 (NYSDEC 2010a). This section describes the individual and comparative analysis of the remedial alternatives with respect to nine evaluation criteria that embody the specific statutory requirements that must be evaluated to satisfy the DER-10 remedy selection process.

5.1 INDIVIDUAL ANALYSIS OF ALTERNATIVES

As described in NYSDEC DER-10 Section 4.2 and consistent with 6 NYCRR 375-1.8(f), during remedy selection, nine evaluation criteria should be used. These are categorized into three groups:

- Threshold Criteria
  - overall protection of human health and the environment
  - compliance with SCGs
- Primary Balancing Criteria
  - long-term effectiveness and permanence
  - reduction of toxicity, mobility, or volume through treatment
  - short-term impact and effectiveness
  - implementability
  - cost
  - land use
- Modifying Criterion
  - community acceptance

The two threshold criteria must be satisfied in order for an alternative to be eligible for selection. The primary balancing criteria are used to evaluate the differences between alternatives. The modifying criterion is formally considered after public comment is received.

The objective of the detailed analysis of remedial alternatives was to analyze and present sufficient information to allow the alternatives to be compared and a remedy selected. The analysis consisted of an individual assessment of each alternative with respect to each of the above referenced evaluation criteria. The summary of this analysis is presented in **Table 3**. The evaluation criteria are described in further detail below.

5.1.1 Overall Protection of Human Health and Environment

The analysis of each alternative with respect to this criterion provides an evaluation of the ability of the alternative to protect human health and the environment. Specifically, this criterion considers:

- How each alternative would eliminate, reduce, or control through removal, treatment, containment, engineering, or institutional controls existing or potential human exposures or environmental impacts
- The ability of each alternative to achieve RAOs.

The evaluation of each alternative with respect to overall protection of human health and the environment is presented in **Table 3**.

5.1.2 Compliance with Standards, Criteria and Guidelines

Each alternative was evaluated to assess whether it would conform to SCGs. Conformity with SCGs is required unless good cause exists why conformance needs to be demonstrated to be technically impracticable.

The evaluation of each alternative with respect to compliance with SCGs is presented in **Table 3**.

5.1.3 Long-Term Effectiveness and Permanence

Each alternative was evaluated to assess the long-term effectiveness and permanence it would afford after remedy implementation. Factors considered, as appropriate, include:

- The magnitude of potential residual risk from materials remaining at the conclusion of the remedial activities. The evaluation will assess the impacts of remaining contamination to human receptors, ecological receptors and the environment
- The adequacy and reliability of institutional and engineering controls, necessary to manage materials left on-site

In consideration of DER-31 *Green Remediation* (NYSDEC 2010b), long-term sustainability of the remedy was included under this criterion. Specifically, total environmental and sustainability impacts (*e.g.,* greenhouse gas sources, materials reused on-site versus disposed, remedy maintenance requirements), and metrics related to direct and indirect impacts for each alternative (*e.g.,* energy, emissions, fuel, volume of material reused on-site and disposed off-site) were considered.

The evaluation of each alternative with respect to long-term effectiveness and permanence is presented in **Table 3**.

5.1.4 Reduction of Toxicity, Mobility or Volume through Treatment

Each alternative was evaluated to assess the degree to which the alternative results in the reduction of toxicity, mobility or volume through treatment. Factors considered, as appropriate, include:

- Treatment or recycling processes the alternative would employ and the materials it would treat
- Amount of hazardous substances, pollutants, or contaminants that would be treated or recycled
- Degree of expected reduction of mobility, toxicity or volume of the waste due to treatment or recycling and the specification of which reduction(s) would occur
- Degree to which treatment would be irreversible
- Type and quantity of residuals that would remain following treatment, considering the persistence, toxicity, mobility and propensity to bioaccumulate such hazardous substances and their constituents
- Degree to which treatment would reduce the inherent hazards posed by the facility

The evaluation of each alternative with respect to reduction of toxicity, mobility or volume through treatment is presented in **Table 3**.

5.1.5 Short-Term Impact and Effectiveness

The short-term impacts of each alternative were assessed, considering the following:

- Short-term potential risks that might be posed to the community during implementation of the alternative
- Potential impacts to workers during implementation of the remedy and the effectiveness and reliability of protective measures
- Potential environmental impacts of the remedial action and the effectiveness and reliability of mitigative measures during implementation
- Time until protection would be achieved

In consideration of DER-31 *Green Remediation* (NYSDEC 2010b), short-term sustainability of the remedy will be included under this criterion. Specifically, total environmental and sustainability impacts (*e.g.,* greenhouse gas sources and materials reused on-site versus disposed during construction-phase activities), and metrics related to direct and indirect impacts for each alternative (*e.g.,* energy, emissions, fuel, volume of material reused on-site and disposed off-site) will be considered.

The evaluation of each alternative with respect to long-term effectiveness and permanence is presented in **Table 3**.

5.1.6 Implementability

Each alternative was assessed relative to the ease or difficulty of implementation by considering the following factors, as appropriate:

- technical feasibility, including technical difficulties associated with construction and the ability to monitor the effectiveness of the remedy
- administrative feasibility, including availability of the necessary personnel and material, and potential difficulties in obtaining specific operating approvals
- reliability and viability of implementation of the institutional or engineering controls necessary for the alternative

The evaluation of each alternative with respect to implementability is presented in **Table 3**.

5.1.7 Cost

For the cost analysis, cost estimates were prepared for each alternative based on vendor information and quotations, cost estimating guides, and experience. Cost estimates were prepared for the purpose of alternative comparison and were based on Site-specific information, when available. The cost estimates include capital costs, annual O&M costs, periodic O&M costs, and present worth cost. The present worth cost for these alternatives was calculated for the expected duration of the remedy at a 7% discount rate. The individual cost estimates for each remedial alternative are presented in **Tables 4a** through **4c**.

5.1.8 Land Use

Pursuant to NYSDEC DER-10 Section 4.2(i), each alternative is assessed relative to the current, intended and reasonably anticipated future use of the Site and its surroundings by considering the following factors, as appropriate:

- Current land use and historical and/or recent development patterns
- Consistency of proposed land use with applicable zoning laws and maps
- Brownfield opportunity areas
- Consistency of proposed land use with applicable comprehensive master plans or any other applicable land-use plan formally adopted by a municipality
- Proximity to property currently used for residential use and to urban, commercial, industrial, agricultural, and recreational areas
- Written and oral comments submitted by the public as part of citizen participation activities on the proposed land use
- Environmental justice concerns
- Proximity of the facility to cultural and natural resources
- Vulnerability of groundwater to contamination that might migrate from the facility
- Final use determination of the facility.

The evaluation of each alternative with respect to land use is presented in **Table 3**.

5.1.9 Community Acceptance

Community acceptance will be addressed during the public comment period prior to the decision document being finalized and issued.

5.2 COMPARATIVE ANALYSIS OF ALTERNATIVES

The detailed analysis of alternatives also included a comparative evaluation designed to consider the relative performance of the alternatives and identify major trade-offs among them. The comparative evaluation of alternatives is presented in the following subsections. In the comparative analysis of alternatives, the performance of each alternative relative to the others was evaluated for each criterion. The comparative analysis of alternatives relative to the nine evaluation criteria is presented below.

5.2.1 Overall Protection of Human Health and Environment

Except for Alternative 1, each alternative would provide for the overall protection of human health and the environment.

Alternative 2 would provide protection of human health associated with soil, groundwater, and soil vapor exposures through institutional and engineering controls, passive groundwater treatment and the existing public water supply connections, and maintenance of the VI mitigation system. Alternative 2 would rely on natural attenuation to address mitigation of residual soil and dissolved groundwater contamination, off-site migration of groundwater contamination, and attainment of groundwater SCGs. These actions complement limited removal and capping of surface soil, active groundwater treatment and installation of the VI mitigation system that were previously completed as IRMs.

Alternative 3 would provide protection of human health and the environment through removal of contaminated soil and grouting of bedrock fractures.

Each alternative would address RAOs to varying degrees. The existing buildings, paving and public water supply address soil and groundwater exposures under Alternative 1; however, there are no institutional controls that would preclude exposures through disrepair or breaching of these existing covers or groundwater use. Natural attenuation is not anticipated to address soil and groundwater RAOs in the foreseeable future. Alternative 1 does not include institutional controls that would address soil and groundwater exposures. Alternative 2 would address RAOs through treatment and natural attenuation of groundwater, soil excavation, capping, and institutional controls. Both alternatives 2 and 3 rely on institutional controls to fully address groundwater RAOs. Alternative 3 would address soil RAOs through removal of soil, and would not rely on institutional controls to meet soil RAOs. Expanded soil removal included in Alternative 3 would achieve soil RAOs, restoring the Site to pre-disposal/unrestricted use conditions with respect to soil. These actions may also afford shorter time-frame for attainment of groundwater and soil vapor RAOs as compared to Alternatives 1 and 2.

5.2.2 Compliance with SCGs

Each alternative would address chemical-specific SCGs to varying degrees. Alternatives 1 and 2 would rely on soil removal performed to date as part of IRMs to address soil SCGs. Cover maintenance included in Alternative 2 better address remaining SCG exceedances as compared to Alternative 1, which relies solely on natural attenuation to achieve SCGs. Soil removal included in Alternative 3 would provide for attainment of soil SCGs such that unrestricted use would be achieved. Soil vapor SCGs would be addressed by installation of a VI mitigation system in Alternative 2 and expanded soil removal in Alternative 3. Groundwater SCGs are not anticipated to be met for the Site for the foreseeable future. Location-specific SCGs were not identified for the Site. Each alternative would achieve action-specific SCGs.

5.2.3 Long-Term Effectiveness and Permanence

With the exception of Alternative 1, residual risks associated with soil, groundwater, and soil vapor would be managed through institutional controls, engineering controls and natural attenuation of groundwater. Alternative 3 would result in the least residual risk, since it would address the greatest quantity of impacted soil, as well as addressing groundwater at the Site.

With the exception of Alternative 1, controls included in each alternative are adequate and reliable. There are minimal long-term sustainability and environmental impacts (*e.g.*, vehicular emissions, and energy usage) associated with Alternatives 2 and 3.

5.2.4 Reduction of Toxicity, Mobility or Volume through Treatment

Soil removal and active groundwater treatment completed as IRMs have resulted in a reduction of toxicity and mobility of contamination at the site. Alternative 3 would afford the greatest reduction in toxicity, mobility, and volume through expanded soil removal and grouting of bedrock fractures.

5.2.5 Short-Term Impact and Effectiveness

There are no short-term impacts associated with Alternative 1and 2. Short-term impacts associated with physical hazards to workers and the community and impacts from emissions and runoff would be addressed for Alternative 3 through accepted health and safety and construction practices. Similarly, nuisance conditions such as dust, noise, and traffic are anticipated with Alternative 3 would be controlled through accepted community health and safety awareness and construction practices. Alternative 3 building demolition would present a hardship for current owner and tenants.

With the exception of Alternative 1, soil and soil vapor RAOs would be addressed upon remedy implementation of each alternative. While IRM soil removal and existing covers at the site address RAOs under Alternative 1, continued operation and maintenance of controls are not included in Alternative 1. Expanded soil removal included in Alternative 3 would potentially shorten the timeframe for attainment of groundwater RAOs as compared to Alternatives 1 and 2.

There would be some short-term environmental and sustainability impacts associated with the implementation of Alternative3. Specifically, construction activities would generate greenhouse gases (emissions from vehicles) and consume fossil fuel (*e.g.* fossil fuel, treatment chemicals, and construction materials). Green remediation techniques, as detailed in NYSDEC DER-31, would be considered to reduce the short-term impacts of the remedy.

5.2.6 Implementability

Each alternative would be readily constructible and operable, and necessary equipment, specialists and materials are readily available. No difficulties are anticipated related to obtaining operating approvals. The effectiveness of each alternative would be readily monitored.

5.2.7 Cost

For the cost analysis, cost estimates were prepared for each alternative based on vendor information and quotations, cost estimating guides, and experience. Cost estimates were prepared for the purpose of alternative comparison and were based on Site-specific information, when available. The cost estimates include capital costs, annual O&M costs, periodic O&M costs, and present worth cost. The present worth cost for these alternatives was calculated for the expected duration of the remedy at a 7% discount rate. The estimated costs for each remedial alternative are summarized as follows:

Table 5: Remedial Alternative Cost Estimate Summary

Alternative	Total Capital Cost	Present Worth of O&M Costs	Total Present Worth Cost
Alternative 1: No Further Action	$0	$0	$0
Alternative 2: Natural Attenuation and Monitoring, and Engineering/Institutional Controls	$15,000	$298,000	$313,000
Alternative 3: Pre-disposal/Unrestricted Use	$8,198,000	$200,000	$8,398,000

5.2.8 Land Use

Each alternative could be implemented consistent with current, intended and reasonably anticipated future use of the property. However, Alternative 3 includes building demolition and reconstruction, which would pose a hardship for current commercial building tenants, including constraints on building a replacement structure under existing building code and zoning rules and coordinating construction with the immediately adjacent rail line and cemetery.

5.2.9 Community Acceptance

Community acceptance would be addressed during the public comment period prior to the decision document being finalized and issued.

6. ALTERNATIVES ANALYSIS SUMMARY AND RECOMMENDATION

This AA was conducted consistent with the requirements of 6 NYCRR Part 375 and NYSDEC's DER-10 (NYSDEC 2010a). As such, RAOs were identified to address the elimination or mitigation of significant threats to human health and the environment presented by environmental conditions resulting from historic operations at BCP Site No. C360115 located at 1-5 Holland Avenue Site in White Plains, New York.

Based on a detailed evaluation of three alternatives using specific criteria required by the 6 NYCRR Part 375 and NYSDEC's DER-10, Alternative 2 is recommended as the final Site remedy. Alternative 2 is recommended as the final remedy because it provides the best balance of the evaluation criteria while achieving the RAOs set forth in this AA Report. Alternative 2 includes the following remedial elements:

- Institutional Controls/Limited Actions
  - Implementation of an environmental easement as a means of restricting future Site groundwater and land use
  - Periodic site reviews
  - Development and implementation of a SMP, including provisions for soil management and groundwater monitoring, as well as requirements to limit exposure to soil and groundwater during site redevelopment and future construction activities.
- *In situ* Passive Groundwater Treatment
  - Groundwater natural attenuation with monitoring
  - Assumes 30 years of groundwater sampling from t*he Site*'s seventeen existing monitoring wells and associated reporting.
- Engineering Controls
  - Maintenance of existing site covers.
  - Operation and Maintenance of existing vapor mitigation system

Alternative 2 actions are in addition to the following actions previously completed as IRMs:

- *In situ* Active Groundwater Treatment
  - Chemical treatment of VOCs in the residual source area using ISCO.
- Limited excavation and off-site disposal of surface soil
  - Excavation and off-site disposal of exposed surface soil exhibiting concentrations above commercial SCOs in the three areas at the site (the southwest corner, loading dock area along Holland Avenue, and southeast corner)
  - Restoration of disturbed areas to existing grade using at least 1 ft of clean fill.
- Engineering Controls
  - Installation of the VI mitigation system to address the potential for VI into on-site and off-site structures.

RAOs would be achieved by Alternative 2 as follows:

- Inhalation of, or exposure to, contaminants volatilizing from soil were addressed by the soil removal and capping and the VI mitigation system completed as part of previous IRMs and would be addressed through institutional controls, and continued operation of the VI mitigation system
- Migration of contaminants in soil to groundwater or surface water would be addressed through surface soil removal and capping completed as part of previous IRMs and through continued maintenance of covers

- Ingestion of groundwater with contaminant levels exceeding Class GA drinking water standards would be addressed by *in situ* treatment of the groundwater water completed as part of previous IRMs and through institutional controls, the existing public water supply and natural attenuation
- Direct contact with, or inhalation of, volatile organic compounds in groundwater exceeding Class GA drinking water standards would be addressed by *in situ* treatment of the groundwater water completed as part of previous IRMs and through institutional controls, the existing public water supply and natural attenuation
- Restoration of the groundwater aquifer to pre-disposal/pre-release conditions, to the extent practical, would be addressed through *in situ* treatment of groundwater completed as part of previous IRMs and through and natural attenuation
- Migration of contaminants in groundwater to surface water would be addressed through *in situ* treatment of groundwater completed as part of previous IRMs and through natural attenuation
- Removal of the source of groundwater contamination, to the extent practical, would be addressed through *in situ* treatment of groundwater completed as part of previous IRMs
- Mitigation of impacts to public health from existing or potential soil vapor intrusion into buildings at the site would be addressed through operation of VI mitigation system previously installed as an IRM.

In addition to addressing the RAOs identified for this Site, the remedy components would provide for property use consistent with the reasonably anticipated future use for the Site.

Implementation of Alternative 2 results in an inherent environmental footprint. The following green remediation techniques, as detailed in NYSDEC Division of Environmental Remediation Program Policy on Green Remediation (DER-31), would be considered during implementation of Alternative 2 remedial components:

- Use of renewable energy and/or purchase of renewable energy credits
- Reduction in vehicle idling, including both on and off road vehicles and construction equipment
- Beneficially reuse material that would otherwise be considered a waste
- Use of ultra-low sulfur for construction equipment.

In summary, Alternative 2 is the recommended alternative because it addresses identified RAOs and satisfies the two threshold criteria, overall protection of human health and the environment, and compliance with SCGs. Alternative 1 does not achieve the RAOs. When comparing Alternative 2 with Alternative 3, using the primary balancing criteria, it is evident that equal protectiveness is provided using Alternative 2 at a lower cost. In addition, this level of protectiveness can be achieved with a smaller environmental footprint than that associated with Alternatives 3.

7. REMEDIAL ACTION WORK PLAN

This section provides a remedial action work plan for the recommended alternative. Consistent with NYSDEC's DER-10 (NYSDEC 2010a), Section 5.3, this section presents a description of the remedial action and remedial technology being implemented.

The RAOs for this Site are as follows:

Soil RAOs for Public Health Protection

- Prevent ingestion/direct contact with soil exhibiting concentrations of COCs above SCGs
- Prevent inhalation of or exposure to contaminants volatilizing from soil

RAOs for Environmental Protection

- Prevent migration of contaminants that would result in groundwater or surface water contamination.

Groundwater RAOs for Public Health Protection

- Prevent ingestion of groundwater with COC concentrations exceeding SCGs
- Prevent contact with, or inhalation of, volatiles from groundwater exhibiting concentrations of COCs above SCGs

Groundwater RAOs for Environmental Protection

- Restore groundwater to pre-disposal/pre-release conditions, to the extent practical
- Prevent the discharge of contaminants to surface water
- Remove the source of groundwater contamination, to the extent practical

Soil Vapor RAOs for Public Health Protection

- Mitigate impacts to public health resulting from existing, or the potential for, soil vapor intrusion into buildings at the Site

Remedial Action Elements remaining to be completed at the Site are as follows:

- Institutional Controls/Limited Actions
  - Implementation of an environmental easement as a means of restricting future Site groundwater and land use
  - Periodic site reviews
  - Development and implementation of a SMP, including provisions for soil management and groundwater monitoring, as well as requirements to limit exposure to soil and groundwater during site redevelopment and future construction activities.
  - Indoor air monitoring at 2 Holland Ave.
- *In situ* Passive Groundwater Treatment
  - Groundwater natural attenuation with monitoring
- Engineering Controls
  - Maintenance of existing site covers or capping (gravel and asphalt) to restore site after the excavation of the surface soil in the three areas of limited surface soil excavation.
  - Operation and Maintenance of existing vapor mitigation system

7.1 DESCRIPTION OF REMEDIAL ACTIONS

As described in Section 3.3, IRM activities were completed as part of remedial or exposure control activities at the Site. Monitoring and/or maintenance of these controls is part of the scope of the remedial action work plan and are described in greater detail in subsequent sections.

7.2 INSTITUTIONAL AND ENGINEERING CONTROLS

Institutional controls would consist of implementation of an environmental easement as a means of restricting future Site groundwater and land use, periodic site reviews and development and implementation of a SMP.

The SMP will include:

- Provisions for groundwater monitoring to assess long-term remedy effectiveness of the ISCO/monitoring remedy
- Provisions for operation, maintenance and monitoring of the VI mitigation system
- Methods to comply with the environmental easement
- Cap inspection requirements.

The SMP will be submitted to the NYSDEC for review and approval.

An environmental easement will be executed to impose land use restrictions and requirements needed to protect current or future uses from residual contamination. It is anticipated that the environmental easement will prohibit the use of site groundwater for potable purposes and limit excavation on-site.

7.3 MAINTENANCE AND MONITORING

Maintenance of the SSDS systems will be required to maintain the integrity of these control systems. Monitoring of the SSDS systems and the groundwater will be required to evaluate the continued effectiveness of the SSDS systems and the effectiveness of the groundwater remediation. Inspection of the asphalt caps and gravel restoration surfaces will be required to evaluate continued cover integrity at the Site. Maintenance and monitoring results will be reported to NYSDEC in the Periodic Review Report required by the SMP. The Periodic Review Report will also provide a Corrective Measures Plan for NYSDEC review and approval prior to implementation of any site corrective maintenance, excepting emergency conditions which will be repaired immediately.

7.3.1 Maintenance of SSD Systems

The VI mitigation SSD systems will require routine and non-routine maintenance. Routine maintenance includes annual inspection of the structures, vacuum blowers, electrical, piping slab and walls. Non-routine maintenance can include:

- Replacement of broken pipe straps
- Minor electrical repairs
- Sealing of openings or cracks in the slab
- Repair of broken system piping, both interior or exterior
- Replacement of vacuum blower covers, exhaust caps, digital micromanometer, and/or system vacuum blowers.

Specific maintenance requirements and procedures will be provided in the SMP.

7.3.2 Monitoring of the SSD Systems

Long term monitoring of the SSD systems will consist of collection and recording of sub-slab pressure to verify sub-slab depressurization is maintained. Specific monitoring and reporting requirements and procedures will be provided in the SMP.

7.3.3 Vapor Intrusion Monitoring at 2 Holland Ave

Two additional rounds of vapor intrusion monitoring will be conducted during two consecutive heating seasons to confirm results from the last round of vapor intrusion monitoring which indicated that "no further action" is appropriate at that location. The monitoring will include one sub-slab sample collected at the location of the highest historic result and one indoor air sample collected during each occurrence. The results of the vapor intrusion monitoring will be discussed with NYSDEC and NYSDOH following the receipt of data from the second event.

7.3.4 Groundwater Monitoring

Groundwater monitoring will be conducted to assess the effectiveness of the ISCO and NA remedy, until residual groundwater concentrations are found to be less than NYSDEC Class GA standards or have become asymptotic at a level acceptable by the NYSDEC. Long-term groundwater monitoring will consist of periodic sampling of the seventeen Site monitoring wells for VOCs. Semi-annual sampling is anticipated for the first three years of site monitoring. A reduction in the frequency of monitoring may be requested to the NYSDEC after this initial period. It is anticipated at this time that a groundwater monitoring program will continue for a period totaling 30 years, unless Class GA standards are achieved or residual concentrations have reached an acceptable asymptotic level. Monitoring at individual wells will be discontinued once Class GA concentrations have been achieved in the well. Specific monitoring and reporting requirements and procedures will be provided in the SMP.

The following wells are anticipated to be included in the initial monitoring program:

- On-site Wells: MW-1, MW-2, MW-2SB, MW-2DB, MW-4S, MW-4D, MW-5, MW-5SB, and MW-5DB;
- Off-site Wells: MW-6 and MW-6SB (upgradient), MW-7, MW-7SB, MW-8, MW-8SB, MW-9, and MW-9SB (downgradient).

Monitoring at these wells is anticipated to be conducted in the spring and fall of each year for the first three years, and the spring in events thereafter should the Department agree to a reduction in frequency. The collected samples submitted to a NYS certified laboratory for analysis by USEPA SW846 Method 8260. Off-site wells that either cannot be physically or legally accessed will not be sampled until physical or legal access can be obtained.

Evaluation of groundwater monitoring data will be performed as part of the Periodic Review Report. At the conclusion of the fifth and tenth years, the effectiveness of the ISCO/NA remedy will be reviewed. The review will evaluate the groundwater quality data trends. If it appears that the groundwater quality data trends for the on-site wells will not achieve Class GA standards or reach an acceptable asymptotic level, then a contingency remedial action evaluation will be completed. This contingency remedial action evaluation will consider groundwater quality trends, current site conditions, and remedial technologies available at the time of the evaluation to assess if a contingent remedy is technically practicable. The result of the contingency remedial action evaluation will be discussed with the NYSDEC to decide whether a contingent remedial action would be implemented.

It is expected that VOC concentrations in off-site monitoring wells will decline subsequent to the VOC concentration declines in the on-site wells. However, if the VOC concentrations in off-site wells do not decline subsequent to the concentration decline in the on-site wells, then the possible influence of an off-site source of VOCs will be discussed with the NYSDEC.

7.3.5 Cover Inspections

Periodic inspections of the site covers (asphalt, building floors and gravel areas) will be conducted to verify that integrity of the covers is maintained. Site covers will be repaired if deficiencies are found during inspections. Actionable deficiencies will include breaches in the cover system components that expose impacted soils. Specific reporting requirements and procedures will be provided in the SMP. Cover repair and restoration requirements will be specified in the SMP.

REFERENCES

NYSDOH. 2006. *Guidance for Evaluating Soil Vapor Intrusion in the State of New York*. October, 2006.

O'Brien & Gere. 2014a. *Remedial Investigation Report, BCP No. C360115, 1-5 Holland Avenue, White Plains, New York.* April 10, 2014.

O'Brien & Gere. 2014b. *Interim Remedial Measure Construction Completion Report. BCP No. C360115, 1-5 Holland Avenue, White Plains, New York.* August 8, 2014

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O'Brien & Gere. 2011. *Remedial Investigation Work Plan. M*arch 1, 2011

NYSDEC. 2010a. *DER-10/Technical Guidance for Site Investigation and Remediation*, May 3, 2010.

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Tables

Table 1
Evaluation of Potential SCGs

Alternatives Analysis Report
Brownfield Cleanup Program No. C360115
1-5 Holland Ave
White Plains, NY

Medium/Location/ Action	Citation	Requirements	Comments	Potential SCG	Alt(s)
Potential chemical-specific SCGs					
Soil	6 NYCRR Part 375-6 Remedial Program Soil Cleanup Objectives	Provides guidance for soil cleanup objectives for various property uses.	Potentially applicable for site soils.	Yes	All
	NYSDEC Commissioner's Policy 51 - Soil Cleanup Guidance	Guidance that provides framework and procedures for the selection of soil cleanup levels. As part of the procedures, supplemental soil cleanup levels are provided.	To be considered for site soils.	Yes	All
Groundwater	NYSDEC TOGS 1.1.1 - Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations	This Technical and Operational Guidance Series (TOGS) presents New York State Department of Environmental Conservation (NYSDEC) Division of Water ambient water quality standards and guidance values and groundwater effluent limitations. The authority for these values is derived from Article 17 of the Environmental Conservation law and 6 NYCRR Parts 700-706, Water Quality.	To be considered for site groundwater.	Yes	All
	40 CFR Part 141 - Drinking Water Standards	Promulgated federal regulation that establishes primary drinking water regulations applicable to public water systems.	Not applicable, relevant or appropriate because site groundwater is not used as drinking water source, nor is it suitable for drinking water source.	No	None
	6 NYCRR Part 703 - Class GA Groundwater Quality Standards	Promulgated water quality standards for fresh groundwater, including narrative and constituent-specific standards.	Potentially applicable for fresh groundwater.	Yes	All
Soil Vapor	NYSDOH Guidance matrices	Provide chemical specific response actions on comparison of sub-slab vapor concentrations to indoor air concentrations.	Potentially applicable for soil vapor.	Yes	2
Potential location-specific SCGs					
Wetlands	6 NYCRR 663 - Freshwater wetland permit requirements	Actions occurring in a designated freshwater wetland (within 100 ft) must be approved by NYSDEC or its designee. Activities occurring adjacent to freshwater wetlands must: be compatible with preservation, protection, and conservation of wetlands and benefits; result in no more than insubstantial degradation to or loss of any part of the wetland; and be compatible with public health and welfare.	No wetlands present at site.	No	None
	Executive Order (EO) 11990 - Protection of Wetlands	Activities occurring in wetlands must avoid, to the extent possible, the long- and short-term adverse impacts associated with the destruction or modification of wetlands. The procedures also require the United States Environmental Protection Agency (USEPA) to avoid direct or indirect support of new construction in wetlands wherever there are practicable alternatives or minimize potential harm to wetlands when there are no practicable alternatives.	No wetlands present at site.	No	None
	Clean Water Act Section 404 33 CFR Parts 320 - 330	Regulatory policies and permit requirements for work affecting waters of the United States, including wetlands.	No wetlands present at site.	No	None
	Clean Water Act Section 404 40 CFR Parts 230-231	Provides for restoration and maintenance of integrity of waters of the United States, including wetlands, through the control of dredged or fill material discharge.	No wetlands present at site.	No	None
	USEPA Office of Solid Waste and Emergency Response (OSWER) Directive 9280.0-02 (August 1985) - Policy on Floodplains and Wetlands Assessments for CERCLA Actions	Superfund actions must meet the requirements of EO 11990 (Protection of Wetlands) and EP 11988 (Floodplain Management).	No wetlands present at site.	No	None

Table 1
Evaluation of Potential SCGs

Alternatives Analysis Report
Brownfield Cleanup Program No. C360115
1-5 Holland Ave
White Plains, NY

Medium/Location/ Action	Citation	Requirements	Comments	Potential SCG	Alt(s)
Floodplains	6 NYCRR 373-2.2 - Location standards for hazardous waste treatment, storage, and disposal facilities -100-yr floodplain	Hazardous waste treatment, storage, or disposal facilities located in a 100-yr floodplain must be designed, constructed, operated and maintained to prevent washout of hazardous waste during a 100-yr flood.	The site is not located within a 100-yr floodplain.	No	None
	40 CFR Part 264.18(b) - Location Standards - Floodplains	Hazardous waste treatment, storage, or disposal facilities located in a 100-yr floodplain must be designed, constructed, operated and maintained to prevent washout of hazardous waste during a 100-yr flood.	The site is not located within a 100-yr floodplain.	No	None
	Executive Order 11988 - Floodplain Management	USEPA is required to conduct activities to avoid, to the extent possible, the long- and short-term adverse impacts associated with the occupation or modification of floodplains. The procedures also require USEPA to avoid direct or indirect support of floodplain development wherever there are practicable alternatives and minimize potential harm to floodplains when there are no practicable alternatives.	The site is not located within a 100-yr floodplain.	No	None
	6 NYCRR 500 - Floodplain Management Regulations Development Permits	Promulgated state regulations providing permit requirements for development in areas of special flood hazard (floodplain within a community subject to a one percent or greater chance of flooding in any given year).	The site is not located within a 100-yr floodplain.	No	None
	USEPA OSWER Directive 9280.0-02 (August 1985) - Policy on Floodplains and Wetlands Assessments for CERCLA Actions	Superfund actions must meet the requirements of EO 11990 (Protection of Wetlands) and EO 11988 (Floodplain Management).	The site is not located within a 100-yr floodplain.	No	None
Within 61 meters (200 ft) of a fault displaced in Holocene time	40 Code of Federal Regulations (CFR) Part 264.18	New treatment, storage, or disposal of hazardous waste is not allowed.	Not applicable. Not located within 200 ft of a fault displaced in Holocene time, as listed in 40 CFR 264 Appendix VI.	No	None
Wilderness area	Wilderness Act 50 CFR Part 35 - Wilderness Preservation and Management	Provides for protection of federally-owned designated wilderness areas.	Not applicable or relevant and appropriate. Site not located in wilderness area.	No	None
Wild, scenic, or recreational barrier	Wild and Scenic Rivers Act	Provides for protection of areas specified as wild, scenic, or recreational.	Not applicable or relevant and appropriate. Site not located near wild, scenic or recreational river.	No	None
Protection of Waters	33 U.S.C. 1341 - Clean Water Act Section 401, State Water Quality Certification Program	States have the authority to veto or place conditions on federally permitted activities that may result in water pollution.	Not applicable to site.	No	None
River or stream	16 USC 661 - Fish and Wildlife Coordination Act	Requires protection of fish and wildlife in a stream when performing activities that modify a stream or river.	Not applicable, as no activities to modify a stream or river are anticipated.	No	None
Habitat of an endangered or threatened species	6 NYCRR 182	Provides requirements to minimize damage to habitat of an endangered species.	Not applicable, as no endangered or threatened species or their habitat were found at the site.	No	None
	Endangered Species Act	Provides a means for conserving various species of fish, wildlife, and plants that are threatened with extinction.	Not applicable, as no endangered or threatened species or their habitat were found at the site.	No	None
Historical property or district	National Historic Preservation Act	Remedial actions are required to account for the effects of remedial activities on any historic properties included on or eligible for inclusion on the National Register of Historic Places.	Not applicable, as no historic properties were identified at the site.	No	None

Table 1
Evaluation of Potential SCGs

Alternatives Analysis Report
Brownfield Cleanup Program No. C360115
1-5 Holland Ave
White Plains, NY

Medium/Location/ Action	Citation	Requirements	Comments	Potential SCG	Alt(s)
Potential action-specific SCGs					
Construction in a floodplain	6 NYCRR 500 - Floodplain management regulations development permits	Hazardous waste treatment, storage, or disposal facilities located in a 100-yr floodplain must be designed, constructed, operated and maintained to prevent washout of hazardous waste during a 100-yr flood.	The site is not located within a 100-yr floodplain.	No	None
Treatment actions	6 NYCRR 373 - Hazardous waste management facilities	Provides requirements for managing hazardous wastes.	Potentially applicable to excavated soils and *in-situ* treatment.	Yes	2-3
	40 CFR 144 through 148 - Underground Injection Control Program Regulations	Provides requirements for injection operations.	Applicable to *in situ* chemical oxidation activities.	Yes	2
General excavation	6 NYCRR 257-3 - Air Quality Standards	Provide limitations for generation of constituents including particulate matter.	Potentially applicable to excavated soils.	Yes	2-3
	40 CFR 50.1 through 50.12 - National Ambient Air Quality Standards.	Provides air quality standards for pollutants considered harmful to public health and the environment. The six principle pollutants include carbon monoxide, lead, nitrogen dioxide, particulates, ozone, and sulfur oxides.	Potentially applicable during dust generating activities such as earth moving, grading, and excavation of soil.	Yes	2-3
Generation and disposal of hazardous material and treatment residuals	6 NYCRR 360 - Solid Waste Management Facilities	Provides requirements for management of solid wastes, including disposal and closure of disposal facilities.	Potentially applicable. Treatment residuals would require management.	Yes	2-3
Land disposal	6 NYCRR 376 - Land disposal restrictions	Provides treatment standards to be met prior to land disposal of hazardous wastes.	Potentially applicable.	Yes	2-3
Construction	29 CFR Part 1910 - Occupational Safety and Health Standards - Hazardous Waste Operations and Emergency Response	Remedial activities must be in accordance with applicable OSHA requirements.	Applicable for construction phase of remediation.	Yes	2-3
	29 CFR Part 1926 - Safety and Health Regulations for Construction	Remedial construction activities must be in accordance with applicable OSHA requirements.	Applicable for construction phase of remediation.	Yes	2-3
Transportation	6 NYCRR 364 - Waste Transporter Permits	Hazardous waste transport must be conducted by a hauler permitted under 6 NYCRR 364.	Potentially applicable.	Yes	2-3
	6 NYCRR Part 372 - Hazardous Waste Manifest System and Related Standards for Generators, Transporters, and Facilities	Substantive hazardous waste generator and transportation requirements must be met when hazardous waste is generated for disposal. Generator requirements include obtaining a USEPA Identification Number and manifesting hazardous waste for disposal.	Potentially applicable.	Yes	2-3
	49 CFR 172-174 and 177-179 - Department of Transportation (DOT) Regulations	Hazardous waste transport to off-site disposal facilities must be conducted in accordance with applicable DOT requirements.	Potentially applicable.	Yes	2-3
Disposal	TSCA requirements and/or hazardous waste requirements.	TSCA or hazardous waste disposal must be conducted in accordance with applicable requirements.	No TSCA or hazardous wastes anticipated. Not applicable.	No	None
Discharge to surface water	6 NYCRR 750 through 758 - State Pollutant Discharge Elimination System (SPDES) Regulations	Substantive requirements associated with discharge to a water body (limitations and monitoring requirements) would be set by NYSDEC.	Not applicable. Discharge to surface water not anticipated.	No	None
Generation of air emissions	NYS Air Guide 1	Provides annual guideline concentrations (AGLs) and short-term guideline concentrations (SGCs) for specific chemicals. These are property boundary limitations that would result in no adverse health effects.	Potentially applicable.	Yes	2-3
	NYS TAGM 4031 - Dust Suppressing and Particle Monitoring at Inactive Hazardous Waste Disposal Sites	Provides limitations on dust emissions.	Potentially applicable.	Yes	2-3
Construction storm water management	NYSDEC General permit for storm water discharges associated with construction activities. Pursuant to Article 17 Titles 7 and 8 and Article 70 of the Environmental Conservation Law.	The regulation prohibits discharge of materials other than storm water and all discharges that contain a hazardous substance in excess of reportable quantities established by 40 CFR 117.3 or 40 CFR 302.4, unless a separate NPDES permit has been issued to regulate those discharges. A permit must be acquired if activities involve disturbance of 5 acres or more. If the project is covered under the general permit, the following are required: development and implementation of a storm water pollution prevention plan; development and implementation of a monitoring program; all records must be retained for a period of at least 3 years after construction is complete.	Not applicable due to site size less than 5 acres.	No	None

Table 2
Components of Remedial Alternatives

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MEDIA	GENERAL RESPONSE ACTION	REMEDIAL TECHNOLOGY/PROCESS OPTION	1	2	3
Groundwater	No action	None	●		
	Institutional controls/limited actions	Monitoring, use restriction, environmental easement, site management plan and periodic site reviews		●	●
	In situ Passive Treatment	Natural Attenuation		●	●
	In situ Active Treatment	Chemical Treatment (Chemical Oxidation - Sodium Persulfate)		■	
Soil	No action	None	●		
	Institutional controls/limited actions	Use restriction, environmental easement, site management plan and periodic site reviews		●	
	Engineering controls	Fencing and gates		■	
	Capping	Asphalt and crushed gravel cap		■	
	Removal	Surface soil removal		■	●
		Subsurface soil removal			●
	Beneficial Reuse	Beneficial on-site reuse of surface soil		■	
	Disposal	Off-site disposal		■	●
Soil Vapor	No action	None	●		
	Institutional controls/limited actions	Monitoring, environmental easement, site management plan and periodic site reviews		●	
	Engineering controls	Vapor Intrusion (VI) mitigation system		■	
		Operation and maintenance of VI mitigation system.		●	
Bedrock Fracture	Grouting	Grouting of bedrock fractures			●
Building Demolition	Demolition, removal and disposal	Building demolition and removal			●

● Remedial Alternative Element

■ Remedial or Exposure Control previously installed by IRM

Alternative 1: No further action

Alternative 2: Groundwater natural attenuation with monitoring and Institutional/Engineering Controls

Alternative 3: Pre-disposal/ Unrestricted use

Table 3

Alternatives Analysis Report
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Criterion	Alternative 1 - No Further Action - Discontinuation of Vapor Intrusion (VI) Mitigation System Operation.	Alternative 2 - Natural Attenuation and Monitoring - Institutional and Engineering Controls - Groundwater Natural Attenuation with Monitoring *Previously installed as IRMs:* *- In Situ Groundwater Treatment (Chemical Oxidation)* *- Limited Surface Soil Removal and Capping* *- VI Mitigation System*	Alternative 3 - Pre-disposal/Unrestricted Use - Institutional Controls - Groundwater Natural Attenuation with Monitoring - Building Demolition - Expanded Surface and Subsurface Soil Removal - Grouting Bedrock Fractures
Overall Protection of Human Health and the Environment			
Overall protection of human health	The Site buildings and paved areas act as a physical cap and limit exposure to contaminants in soil beneath the buildings and paved areas; however this alternative would not provide a means to mitigate potential risks associated with subsurface soil exposures during subsurface disturbances or exposure to soil vapor. Protection of human health from risks associated with ingestion of groundwater exceeding SCGs is provided through public water supply connections for the Site and surrounding properties, though no groundwater use restrictions are included in this alternative.	Protection of human health is provided through institutional and engineering controls for the Site, precluding future groundwater use, restricting land use, activities involving exposure to soil and soil vapor, and restricting access to the site. The Site buildings and paved areas act as a physical cap and limit exposure to contaminants in soil beneath the buildings and paved areas. Additional protection of human health relative to soil exposure was ~~is~~ afforded through limited removal of surface soil and capping that was completed as an IRM. Protection of health relative to soil vapor exposures was ~~is~~ provided through a VI mitigation system that was installed as an IRM. Protection of human health from risks associated with ingestion of groundwater exceeding SCGs is provided through public water supply connections for the Site and surrounding properties. Additional protection of human health to risks associated with ingestion of groundwater exceeding SCGs would be provided through active treatment of groundwater.	Overall protection to human health would be provided through expanded removal of contaminated soil from the Site and through grouting of fractures in the bedrock to contain potential residual sources.
Overall protection of the environment	Relies on natural attenuation to address off-Site migration of groundwater contamination, to attain groundwater SCGs, and to mitigate sources of soil and groundwater contamination. Existing Site buildings provide some source area cover, reducing infiltration, and thereby reducing contaminant migration. Further protection of the environment relative to reduction in infiltration that could result in mobilization of contaminants in soil and groundwater was is addressed through removal of potentially contaminated surface soil and installation of new asphalt areas by IRM. Additional protection for groundwater exposures was provided through active treatment of groundwater by IRM.	Relies on natural attenuation to address off-Site migration of groundwater contamination, to attain groundwater SCGs, and to mitigate sources of soil and groundwater contamination. Existing Site buildings provide some source area cover, reducing infiltration, and thereby reducing contaminant migration. Further protection of the environment relative to reduction in infiltration that could result in mobilization of contaminants in soil and groundwater was ~~is~~ addressed through removal of potentially contaminated surface soil and installation of new asphalt areas by IRM. Additional protection for groundwater exposures was provided through active treatment of groundwater by IRM.	Overall protection to the environment would be provided through removal of contaminated soil from the Site and through grouting of fractures in the bedrock to contain potential residual sources.
Attainment of RAOs	Alternative 1 addresses groundwater RAOs through the use of the public water supply and, to a limited extent, natural attenuation. Alternative 1 partially addresses soil RAOs through previous soil excavations and the presence of the Site buildings and paved areas that limit exposures to soil on portions of the Site. Alternative 1 is not anticipated to meet RAOs for soil or groundwater for the foreseeable future.	Alternative 2 addresses the groundwater RAOs through institutional controls, public water supply, and natural attenuation. Soil RAOs are addressed through institutional and engineering controls. Soil RAOs are also addressed by previously completed IRMs consisting of limited surface soil removal, and installation of paved areas that limit exposure to soil on portions of the site. Alternative 2 also addresses the soil vapor RAOs through institutional and engineering controls, and maintenance of the VI mitigation system was installed as an IRM.	Alternative 3 addresses the groundwater RAOs through source removal and grouting of fractures in groundwater and natural attenuation. In addition, institutional controls and public water supply, as necessary, until groundwater SCGs are met, also address groundwater RAOs. Soil RAOs are addressed through expanded surface and subsurface soil removal.
Compliance with SCGs			
Compliance with chemical-specific SCGs	Attains soil SCGs for soil included in the previously excavated areas. Relies on natural attenuation to achieve soil, soil vapor, and groundwater SCGs.	Attains soil SCGs for soil included in the previously excavated areas. Relies on continued maintenance and operation of the previously installed VI mitigation system to achieve SCGs for soil vapor. Relies on in-situ treatment and natural attenuation to achieve SCGs for groundwater. Groundwater monitoring provides a means of evaluating progress toward attainment of groundwater SCGs.	Attains soil and soil vapor SCGs through expanded removal of surface and subsurface soil to bedrock for the purpose of achieving unrestricted use SCOs. Relies on grouting of bedrock fractures and natural attenuation to attain groundwater SCGs.
Compliance with location-specific SCGs	No location-specific SCGs have been identified for this Site.	No location-specific SCGs have been identified for this Site.	No location-specific SCGs have been identified for this Site.
Compliance with action-specific SCGs	No actions were included in this alternative.	Existing controls were installed as IRMs. No additional construction activities are included in this alternative. Continued maintenance and monitoring activities would be consistent with OSHA safety standards and would be outlined in a project HASP. Wastes generated would be managed, transported and disposed of in accordance with applicable state and federal requirements.	Construction activities would be conducted consistent with air quality standards and in accordance with OSHA safety requirements that would be outlined in a project HASP. Wastes generated would be managed, transported and disposed of in accordance with applicable state and federal requirements.

Table 3

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Criterion	Alternative 1 - No Further Action - Discontinuation of Vapor Intrusion (VI) Mitigation System Operation.	Alternative 2 - Natural Attenuation and Monitoring - Institutional and Engineering Controls - Groundwater Natural Attenuation with Monitoring *Previously installed as IRMs:* *- In Situ Groundwater Treatment (Chemical Oxidation)* *- Limited Surface Soil Removal and Capping* *- VI Mitigation System*	Alternative 3 - Pre-disposal/Unrestricted Use - Institutional Controls - Groundwater Natural Attenuation with Monitoring - Building Demolition - Expanded Surface and Subsurface Soil Removal - Grouting Bedrock Fractures
Long-term effectiveness and permanence			
Magnitude of residual risk	No additional actions are implemented under Alternative 1, therefore, impacts to human health and local receptors remain on site following implementation of this remedial alternative. Risks associated with groundwater use at the Site would be addressed by the public water supply and natural attenuation.	Following implementation of Alternative 2 residual risks would remain associated with subsurface soil and groundwater. Residual risk would be managed through institutional and engineering controls.	Following implementation of Alternative 3 residual risks would remain associated with groundwater. Residual risk would be managed through institutional controls.
Adequacy and reliability of controls	The site buildings are an adequate means of controlling direct contact with soil within the building footprint. The paved areas would also provide an adequate and reliable means of controlling direct contact with the soil in this area. A public water supply is an adequate and reliable means of controlling exposures to groundwater (as a potable water source). No controls are included in this alternative related to direct contact with soil in the areas not covered by buildings and pavement or vapor intrusion in site buildings. No provisions are included under Alternative 1 for maintenance of surfaces or restriction of damage/penetration of covers or restriction of groundwater use.	Institutional and engineering controls included in Alternative 2 are adequate and reliable means of managing exposures to soil and groundwater. The asphalt and crushed gravel capped areas provide means of controlling exposures to contaminated surface soil. Previously completed active groundwater treatment is an adequate and reliable means of addressing contaminated groundwater. Previously completed removal is an adequate and reliable means of addressing contaminated surface soil. Institutional, engineering controls, and continued operation of the existing VI mitigation system would be an adequate and reliable means of addressing exposures to soil, groundwater and soil vapor. Maintenance, monitoring and periodic reviews included in Alternative 2 would provide reliable means of protecting covers and evaluating groundwater conditions at the Site.	Institutional controls included in Alternative 3 are reliable means of managing exposures to soil and groundwater. Alternative 3 provides a greater degree of adequacy and reliability, afforded by expanded soil removal and grouting of bedrock fractures. Monitoring and periodic reviews included in Alternative 3 would provide reliable means of evaluating groundwater conditions at the Site.
Sustainability and environmental impacts	No energy consumption, greenhouse gas or pollutant emissions, water or resource use, impacts to water, ecology or community are anticipated for this alternative. Protection is afforded to workers at the site (site buildings and pavement), however, protection of workers from potential exposure during subsurface disturbance or from soil vapor in buildings is not afforded by the alternative.	No long-term pollutant emissions, impacts to water, ecology, or community are anticipated for this alternative. Safety equipment and personal protective equipment would protect workers from exposures. Low long-term energy consumption and fuel use/greenhouse gas emissions as a result of groundwater monitoring and operation of VI mitigation system.	No long-term pollutant emissions, no impacts to water, ecology, or community. Safety equipment and personal protective equipment would protect workers from exposures. Low long-term energy consumption and fuel use/greenhouse gas emissions as a result of groundwater monitoring.
Reduction of toxicity, mobility, or volume through treatment			
Treatment or recycling processes employed and materials treated	Alternative 1 does not include active treatment processes.	Alternative 2 does not include active treatment processes.	Alternative 3 does not include any active treatment processes, however, Alternative 3 does include expanded excavation and off-site disposal of surface and subsurface soils.
Amount of hazardous substances, pollutants, or contaminants that would be treated or recycled	None	None.	Approximately 3,000 cubic yards of non hazardous soil would be excavated and disposed off-site at a landfill. Approximately 1600 tons of construction and demolition debris would be generated. Some of the demolition material could be recycled (structural steel).
Degree of expected reduction in toxicity, mobility, or volume	This alternative would rely solely on natural attenuation to reduce toxicity, mobility and volume of contaminants. Contaminants would break down over a long period of time.	Natural attenuation would reduce toxicity, mobility and volume of contaminants. Additional reductions relating to mobility of contaminants would be afforded through maintenance of the asphalt cover.	Natural attenuation would reduce toxicity, mobility and volume of contaminants. Alternative 3 would result in the greatest reduction in toxicity, mobility, and volume of contaminants through soil removal and grouting of fractures in bedrock.
Degree to which treatment is irreversible	NA	NA.	Excavation and off-Site disposal of contaminated surface soil is irreversible.
Type and quantity of residuals remaining after treatment	No further treatment processes or removal are used in this alternative. Some contaminated mass has been removed from the Site through excavation and off-Site disposal of contaminated surface soil and chemical oxidation injections previously performed as IRMs. Natural attenuation would result in the natural breakdown of contaminants over a long duration of time. Soil and groundwater contamination are anticipated to remain at the site for the foreseeable future.	No further treatment processes or removal are used in this alternative. Some contaminated mass has been removed from the Site through excavation and off-Site disposal of contaminated surface soil and chemical oxidation injections previously performed as IRMs. Natural attenuation would result in the natural breakdown of contaminants over a long duration of time.	This alternative would remove the contaminated soil mass beneath the Site building and encapsulate residual contaminant mass in bedrock. When compared to the other alternatives, this alternative would remove the greatest volume of contaminant mass from the Site.
Degree to which treatment would reduce the inherent hazards posed by the facility	Significant reduction through chemical oxidation previously completed as an IRM. Residual groundwater contamination is expected to be addressed long term through natural attenuation.	Significant reduction through chemical oxidation previously completed as an IRM. Residual groundwater contamination is expected to be addressed long term through natural attenuation.	Most reduction. As with the other scenarios residual groundwater contamination would remain and is expected to be addressed long term through natural attenuation.

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Criterion	Alternative 1 - No Further Action - Discontinuation of Vapor Intrusion (VI) Mitigation System Operation.	Alternative 2 - Natural Attenuation and Monitoring - Institutional and Engineering Controls - Groundwater Natural Attenuation with Monitoring *Previously installed as IRMs:* *- In Situ Groundwater Treatment (Chemical Oxidation)* *- Limited Surface Soil Removal and Capping* *- VI Mitigation System*	Alternative 3 - Pre-disposal/Unrestricted Use - Institutional Controls - Groundwater Natural Attenuation with Monitoring - Building Demolition - Expanded Surface and Subsurface Soil Removal - Grouting Bedrock Fractures
Ability of alternative to reduce the toxicity, mobility and volume of Site contamination	Alternative 1 relies, in part, on natural attenuation for reduction in toxicity, mobility and volume of groundwater contamination. The order of magnitude decline in groundwater PCE concentrations between the potential source area and downgradient monitoring wells suggests that attenuation of PCE in groundwater is occurring. Previous removal of surface soil as an IRM reduced the volume of contaminated soil. Previous groundwater remediation as an IRM	Alternative 2 relies, in part, on natural attenuation for reduction in toxicity, mobility and volume of groundwater contamination. The order of magnitude decline in groundwater PCE concentrations between the potential source area and downgradient monitoring wells suggests that attenuation of PCE in groundwater is occurring. Previous Removal of surface soil as an IRM reduced the volume of contaminated soil. Previous groundwater remediation as an IRM reduced toxicity, mobility and volume of contaminated groundwater. Mobility of contamination is also reduced through VI mitigation system.	Alternative 3 achieves reduction in toxicity, volume and mobility through the removal of subsurface soil contamination from the Site. Residual groundwater contamination, if any, would be addressed through natural attenuation and grouting of bedrock fractures. The order of magnitude decline in groundwater PCE concentrations between the potential source area and downgradient monitoring wells suggests that attenuation of PCE in groundwater is occurring.
Short-Term Effectiveness			
Potential human exposures during implementation of the alternative	Alternative 1 does not include active treatment processes.	Alternative 2 does not include active treatment processes.	Physical hazards relating to the movement of heavy equipment and vehicles associated with remedial construction activities would be anticipated. It should be noted that a significantly greater amount of construction activity is anticipated for Alternative 3 as compared to the other alternatives. Chemical hazards related to site contaminants in dust, volatile emissions, and surface runoff would be anticipated.
Sustainability and environmental impacts	There are no additional environmental and sustainability impacts expected as a result of implementing this alternative. No energy consumption, greenhouse gas or pollutant emissions, no water or resource use, no impacts to water, ecology, workers, or community. Limited protection is afforded to workers at the site (site buildings and pavement), however, protection of workers from potential exposure during subsurface disturbance or from soil vapor in buildings is not afforded by the alternative.	Fuel use/greenhouse gas emissions associated with operation of the sub-slab depressurization systen. Minimal pollutant emissions, impacts to water, ecology, or community. Safety equipment and personal protective equipment would protect workers from exposures.	Fuel use/greenhouse gas emissions associated with operation of excavation/construction equipment. Minimal pollutant emissions, impacts to water, ecology, or community. Safety equipment and personal protective equipment would protect workers from exposures. Alternative 3 would have the greatest short-term environmental and community impact due to extent of soil excavation and building demolition. It is anticipated that some of the demolition material would be recycled (structural steel) or may be suitable for beneficial reuse (fill). Green remediation techniques, as detailed in NYSDEC DER-31, would be considered to reduce the short-term impacts of the remedy.
Potential nuisance conditions	There are no nuisance conditions associated with implementing this alternative.	There are no nuisance conditions associated with implementing this alternative.	Nuisance conditions related to the implementation of Alternative 3 are anticipated to include dust and noise generation, runoff, and additional traffic. Building demolition would present a hardship for the current tenants.
Engineering controls to mitigate short-term impacts	None. No active components are related to this alternative.	None. No active components are related to this alternative.	Applicable hazards would be identified and proper health and safety measures would be established in a project specific HASP to be protective of workers and the community. Construction procedures including dust suppression, erosion control, and construction hours could be implemented to address nuisance conditions.
Time until RAOs are achieved	Soil RAOs have been met through IRMs. The estimated timeframe to achieve groundwater RAOs is unknown. Soil Vapor RAOs would not be met with this alternative in the foreseeable future.	Soil and soil vapor RAOs have been met through IRMs. The estimated timeframe to achieve groundwater RAOs is unknown.	Soil and soil vapor RAOs would be met upon implementation of Alternative 3. The estimated timeframe to achieve groundwater RAOs is unknown.
Implementability			
Technical Feasibility - ability to construct and operate the remedial technology	There are no technologies to be constructed in this alternative.	There are no technologies to be constructed in this alternative.	Remedial elements are readily constructible and operable.
Ability to monitor effectiveness of remedy	No monitoring is included in Alternative 1.	Effectiveness of remedy could be readily monitored by groundwater monitoring and periodic Site inspections relating to the institutional controls.	Effectiveness of remedy could be readily monitored by groundwater monitoring and periodic Site inspections relating to the institutional controls.
Reliability of technology	There are no technologies to be constructed in this alternative.	There are no technologies to be constructed in this alternative.	Complete demolition of the building and Site wide excavation of contaminated soil presents a reliable means to remove source area contaminants.
Ease of undertaking additional remedial actions, if necessary	Additional remedial actions, if necessary, would be readily implementable.	Additional remedial actions, if necessary, would be readily implementable.	Additional remedial actions, if necessary, would be readily implementable.

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Availability of off-site treatment storage and disposal services and capacities	None required.	None required.	Off-site TSDFs are readily available to manage soil that would be shipped from the Site during implementation of this alternative.
Availability of necessary equipment, specialists, and materials	None required.	Equipment, specialists and materials are widely available.	Equipment, specialists and materials are widely available.
Potential difficulties in obtaining operating approvals	No coordination necessary.	No difficulties are anticipated in obtaining operating approvals.	No difficulties are anticipated in obtaining operating approvals.
Reliability and viability of institutional and engineering controls	None	Institutional and engineering controls included in Alternative 2 are reliable means of managing exposures to soil vapor, soil and groundwater.	Institutional controls included in Alternative 3 are reliable means of managing exposures to soil and groundwater.
Costs			
Total capital cost	$0	$15,000	$8,129,000
Annual O&M cost	$0	$54,800 (Yr 1-2)/$44,300 (Yr 3)/11,500 (Yr 4-30)	$54,800 (Yr 1-2)/$44,300 (Yr 3)/1,500 (Yr 4-30)
Periodic O&M cost	$0	$23,000	$23,000
Approximate total net present worth cost	$0	$313,000	$8,398,000
Land Use			
Evaluation of land use factors	The facility is located in an area zoned for light industrial use in White Plains, NY. Commercial properties and railroad tracks surround the Site. Based on zoning and current facility and surrounding uses, the reasonably anticipated future use for the facility is commercial use. Consistent with 6 NYCRR-1.8(f) and DER-10 4.2(i), the current, intended and reasonably anticipated future use of the facility was considered when selecting SCOs. Remedial activities would be conducted in accordance with facility zoning and consider the current, intended and reasonably anticipated future use of the facility. Alternatives 1 and 2 are consistent with current, intended and reasonably anticipated future use of the facility. However, Alternative 3 includes building demolition which would present a hardship for current commercial building tenants.		

Notes:
cis-1,2-DCE - cis 1,2 - dichloroethene
DER-10 - Division of Environmental Remediation Technical Guidance for Site Investigation and Remediation
DER-31 - Division of Environmental Remediation Program Policy for Green Remediation
HASP - Health and Safety Plan
NA - Not applicable
NYCRR - New York Codes, Rules, and Regulations
NYSDEC - New York State Department of Environmental Conservation
OSHA - Occupational Safety and Health Administration
PCE - Tetrachloroethene
RAO - Remedial Action Objective
SCG - Standards, Criteria, and Guidance
SCO - Soil Cleanup Objective
TCE - Trichloroethene
TSDF - Treatment, storage and disposal facilities

Table 4a
Alternative 1 Cost Estimate

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Brownfield Cleanup Program No. C360115
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Alternative 1 - No further action

	QTY	UNIT	UNIT COST	TOTAL COST	Notes/Assumptions
DIRECT CAPITAL CONSTRUCTION COSTS					
TOTAL DIRECT CAPITAL COST				**$0**	
Engineering/Design/Field Oversight			20%	$0	
Legal			3%	$0	
Contingency			25%	$0	
TOTAL ALTERNATIVE CAPITAL COST (rounded)				**$0**	
OPERATION AND MAINTENANCE COSTS					
TOTAL OPERATION AND MAINTENANCE COST				**$0**	

PRESENT WORTH ANALYSIS (YEARS 1-30)		**Discount**		
Cost Type	**Total Cost**	**Factor (7%)**	**Cost Per Yr**	**Present Value**
Capital Cost - Year 0	$0	1.000	$0	$0
Annual O&M - Years 1-30			$0	$0
Periodic Costs - Years 5, 10, 15, 20, 25, 30			$0	$0
TOTAL PROJECT PRESENT WORTH (rounded)				**$0**

Table 4b
Alternative 2 Cost Estimate

Alternatives Analysis Report
Brownfield Cleanup Program No. C360115
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Alternative 2 - Groundwater monitoring and institutional/engineering controls

	QTY	UNIT	UNIT COST	TOTAL COST (ROUNDED)	Notes/Assumptions
DIRECT CAPITAL CONSTRUCTION COSTS					
Institutional Controls					
Develop site management plan	1	ls	$15,000	$15,000	
TOTAL DIRECT CAPITAL COST				**$15,000**	
TOTAL ALTERNATIVE CAPITAL COST (rounded)				**$15,000**	(rounded)
OPERATION AND MAINTENANCE COSTS					
Annual Costs (Years 1 and 2)					
Vapor Intrusion monitoring (2 Holland)					
Indoor Air and Sub-Slab Oversight and Labor	1	ls	$6,000.00	$6,000	32 hours labor for two individuals plus equipment
Vapor sample analytical	4	ea	$300.00	$1,000	TO-15 (includes 1 subslab, one indoor air, QA/QC and one ambient air)
Vapor reporting	1	ls	$3,500.00	$3,500	Annual
Groundwater Monitoring and Institutional Controls					
Groundwater monitoring oversight and labor	2	ea	$11,500	$23,000	Semi-Annual PDB sampling, well and cap inspection
Groundwater sample analytical	42	ea	$150	$6,300	21 samples per event (includes QA/QC) for VOCs
Groundwater reporting	1	ls	$3,500	$3,500	Annual
Site inspection and reporting	1	ls	$1,500	$1,500	Annual
VI Operation and Maintenance	1	ls	$10,000	$10,000	Annual
TOTAL ANNUAL O&M COST - Years 1-2 (rounded)				**$54,800**	
Annual Costs (Year 3)					
Groundwater Monitoring and Institutional Controls					
Groundwater monitoring oversight and labor	2	ea	$11,500	$23,000	Semi-Annual PDB sampling, well and cap inspection
Groundwater sample analytical	42	ea	$150	$6,300	21 samples per event (includes QA/QC) for VOCs
Groundwater reporting	1	ls	$3,500	$3,500	Annual
Site inspection and reporting	1	ls	$1,500	$1,500	Annual
VI Operation and Maintenance	1	ls	$10,000	$10,000	Annual
TOTAL ANNUAL O&M COST - Year 3 (rounded)				**$44,300**	
Annual Costs (Years 4-30)					
Groundwater Monitoring and Institutional Controls					
Site inspection and reporting	1	ls	$1,500	$1,500	Annual
VI Operation and Maintenance	1	ls	$10,000	$10,000	Annual
TOTAL ANNUAL O&M COST (rounded)				**$11,500**	
Periodic Costs (Years 5, 10, 15, 20, 25, 30)					
Groundwater monitoring oversight and labor	1	ls	$11,500	$11,500	Annual low flow sampling and inspection of 17 MW
Groundwater sample analytical	21	ea	$150	$3,200	21 samples per event (includes QA/QC) for VOCs
Groundwater reporting	1	ls	$3,500	$3,500	Annual
5-yr reviews	1	ea	$5,000	$5,000	
TOTAL PERIODIC O&M COST (rounded)				**$23,200**	

PRESENT WORTH ANALYSIS (YEARS 1-30)				
Cost Type	**Total Cost**	**Discount Factor (7%)**	**Cost Per Yr**	**Present Value**
Capital Cost - Year 0	$15,000	1.000	$15,000	$15,000
Annual O&M - Years 1-2			$54,800	$99,000
Annual O&M - Year 3			$44,300	$36,000
Annual O&M - Years 4-30			$11,500	$113,000
Periodic Costs - Years 5, 10, 15, 20, 25, 30			$23,200	$50,000
TOTAL PROJECT PRESENT WORTH (rounded)				**$313,000**

Notes:
PDB - Passive diffusion sampling.

Table 4c
Alternative 3 Cost Estimate

Alternatives Analysis Report
Brownfield Cleanup Program No. C360115
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Alternative 3 - Pre-disposal/ Unrestricted Use

	QTY	UNIT	UNIT COST	TOTAL COST (ROUNDED)	Notes/Assumptions
DIRECT CAPITAL CONSTRUCTION COSTS					
General Conditions	6	mo	$15,000	$90,000	Trailer, electrical and maintenance
Surveys & Permits	120	hr	$150	$18,000	
Erosion and Sediment Control	1	LS	$10,000	$10,000	allotment
Building Demolition					
Building demolition	327,000	cf	$0.40	$131,600	Demo building (16,400 sf total; 10,850 2 story, addnl 5,550 sf 1 story)
Slab on grade foundation removal	16,400	sf	$1.00	$16,400	Assumes no footings; 10 inch thickness
Asphalt Parking Removal	29,000	sf	$0.40	$11,600	Assumes 3-inch thickness
Transportation and Disposal as C&D	4,114	tons	$125.00	$514,200	0.25 ton per cy building/1.5 ton per cy all else; up to 150 miles
Soil Excavation					
Source area excavation	1,944	cy	$10.00	$19,400	50 x 50 x 21 ft; overburden above bedrock
Sheet piling system	8,400	sf	$45.00	$378,000	200 lf for 21-ft excavation with whalers
Dewatering system/ on-site treatment					
Pumping	30	day	$250	$7,500	Portable pumps and Frac tank equalization
On-site treatment Allotment	1	ls	$23,000	$23,000	with POTW discharge
Impacted Fill excavation	4,907	cy	$10.00	$49,100	Assumes fill material removal (5-ft depth x 29,000 sf)
Transportation and disposal	8,565	cy	$175	$1,498,800	Assumes non-hazardous waste, 25% bulking factor; 150 mi one way
Restoration					
Provide and place subgrade backfill	6,583	cy	$32.00	$210,700	site fill material to within 6-inches of grade
Provide and Place pavement sub-grade stone	269	cy	$40.00	$10,700	3-inch layer
Place regular duty asphalt	29,000	sf	$2.75	$79,750	3-inches asphalt
Erect 2 story masonry building	16,400	sf	$125.00	$2,050,000	16,400 sf total, slab on grade. In-kind with existing
Bedrock Fracture Grouting	1	ls	$405,000	$405,000	Assumes grouting to 60 ft within bedrock; source area
Institutional Controls					
Develop site management plan	1	ls	$15,000	$15,000	
TOTAL DIRECT CAPITAL COST				**$5,538,750**	
INDIRECT CAPITAL COSTS					
Engineering/Design/Field Oversight			20%	1,108,000	
Legal			3%	166,000	
Contingency			25%	1,385,000	
TOTAL INDIRECT CAPITAL COSTS				**$2,659,000**	
TOTAL ALTERNATIVE CAPITAL COST (rounded)				**$8,198,000**	(rounded)

Table 4c
Alternative 3 Cost Estimate

Alternatives Analysis Report
Brownfield Cleanup Program No. C360115
1-5 Holland Ave
White Plains, New York

Alternative 3 - Pre-disposal/ Unrestricted Use

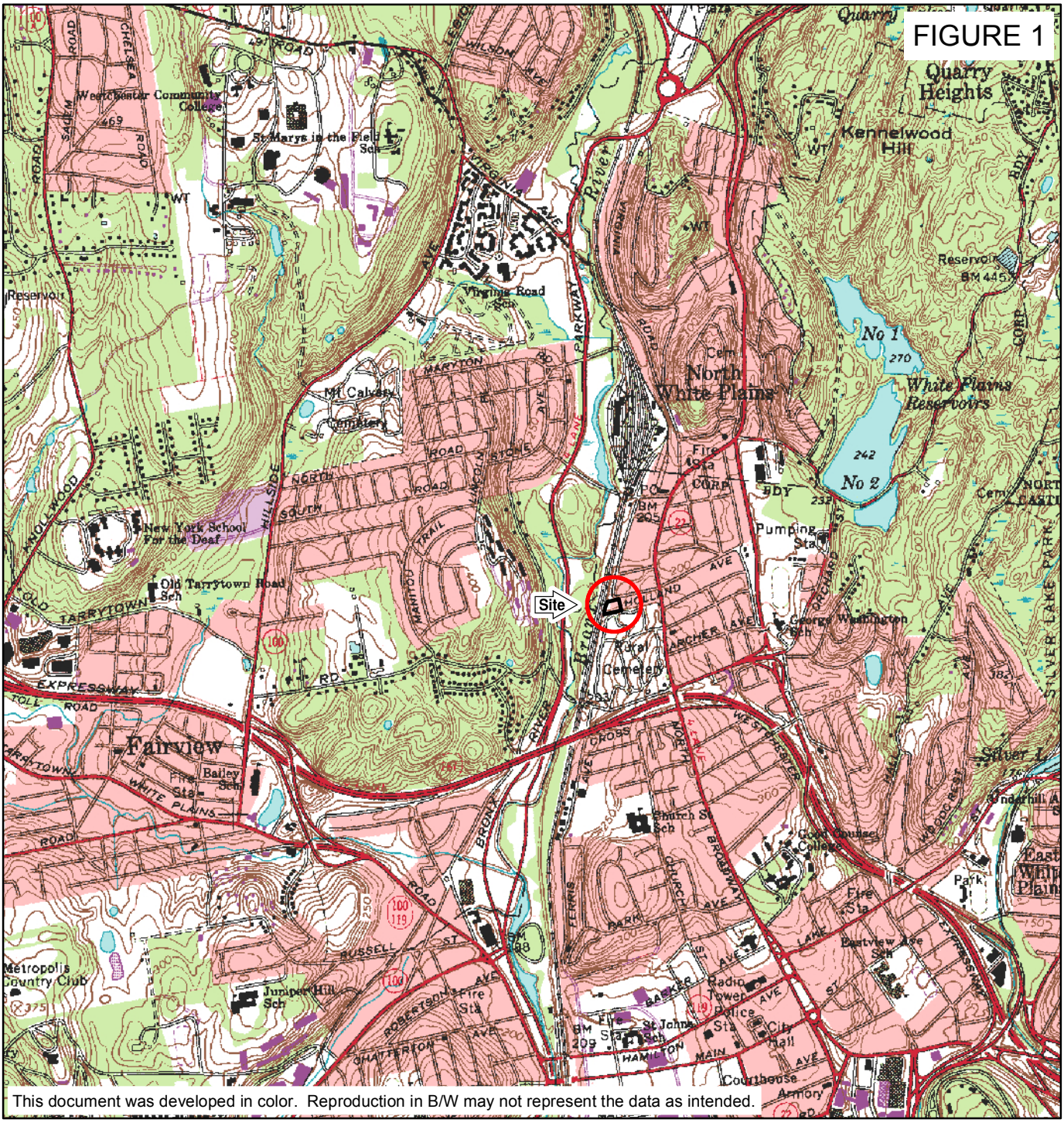
	QTY	UNIT	UNIT COST	TOTAL COST (ROUNDED)	Notes/Assumptions
OPERATION AND MAINTENANCE COSTS					
Annual Costs (Years 1 and 2)					
Vapor Intrusion monitoring (2 Holland)					
Indoor Air and Sub-Slab Oversight and Labor	1	ls	$6,000.00	$6,000	32 hours labor for two individuals plus equipment
Vapor sample analytical	4	ea	$300.00	$1,000	TO-15 (includes 1 subslab, one indoor air, QA/QC and one ambient air)
Vapor reporting	1	ls	$3,500.00	$3,500	Annual
Groundwater Monitoring and Institutional Controls					
Groundwater monitoring oversight and labor	2	ea	$11,500	$23,000	Semi-Annual PDB sampling, well and cap inspection
Groundwater sample analytical	42	ea	$150	$6,300	21 samples per event (includes QA/QC) for VOCs
Groundwater reporting	1	ls	$3,500	$3,500	Annual
Site inspection and reporting	1	ls	$1,500	$1,500	Annual
VI Operation and Maintenance	1	ls	$10,000	$10,000	Annual
TOTAL ANNUAL O&M COST - Years 1-2 (rounded)				**$54,800**	
Annual Costs (Year 3)					
Groundwater Monitoring and Institutional Controls					
Groundwater monitoring oversight and labor	2	ea	$11,500	$23,000	Semi-Annual low flow sampling and inspection of 17 MW
Groundwater sample analytical	42	ea	$150	$6,300	21 samples per event (includes QA/QC) for VOCs
Groundwater reporting	1	ls	$3,500	$3,500	Annual
Site inspection and reporting	1	ls	$1,500	$1,500	Annual
VI Operation and Maintenance	1	ls	$10,000	$10,000	Annual
TOTAL ANNUAL O&M COST - Year 3 (rounded)				**$44,300**	
Annual Costs (Years 4-30)					
Site Inspection and Reporting	1	ls	$1,500	$1,500	Annual
TOTAL ANNUAL O&M COST Years 6-30 (rounded)				**$1,500**	
Periodic Costs (Years 5, 10, 15, 20, 25, 30)					
Groundwater Monitoring (on-site and off-site) and Institutional Controls					
Groundwater monitoring oversight and labor	1	ls	$11,500	$11,500	Once per 5 yrs, PDB sampling, well and cap inspection
Groundwater sample analytical	21	ea	$150	$3,200	21 samples per event (includes QA/QC) for VOCs
Groundwater Reporting	1	ls	$3,500	$3,500	Annual
5-yr reviews	1	ea	$5,000	$5,000	
TOTAL PERIODIC O&M COST (rounded)				**$23,200**	

PRESENT WORTH ANALYSIS (YEARS 1-30)		**Discount**		
Cost Type	**Total Cost**	**Factor (7%)**	**Cost Per Yr**	**Present Value**
Capital Cost - Year 0	$8,198,000	1.000	$8,198,000	$8,198,000
Annual O&M - Years 1-2			$54,800	$99,000
Annual O&M - Year 3			$44,300	$36,000
Annual O&M - Years 4-30			$1,500	$14,500
Periodic Costs - Years 5, 10, 15, 20, 25, 30			$23,200	$50,000
TOTAL PROJECT PRESENT WORTH (rounded)				**$8,398,000**

Notes:
PDB - Passive diffusion sampling.

Figures

FIGURE 1



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BROWNFIELD CLEANUP
ALTERNATIVES ANALYSIS /
REMEDIAL ACTION WORK PLAN
PROGRAM NO. C360115
1-5 HOLLAND AVENUE
WHITE PLAINS, NY

MAP LOCATION

N

SITE LOCATION

0 1,000 2,000 4,000 6,000 8,000

Feet

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FIGURE 2

N

LEGEND

PROPERTY BOUNDARY

SURFACE WATER

BROWNFIELD CLEANUP
ALTERNATIVES ANALYSIS /
REMEDIAL ACTION WORK PLAN
PROGRAM NO. C360115
1-5 HOLLAND AVENUE
WHITE, PLAINS, NY

SITE BOUNDARIES

0 62.5 125 250

Feet

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FIGURE 3

N

LEGEND

- BUILDINGS
- APPROXINMATE PROPERTY BOUNDARY
- ESA FEATURES

BROWNFIELD CLEANUP ALTERNATIVES ANALYSIS / REMEDIAL ACTION WORK PLAN
PROGRAM NO. C360115
1-5 HOLLAND AVENUE
WHITE, PLAINS, NY

SITE FEATURES

0 20 40 80
Feet

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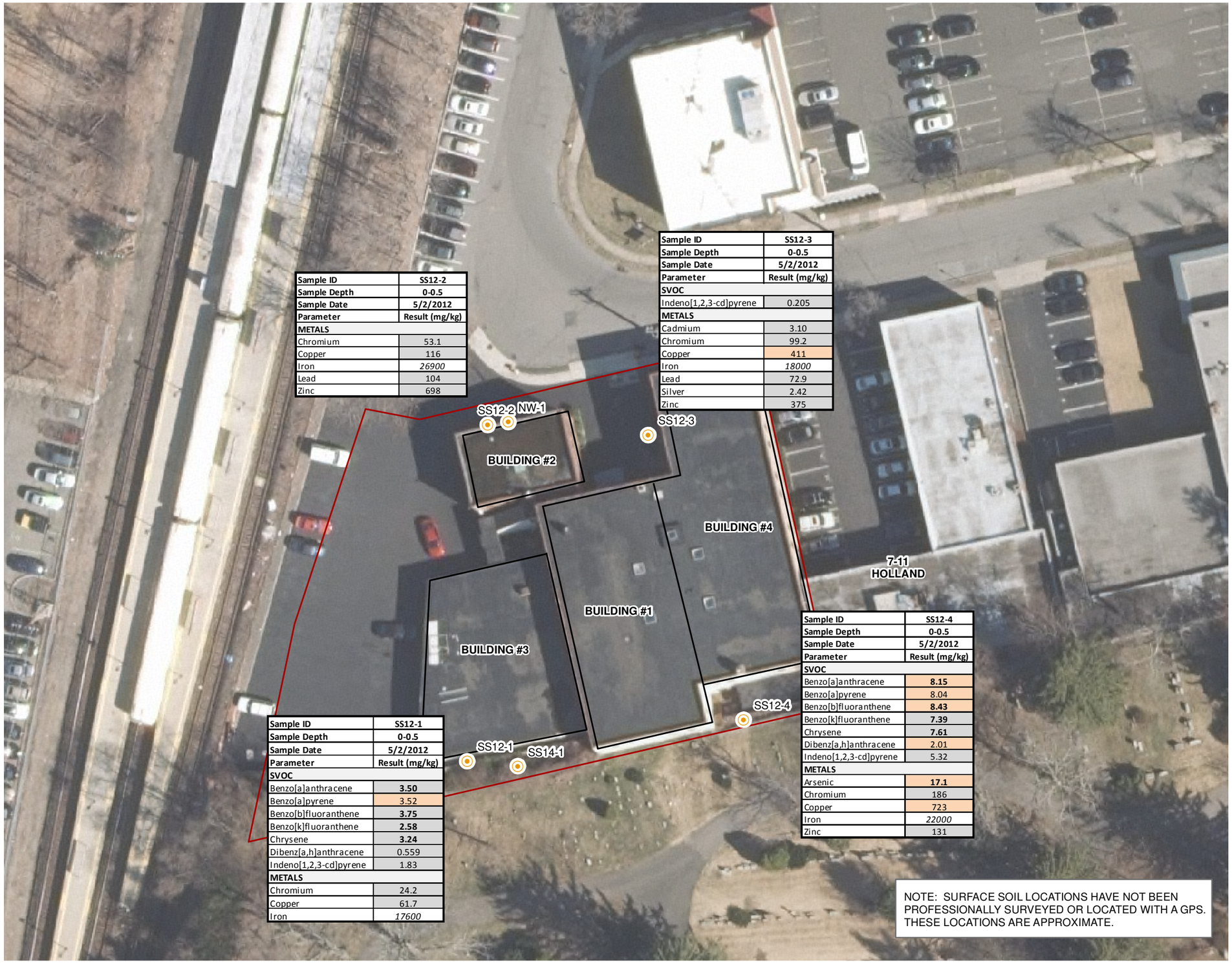

Sample ID	SS12-2
Sample Depth	0-0.5
Sample Date	5/2/2012
Parameter	Result (mg/kg)
METALS	
Chromium	53.1
Copper	116
Iron	*26900*
Lead	104
Zinc	698

Sample ID	SS12-3
Sample Depth	0-0.5
Sample Date	5/2/2012
Parameter	Result (mg/kg)
SVOC	
Indeno[1,2,3-cd]pyrene	0.205
METALS	
Cadmium	3.10
Chromium	99.2
Copper	411
Iron	*18000*
Lead	72.9
Silver	2.42
Zinc	375

Sample ID	SS12-1
Sample Depth	0-0.5
Sample Date	5/2/2012
Parameter	Result (mg/kg)
SVOC	
Benzo[a]anthracene	**3.50**
Benzo[a]pyrene	3.52
Benzo[b]fluoranthene	**3.75**
Benzo[k]fluoranthene	**2.58**
Chrysene	**3.24**
Dibenz[a,h]anthracene	0.559
Indeno[1,2,3-cd]pyrene	1.83
METALS	
Chromium	24.2
Copper	61.7
Iron	*17600*

Sample ID	SS12-4
Sample Depth	0-0.5
Sample Date	5/2/2012
Parameter	Result (mg/kg)
SVOC	
Benzo[a]anthracene	**8.15**
Benzo[a]pyrene	8.04
Benzo[b]fluoranthene	**8.43**
Benzo[k]fluoranthene	**7.39**
Chrysene	**7.61**
Dibenz[a,h]anthracene	2.01
Indeno[1,2,3-cd]pyrene	5.32
METALS	
Arsenic	**17.1**
Chromium	186
Copper	723
Iron	*22000*
Zinc	131

NOTE: SURFACE SOIL LOCATIONS HAVE NOT BEEN PROFESSIONALLY SURVEYED OR LOCATED WITH A GPS. THESE LOCATIONS ARE APPROXIMATE.

FIGURE 4

N

LEGEND

- SURFACE SOIL SAMPLE LOCATION
- BUILDINGS
- PROPERTY BOUNDARY
- **BOLD** - EXCEEDS PART 375 PROTECTION OF GROUNDWATER
- **BOLD** - EXCEEDS PART 375 UNRESTRICTED
- **BOLD** - EXCEEDS PART 375 RESTRICTED COMMERCIAL

BROWNFIELD CLEANUP
ALTERNATIVES ANALYSIS /
REMEDIAL ACTION WORK PLAN
PROGRAM NO. C360115
1-5 HOLLAND AVENUE
WHITE, PLAINS, NY

SURFACE SOIL CONCENTRATIONS - SVOCs AND METALS

0 20 40 80
Feet

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FIGURE 5

N

LEGEND

- SOIL BORING (INSIDE BUILDING)
- SOIL BORING (OUTSIDE BUILDING)
- GROUND PROBE
- MONITORING WELL
- BUILDINGS
- **BOLD** - EXCEEDS PART 375 PROTECTION OF GROUNDWATER
- **BOLD** - EXCEEDS PART 375 UNRESTRICTED
- **BOLD** - EXCEEDS PART 375 RESTRICTED COMMERCIAL

BROWNFIELD CLEANUP
ALTERNATIVES ANALYSIS /
REMEDIAL ACTION WORK PLAN
PROGRAM NO. C360115
1-5 HOLLAND AVENUE
WHITE, PLAINS, NY

SUBSURFACE SOIL CONCENTRATIONS - METALS

0 7.5 15 30
Feet

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Sample ID	FNY9-SB-02
Sample Depth	0.5 - 4.0
Sample Date	4/28/2011
Parameter	Result (mg/kg)
Arsenic	**98.1**
Chromium	28.6
Copper	423
Iron	*60700*
Lead	276
Mercury	**7.92**
Zinc	132

Sample ID	FNY9-SB-01
Sample Depth	0.5 - 4.0
Sample Date	4/28/2011
Parameter	Result (mg/kg)
Chromium	16.8
Copper	605
Iron	*14500*
Lead	84.9
Mercury	**10.5**
Zinc	272

Sample ID	FNY-10
Sample Depth	1.0 - 3.0
Sample Date	11/20/2008
Parameter	Result (mg/kg)
Chromium	15.9
Iron	*13300*

Sample ID	FNY-18
Sample Depth	0 - 5.0
Sample Date	11/21/2008
Parameter	Result (mg/kg)
Chromium	16.7
Iron	*15500*

Sample ID	FNY-12
Sample Depth	1.0 - 3.0
Sample Date	11/20/2008
Parameter	Result (mg/kg)
Chromium	15.5
Iron	*15400*

Sample ID	FNY9-SB-03
Sample Depth	0.5 - 4.0
Sample Date	4/28/2011
Parameter	Result (mg/kg)
Chromium	10.7
Iron	*11500*

Sample ID	FNY-10
Sample Depth	15.0 - 17.0
Sample Date	11/20/2008
Parameter	Result (mg/kg)
Chromium	22.4
Iron	*16600*

Sample ID	FNY-12
Sample Depth	11.0 - 13.0
Sample Date	11/20/2008
Parameter	Result (mg/kg)
Chromium	13.7
Iron	*13700*

Sample ID	FNY-16
Sample Depth	12.0 - 14.0
Sample Date	11/21/2008
Parameter	Result (mg/kg)
Chromium	20.5
Iron	*21800*

Sample ID	FNY-9
Sample Depth	1.0 - 3.0
Sample Date	11/20/2008
Parameter	Result (mg/kg)
Arsenic	13.8
Chromium	13
Copper	990
Iron	*22500*
Lead	239
Mercury	**15.4**
Silver	2.6 J
Zinc	283

Sample ID	FNY-16
Sample Depth	0 - 2.0
Sample Date	11/21/2008
Parameter	Result (mg/kg)
Chromium	22.2
Iron	*21600*

Sample ID	FNY-9
Sample Depth	11.0 - 13.0
Sample Date	11/20/2008
Parameter	Result (mg/kg)
Chromium	23.1
Copper	61.9
Iron	*18800*
Zinc	130

Sample ID	FNY-8
Sample Depth	1.0 - 3.0
Sample Date	11/20/2008
Parameter	Result (mg/kg)
Chromium	6.9
Iron	*7400*

Sample ID	FNY-17
Sample Depth	14.0 - 16.0
Sample Date	11/21/2008
Parameter	Result (mg/kg)
Chromium	20.8
Iron	*16200*

Sample ID	FNY-8
Sample Depth	11.0 - 13.0
Sample Date	11/20/2008
Parameter	Result (mg/kg)
Chromium	4.9
Iron	*5850*

Sample ID	FNY-17
Sample Depth	2.0 - 4.0
Sample Date	11/21/2008
Parameter	Result (mg/kg)
Chromium	8.4
Iron	*8850*

Sample ID	GP5-SB-03
Sample Depth	0.5 - 4.0
Sample Date	4/28/2011
Parameter	Result (mg/kg)
Arsenic	**17.7**
Chromium	30.8
Copper	129
Iron	*21800*
Lead	149
Mercury	**5.45**
Zinc	158

Sample ID	FNY-15
Sample Depth	10.0 - 12.0
Sample Date	11/21/2008
Parameter	Result (mg/kg)
Chromium	9.6
Iron	*9600*

Sample ID	GP-5
Sample Depth	0 - 4.0
Sample Date	4/9/1999
Parameter	Result (mg/kg)
Arsenic	11
Cadmium	5
Chromium	7
Lead	**4200**
Mercury	**50**

Sample ID	GP5-SB-01
Sample Depth	0.5 - 4.0
Sample Date	4/28/2011
Parameter	Result (mg/kg)
Chromium	10.5
Iron	*9630*

Sample ID	GP5-SB-02
Sample Depth	0.5 - 4.0
Sample Date	4/28/2011
Parameter	Result (mg/kg)
Chromium	10.7
Iron	*9950*

Sample ID	FNY-11
Sample Depth	1.0 - 3.0
Sample Date	11/20/2008
Parameter	Result (mg/kg)
Chromium	4.6
Iron	*3870*
Zinc	238

Sample ID	FNY-13
Sample Depth	4.0 - 6.0
Sample Date	11/21/2008
Parameter	Result (mg/kg)
Chromium	6.6
Iron	*7340*
Silver	3.2

Sample ID	FNY-14
Sample Depth	0 - 2.0
Sample Date	11/21/2008
Parameter	Result (mg/kg)
Chromium	10
Iron	*9980*

Sample ID	HB-3A
Sample Depth	0 - 1.0
Sample Date	6/2/1999
Parameter	Result (mg/kg)
Chromium	7.16
Mercury	**1.18**

Sample ID	FNY-11
Sample Depth	13.0 - 15.0
Sample Date	11/20/2008
Parameter	Result (mg/kg)
Chromium	7.7
Iron	*8180*

Sample ID	GP-4
Sample Depth	0.5 - 1.0
Sample Date	4/9/1999
Parameter	Result (mg/kg)
Chromium	11

Sample ID	HB-1
Sample Depth	0 - 1.0
Sample Date	4/9/1999
Parameter	Result (mg/kg)
Cadmium	5
Chromium	25
Lead	350
Mercury	0.2

Sample ID	FNY-13
Sample Depth	10.0 - 12.0
Sample Date	11/21/2008
Parameter	Result (mg/kg)
Chromium	10.8
Iron	*10900*
Silver	3.2

Sample ID	FNY-14
Sample Depth	8.0 - 10.0
Sample Date	11/21/2008
Parameter	Result (mg/kg)
Chromium	14.9
Iron	*12900*

FNY9-SB-02
FNY9-SB-03
FNY9-SB-01
FNY-9
FNY-10
FNY-12
FNY-13
FNY-16
FNY-8
GP5-SB-03
GP-5
GP5-SB-02
GP5-SB-01
FNY-17
FNY-15
HB-3A
FNY-11
GP-4
FNY-14
HB-1
BUILDING #1
BUILDING #2
BUILDING #3
BUILDING #4
7-11
HOLLAND

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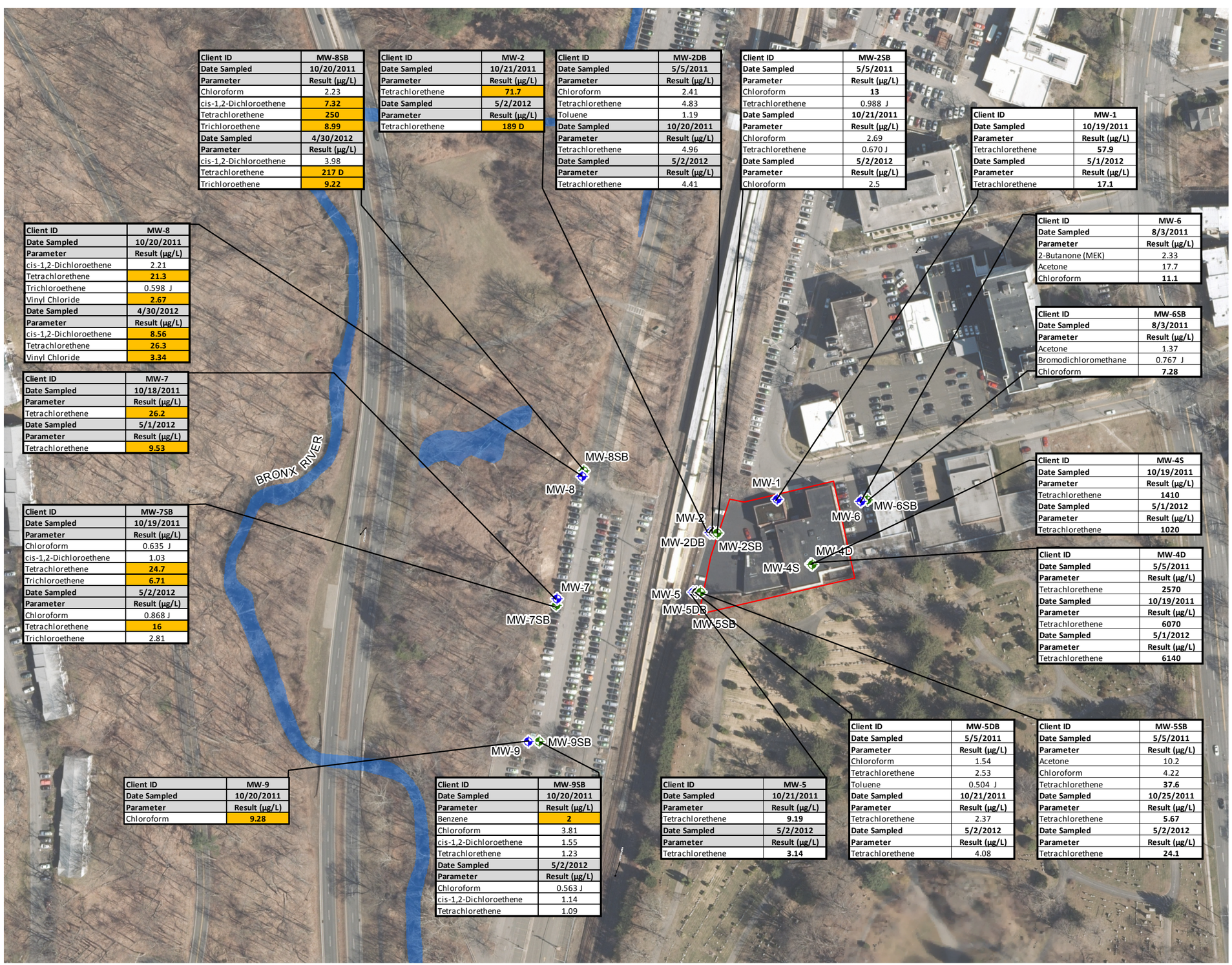
FIGURE 6



Client ID	MW-8SB
Date Sampled	10/20/2011
Parameter	Result (µg/L)
Chloroform	2.23
cis-1,2-Dichloroethene	**7.32**
Tetrachloroethene	**250**
Trichloroethene	**8.99**
Date Sampled	4/30/2012
Parameter	Result (µg/L)
cis-1,2-Dichloroethene	3.98
Tetrachloroethene	**217 D**
Trichloroethene	**9.22**

Client ID	MW-2
Date Sampled	10/21/2011
Parameter	Result (µg/L)
Tetrachlorethene	**71.7**
Date Sampled	5/2/2012
Parameter	Result (µg/L)
Tetrachlorethene	**189 D**

Client ID	MW-2DB
Date Sampled	5/5/2011
Parameter	Result (µg/L)
Chloroform	2.41
Tetrachlorethene	4.83
Toluene	1.19
Date Sampled	10/20/2011
Parameter	Result (µg/L)
Tetrachlorethene	4.96
Date Sampled	5/2/2012
Parameter	Result (µg/L)
Tetrachlorethene	4.41

Client ID	MW-2SB
Date Sampled	5/5/2011
Parameter	Result (µg/L)
Chloroform	**13**
Tetrachlorethene	0.988 J
Date Sampled	10/21/2011
Parameter	Result (µg/L)
Chloroform	2.69
Tetrachlorethene	0.670 J
Date Sampled	5/2/2012
Parameter	Result (µg/L)
Chloroform	2.5

Client ID	MW-1
Date Sampled	10/19/2011
Parameter	Result (µg/L)
Tetrachlorethene	**57.9**
Date Sampled	5/1/2012
Parameter	Result (µg/L)
Tetrachlorethene	**17.1**

Client ID	MW-8
Date Sampled	10/20/2011
Parameter	Result (µg/L)
cis-1,2-Dichloroethene	2.21
Tetrachlorethene	**21.3**
Trichloroethene	0.598 J
Vinyl Chloride	**2.67**
Date Sampled	4/30/2012
Parameter	Result (µg/L)
cis-1,2-Dichloroethene	**8.56**
Tetrachlorethene	**26.3**
Vinyl Chloride	**3.34**

Client ID	MW-6
Date Sampled	8/3/2011
Parameter	Result (µg/L)
2-Butanone (MEK)	2.33
Acetone	17.7
Chloroform	**11.1**

Client ID	MW-6SB
Date Sampled	8/3/2011
Parameter	Result (µg/L)
Acetone	1.37
Bromodichloromethane	0.767 J
Chloroform	**7.28**

Client ID	MW-7
Date Sampled	10/18/2011
Parameter	Result (µg/L)
Tetrachlorethene	**26.2**
Date Sampled	5/1/2012
Parameter	Result (µg/L)
Tetrachlorethene	**9.53**

Client ID	MW-4S
Date Sampled	10/19/2011
Parameter	Result (µg/L)
Tetrachlorethene	**1410**
Date Sampled	5/1/2012
Parameter	Result (µg/L)
Tetrachlorethene	**1020**

Client ID	MW-4D
Date Sampled	5/5/2011
Parameter	Result (µg/L)
Tetrachlorethene	**2570**
Date Sampled	10/19/2011
Parameter	Result (µg/L)
Tetrachlorethene	**6070**
Date Sampled	5/1/2012
Parameter	Result (µg/L)
Tetrachlorethene	**6140**

Client ID	MW-7SB
Date Sampled	10/19/2011
Parameter	Result (µg/L)
Chloroform	0.635 J
cis-1,2-Dichloroethene	1.03
Tetrachlorethene	**24.7**
Trichloroethene	**6.71**
Date Sampled	5/2/2012
Parameter	Result (µg/L)
Chloroform	0.868 J
Tetrachlorethene	**16**
Trichloroethene	2.81

Client ID	MW-9
Date Sampled	10/20/2011
Parameter	Result (µg/L)
Chloroform	**9.28**

Client ID	MW-9SB
Date Sampled	10/20/2011
Parameter	Result (µg/L)
Benzene	**2**
Chloroform	3.81
cis-1,2-Dichloroethene	1.55
Tetrachlorethene	1.23
Date Sampled	5/2/2012
Parameter	Result (µg/L)
Chloroform	0.563 J
cis-1,2-Dichloroethene	1.14
Tetrachlorethene	1.09

Client ID	MW-5
Date Sampled	10/21/2011
Parameter	Result (µg/L)
Tetrachlorethene	**9.19**
Date Sampled	5/2/2012
Parameter	Result (µg/L)
Tetrachlorethene	**3.14**

Client ID	MW-5DB
Date Sampled	5/5/2011
Parameter	Result (µg/L)
Chloroform	1.54
Tetrachlorethene	2.53
Toluene	0.504 J
Date Sampled	10/21/2011
Parameter	Result (µg/L)
Tetrachlorethene	2.37
Date Sampled	5/2/2012
Parameter	Result (µg/L)
Tetrachlorethene	4.08

Client ID	MW-5SB
Date Sampled	5/5/2011
Parameter	Result (µg/L)
Acetone	10.2
Chloroform	4.22
Tetrachlorethene	**37.6**
Date Sampled	10/25/2011
Parameter	Result (µg/L)
Tetrachlorethene	**5.67**
Date Sampled	5/2/2012
Parameter	Result (µg/L)
Tetrachlorethene	**24.1**

LEGEND

- OVERBURDEN MONITORING WELL
- SHALLOW BEDROCK MONITORING WELL
- DEEP BEDROCK MONITORING WELL
- PROPERTY BOUNDARY
- SURFACE WATER

BOLD - EXCEEDS TOGS 1.1.1 CLASS GA STANDARDS/CRITERIA

BROWNFIELD CLEANUP
ALTERNATIVES ANALYSIS /
REMEDIAL ACTION WORK PLAN
PROGRAM NO. C360115
1-5 HOLLAND AVENUE
WHITE, PLAINS, NY

GROUNDWATER CONCENTRATIONS VOCs

0 75 150 300
Feet

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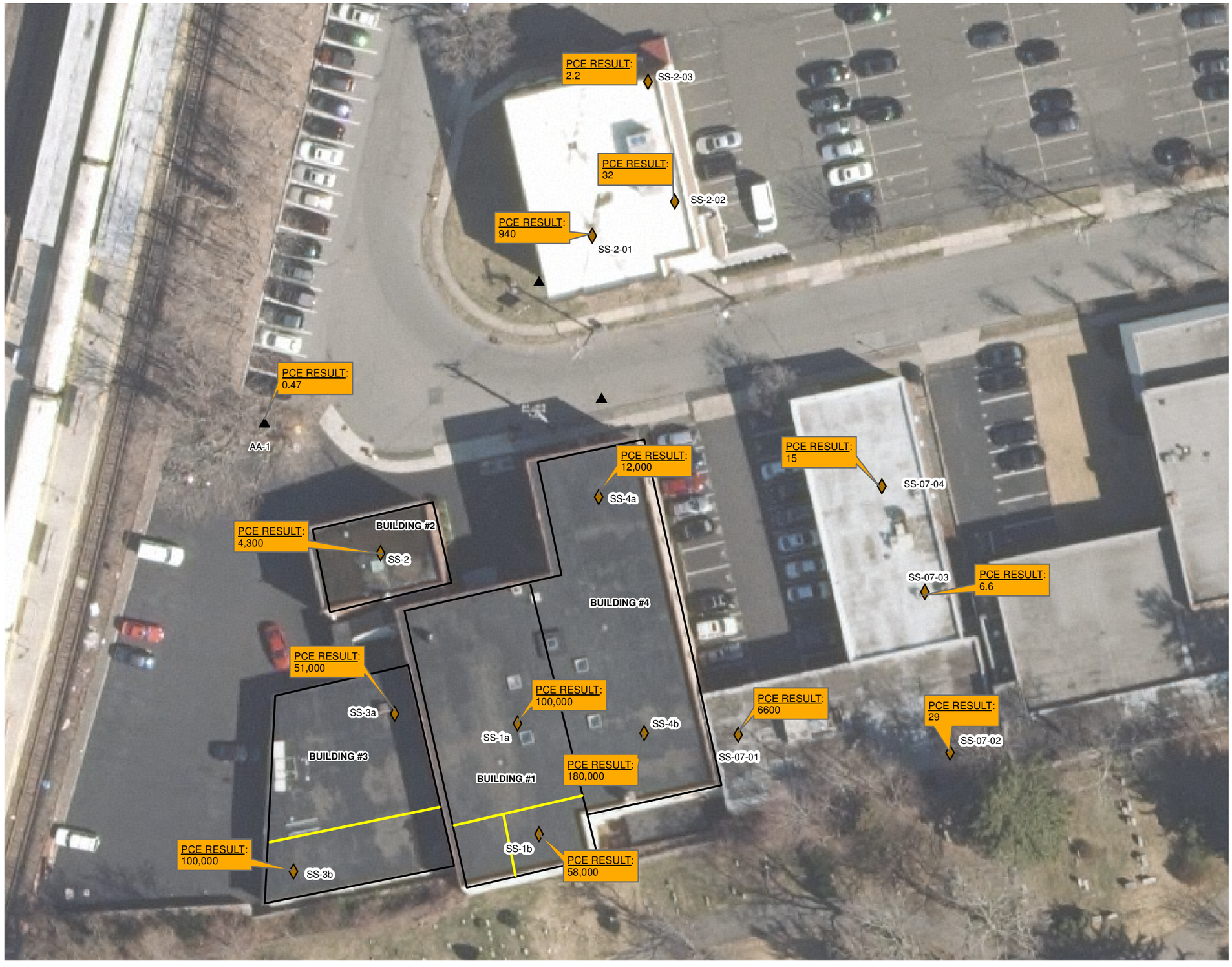

FIGURE 7

N

LEGEND

- ▲ AMBIENT AIR SAMPLE (mg/m³)
- ♦ SUBSLAB VAPOR SAMPLE (mg/m³)
- WALLS
- BUILDINGS

BROWNFIELD CLEANUP ALTERNATIVES ANALYSIS / REMEDIAL ACTION WORK PLAN
PROGRAM NO. C360115
1-5 HOLLAND AVENUE
WHITE, PLAINS, NY

SOIL VAPOR CONCENTRATIONS - PCE

0 17.5 35 70
Feet

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FIGURE 8

LEGEND

MIP ECD READINGS (µV)

- <300000
- 300001 - 400000
- 400001 - 500000
- 500001 - 600000
- 600001 - 1700000
- ESA FEATURES
- SS-4b MIP INVESTIGATION AREA (VOC's)
- (2.1) DEPTH OF MAXIMUM ECD READING (FT BGS)

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MIP MAXIMUM ELECTRON CAPTURE DETECTOR (ECD) READINGS

0 12.5 25 50
Feet

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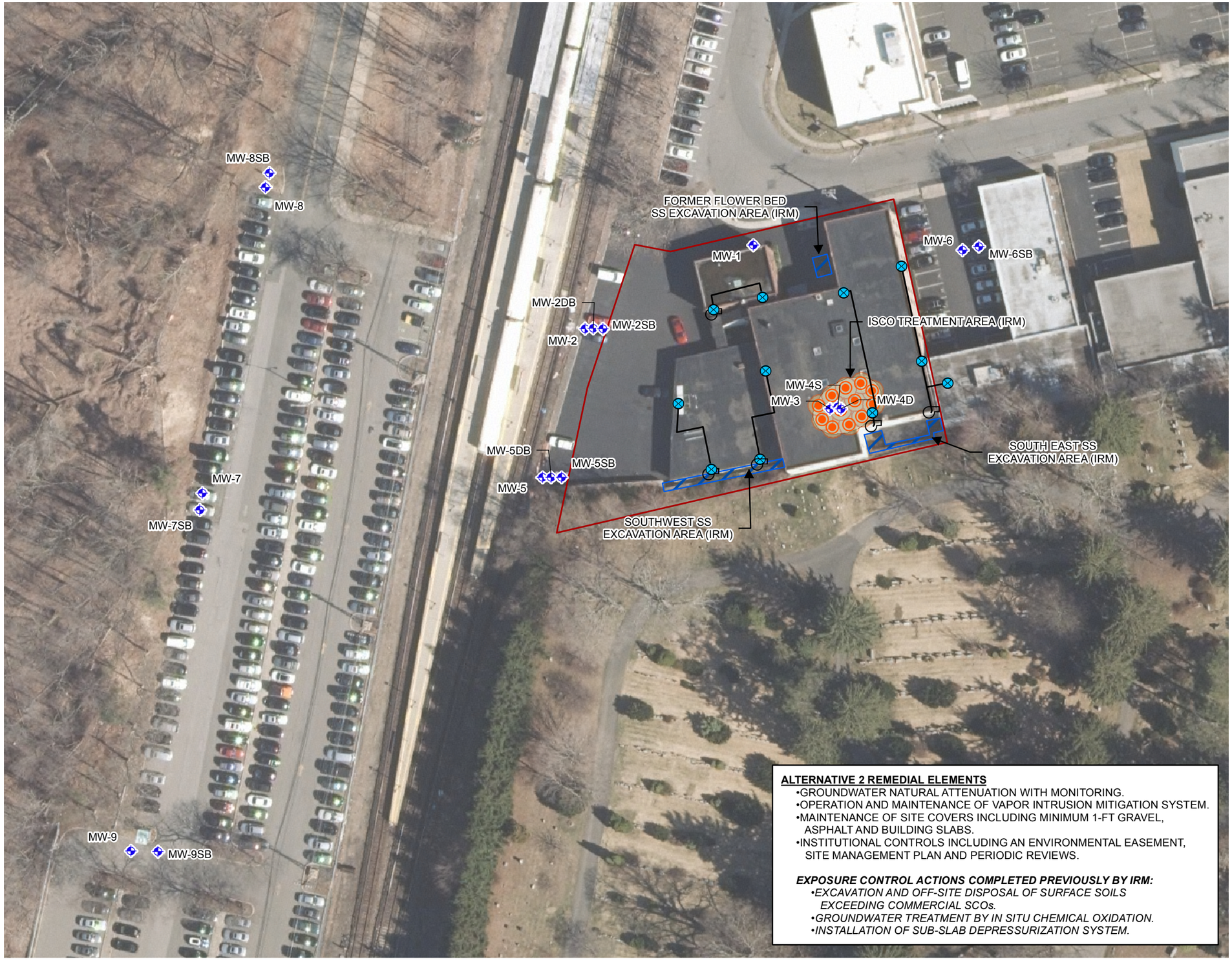

ALTERNATIVE 2 REMEDIAL ELEMENTS

- •GROUNDWATER NATURAL ATTENUATION WITH MONITORING.
- •OPERATION AND MAINTENANCE OF VAPOR INTRUSION MITIGATION SYSTEM.
- •MAINTENANCE OF SITE COVERS INCLUDING MINIMUM 1-FT GRAVEL, ASPHALT AND BUILDING SLABS.
- •INSTITUTIONAL CONTROLS INCLUDING AN ENVIRONMENTAL EASEMENT, SITE MANAGEMENT PLAN AND PERIODIC REVIEWS.

EXPOSURE CONTROL ACTIONS COMPLETED PREVIOUSLY BY IRM:

- *•EXCAVATION AND OFF-SITE DISPOSAL OF SURFACE SOILS EXCEEDING COMMERCIAL SCOs.*
- *•GROUNDWATER TREATMENT BY IN SITU CHEMICAL OXIDATION.*
- *•INSTALLATION OF SUB-SLAB DEPRESSURIZATION SYSTEM.*

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FIGURE 9

N

LEGEND

- APPROXIMATE PROPERTY BOUNDARY
- MONITORING WELL

PREVIOUSLY INSTALLED BY IRM

- EXHAUST FAN
- SYSTEM SUCTION POINT
- SYSTEM SUCTION PIPING
- GRAVEL COVER
- INJECTION WELL CLUSTER LOCATION

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ALTERNATIVE 2

0 30 60 120
Feet

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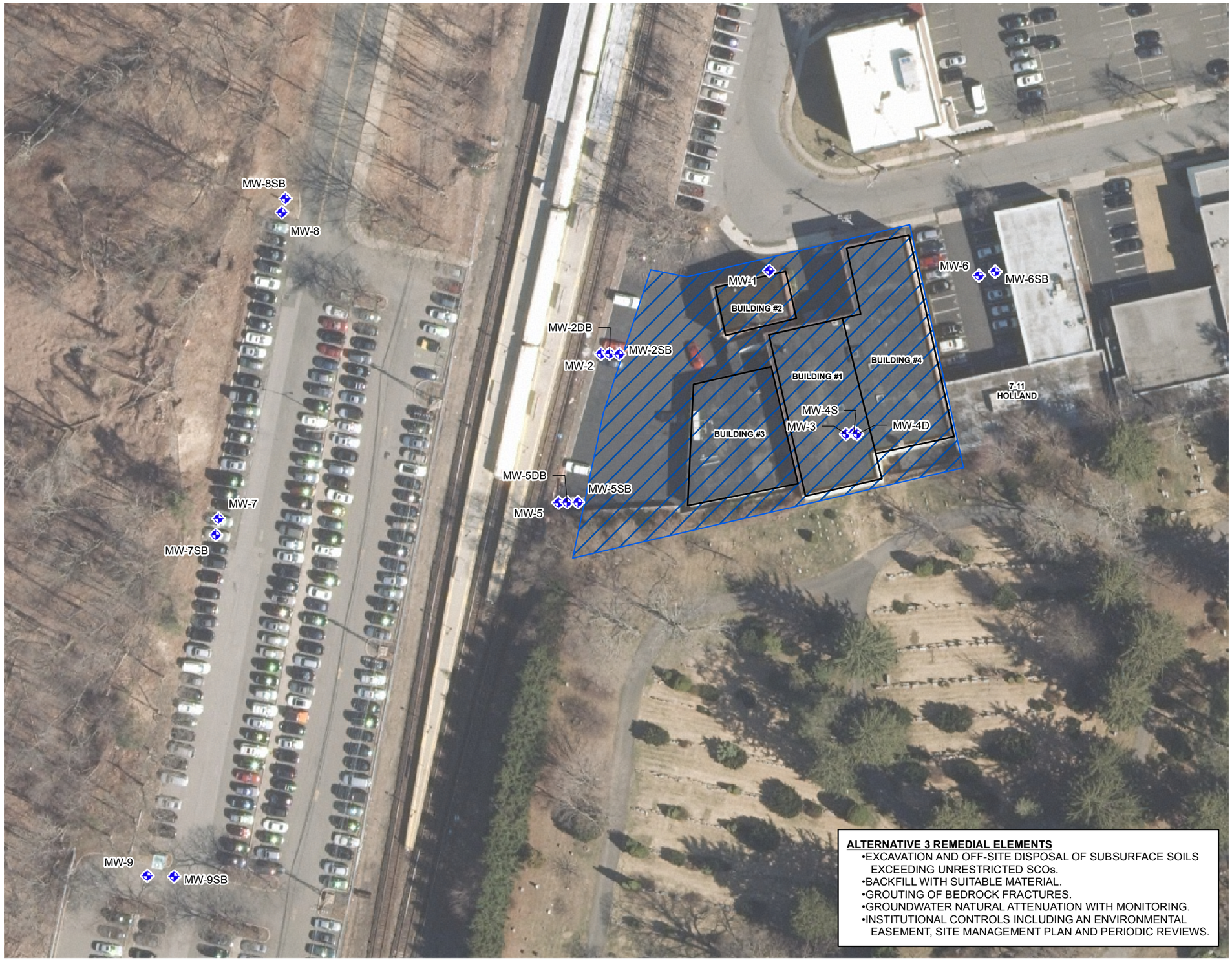
FIGURE 10



N

LEGEND

- MONITORING WELL
- BUILDING TO BE DEMOLISHED
- EXCAVATION AREA

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ALTERNATIVE 3

0 30 60 120
Feet

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