LGA Hotel Site
Remedial Action Work Plan

112-12 – 112-18 and 112-24 Astoria Boulevard
East Elmhurst, NY 11369
Block 1706, Lots 5, 9 and 11
BCP Site #C241142
NYSDEC Spill #0806500
PBS #s 2-610483 and 2-268992
OER #10EHAZ318Q, CEQR #03DCP058Q

Submitted to:
New York State Department of Environmental Conservation
Division of Environmental Remediation
Remedial Bureau B
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June 2014

CERTIFICATIONS

I, Matthew M. Carroll, am currently a registered professional engineer licensed by the State of New York. I have primary direct responsibility for implementation of the remedial program for the LGA Hotel Site (NYSDEC BCA Index No. C241142-02-13; Site No. C241124).

I certify that the Site description presented in this Remedial Action Work Plan (RAWP) is identical to the Site descriptions presented in the Brownfield Cleanup Agreement for the LGA Hotel Site and related amendments.

I certify that this plan includes proposed use restrictions, Institutional Controls, Engineering Controls, and plans for all operation and maintenance requirements applicable to the Site and provision for development of an Environmental Easement to be created and recorded pursuant ECL 71-3605. This RAWP requires that all affected local governments, as defined in ECL 71-3603, will be notified that such Easement has been recorded. This RAWP requires that a Site Management Plan must be submitted by the Applicant for the continual and proper operation, maintenance, and monitoring of all Engineering Controls employed at the Site, including the proper maintenance of all remaining monitoring wells, for approval by the Department.

I certify that this RAWP has a plan for transport and disposal of all soil, fill, fluids and other material removed from the property under this Plan, and that all transport and disposal will be performed in accordance with all local, State and Federal laws and requirements. All exported material will be taken to facilities licensed to accept this material in full compliance with all Federal, State and local laws.

I certify that this RAWP has a plan for import of all soils and other material from off-Site and that all activities of this type will be in accordance with all local, State and Federal laws and requirements.

I certify that this RAWP has a plan for nuisance control during the remediation and all invasive development work, including a dust, odor and vapor suppression plan and that such plan is sufficient to control dust, odors and vectors and will prevent nuisances from occurring.

I certify that all information and statements in this certification are true. I understand that a false statement made herein is punishable as Class “A” misdemeanor, pursuant to Section 210.45 of the Penal Law.

_____	_____	_____
NYS Professional Engineer #	Date	Matthew M. Carroll, P.E. Signature

It is a violation of Article 130 of New York State Education Law for any person to alter this document in any way without the express written verification of adoption by any New York State licensed engineer in accordance with Section 7209(2), Article 130, New York State Education Law.

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AGV	NYSDOH Air Guidance Value
AOC	area of concern
AS	air sparging
BCA	Brownfield Cleanup Agreement
BCP	Brownfield Cleanup Program
ECL	Environmental Conservation Law
BTEX	benzene, toluene, ethylbenzene and xylenes
CAMP	Community Air Monitoring Program
C&D	construction and demolition
CDS	construction dewatering system
Class GA Standards	NYSDEC TOGS 1.1.1 Class GA Ambient Water Quality Standards and Guidance Values
CEQR	City Environmental Quality Review
CFR	Code of Federal Regulations
CPP	Citizen Participation Plan
COC	Certificate of Completion
DCE	dichloroethylene
DER-10	NYSDEC Division of Environmental Remediation (DER), DER-10 / Technical Guidance for Site Investigation and Remediation
DRO	diesel range organics
DOC	dissolved organic carbon
DUSR	Data Usability Summary Report
EC	engineering control
ESA	Environmental Site Assessment
EZ	exclusion zone
FB	field blanks
FER	Final Engineering Report
ft-btoc	feet below top of well casing
ft-bg	feet below sidewalk grade
HASP	Health and Safety Plan
HSA	Hollow Stem Auger
HSO	Health and Safety Officer
IC	institutional control
ISCO	in-situ chemical oxidation
IRM	Interim Remedial Measure
MW	monitoring well
NGVD	National Geodetic Vertical Datum
NIOSH	National Institute for Occupational Safety and Health
NYCDEP	New York City Department of Environmental Protection
NYCDOB	New York City Department of Buildings
NYCDOT	New York City Department of Transportation
NYCRR	New York Codes, Rules and Regulations
NYSDEC	New York State Department of Environmental Conservation

NYSDOH	New York State Department of Health
NYSDOH-ELAP	NYSDOH Environmental Laboratory Approval Program
OSHA	Occupational Safety and Health Association
PCB	polychlorinated biphenyl
PCE	perchloroethylene, aka tetrachloroethylene
PID	photoionization detector
PP Metals	Priority Pollutant Metals
PPE	personal protective equipment
QA/QC	quality assurance / quality control
QAPP	Quality Assurance Project Plan
RAWP	Remedial Action Plan
RCNY	Rules of the City of New York
RMO	Remedial Measure Objective
RE	Remedial Engineer
RI	remedial investigation
RSCOs	Recommended Soil Cleanup Objectives
RCUSCOs	6 NYCRR 375-6.8(b) Track 4 – Restricted-Commercial Use Soil Cleanup Objectives
SB	soil boring
SV	soil vapor
SMP	Site Management Plan
SMMP	Soil/Material Management Plan
SSDS	sub-slab depressurization system
SVE	soil vapor extraction
SVOC	semi-volatile organic compound
TAL	Target Analyte List
TAGM 4046	NYSDEC Technical and Administrative Guidance Memorandum #4046
TB	trip blanks
TCE	trichloroethylene
TCL	Target Compound List
TCLP	Toxicity Characteristic Leaching Procedure
TCLP Limits	USEPA Maximum Concentrations of Contaminants for the Toxicity Characteristic
TOC	total organic carbon
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
UST	underground storage tank
UUSCOs	6 NYCRR 375-6.8(a) Track 1 Unrestricted Use Soil Cleanup Objectives
VOC	volatile organic compound

EXECUTIVE SUMMARY

SITE DESCRIPTION/PHYSICAL SETTING/SITE HISTORY

On April 11, 2013, LGA Hospitality, LLC (the "Volunteer") entered into a Brownfield Cleanup Agreement (BCA) with the New York State Department of Environmental Conservation to investigate and remediate the property located at 112-12 – 112-18 and 112-24 Astoria Boulevard (Block 1706, Lots 5, 9, and 11) in the East Elmhurst neighborhood of Queens, New York (the "Site"). The New York State Brownfield Cleanup Agreement Index Number is C241142-02-13 and the Site Number is C241142.

The Volunteer is proposing to construct a 126-room six-story hotel with one cellar and two sub-cellar levels. Excavation for the cellar and sub-cellars will extend to approximately 36 feet below grade (ft-bg) across the entire Site with the exception of a five-foot-wide strip along 112th Place to the east due to a street widening easement.

The cellar level will contain conference rooms and administrative offices, accessory kitchen, public restrooms, fitness center, guest laundry, storage rooms, and building utility services. The first sub-cellar will be used for parking, storage, employee facilities, laundry, offices and storage. Facilities in the second sub-cellar will include parking, storage, walk-in pits for passenger and service elevators and a car elevator.

The 0.37-acre Site is located at the intersection of Astoria Boulevard and 112th Place in the East Elmhurst section of Queens, New York. The Site is located on Block 1706 and includes lots 5, 9 and 11. The addresses associated with the Site are 112-12 to 112-18 and 112-24 Astoria Boulevard. The Site is bordered to the east by 112th Place followed by a parking facility, to the west by four-story attached houses with a basement and a vacant lot, both followed by 112th Street, to the north by Astoria Boulevard and the eastbound entrance to the Grand Central Parkway, and to the south by two-story family house with a basement and driveway. A location map for the Site is provided as Figure 1. A map of the current Site layout is included as Figure 2.

The Site, which is currently vacant, formerly operated as a gasoline filling station, and is developed with a one-story house with a crawl space, two one-story masonry buildings and an attached partial two-story masonry building. The second floor of the partial two-story building was occupied by a former Site owner. The ground floors of the one-story buildings were used for auto repair operations. Based on historical information, the use of the Site as a filling station began in approximately 1928 and was discontinued in 2004. However, the use of the Site for auto repair continued until 2007. Prior to 1928, the use of the property was residential.

The surrounding properties include commercial businesses, residential apartment buildings with ground-floor retail, and one- and two-family houses. The eastbound entrance to the Grand Central Parkway is located north of the Site across Astoria Boulevard.

The Site and surrounding area was rezoned in 2003 as part of the North Corona Rezoning under City Environmental Quality Review (CEQR) #03DCP058Q, which included the placement of a

hazardous materials "E" designation on the three lots comprising the Site (New York City Planning Commission, April 21, 2003). Hazardous Materials "E" designation E-121 was assigned to the Site as part of the rezoning and the New York City Mayor's Office of Environmental Remediation (OER) assigned project number 10EHAZ318Q to the Site.

SUMMARY OF THE 2013 REMEDIAL INVESTIGATION

Subsurface investigation, including test pitting, and soil, soil vapor and groundwater sampling, was performed at the Site between August and November 2013.

Test pits installed during the RI uncovered three 550-gallon USTs, two connected to fill ports in the sidewalk along 112th Place and the third tank located on the southeast part of the Site.

Petroleum-related volatile organic compounds (VOCs) and semi-volatile organic compounds (SVOCs) were detected in soils at levels above the Unrestricted Use and Protection of Groundwater SCOs near the area of former gasoline/diesel storage tanks. No VOCs or SVOCs were detected in the soil samples collected from at or slightly above the excavation depth of approximately 36 ft-bg. 6Petroleum-related VOCs and SVOCs were detected in groundwater above the Class GA Standards at two on-site locations near the former buried tanks and one downgradient off-site location. Petroleum-related VOCs were detected above the ambient air concentrations at all locations with the exception of one location near the southern Site boundary, where the samples were run at a high dilution factor, resulting in reporting limits above the ambient air concentrations; therefore, the presence of VOCs at this location cannot be discounted

Chlorinated solvents were not detected in soils with the exception of methylene chloride, assumed to be a laboratory contaminant, and tetrachloroethylene (PCE), detected in trace amounts near the southern property boundary. Chloroform, assumed to be a laboratory contaminant, was detected in groundwater samples collected from two temporary wells. PCE, at a concentration above the Class GA standard, was detected at one location, near the southern (upgradient) property boundary. Chlorinated solvents were not detected in groundwater at the remaining sample locations. PCE was detected in soil vapor samples collected along the western and southern (upgradient) Site boundaries. Groundwater sampling did not indicate PCE levels above Class GA standards, with the exception of the sample nearest the upgradient property boundary. The distribution of groundwater impacts does not support a relationship between chlorinated solvent concentrations in groundwater and soil vapor and the elevated concentrations in soil vapor are likely due to an off-site source being transported through groundwater and soil vapor media.

Metals and fill-related SVOCs were detected in shallow soils during the 2008 and 2009 investigations. With the exception of naphthalene, detected at one location, no SVOCs above the SCOs were identified in the RI sampling, indicating that the historic fill has not impacted the underlying native material.

QUALITATIVE HUMAN HEALTH EXPOSURE ASSESSMENT

The results of the remedial investigations provided sufficient data to complete a Qualitative Human Health Exposure Assessment, which identified several complete exposure pathways that include:

- direct contact with surface soils (and incidental ingestion),
- direct contact with groundwater
- inhalation of vapors.

The potential exposure pathways associated with the remediation/construction phase of the redevelopment are temporary and of limited duration. Worker exposure to impacted groundwater and soil vapor and particulates will be addressed by adherence to health and safety protocols. Based upon the measured ambient air concentrations, no off-site impacts are present due to the contaminant concentrations on-site. Potential exposure of neighborhood residents and other off-site populations will be addressed through compliance with the Community Air Monitoring Plan (CAMP). A summary of the CAMP is included in Section 5.0 of the HASP presented in Appendix A of this Remedial Action Work Plan (RAWP). Potential exposure of building occupants to contaminants in indoor air will be avoided by removal of Site soils to a depth of approximately 36 ft-bg, six to 11 feet below the groundwater table); if needed; application of oxygen releasing slurry to promote petroleum degradation; and installation of waterproofing below the future Site building.

SUMMARY OF THE REMEDIAL ACTIONS

The proposed remedial actions, intended to address all environmental issues associated with the Site, consist of the following:

- Excavation of soil/fill down to development depth (approximately 36 ft-bg) within the proposed building footprint. Excavated soil will be screened for indications of contamination including by visual means, odor and monitoring with a photoionization detector (PID);
- Disposal of impacted material from the Site in accordance with all Federal, State and local rules and regulations for handling, transport, and disposal;
- Installation and operation of a dewatering system for hydraulic control during excavation and management of impacted groundwater for off-Site disposal;
- Collection and analysis of end-point samples to evaluate attainment of Part 375 Restricted-Commercial Use SCOs (RCUSCOs);
- If necessary, addition of oxygen releasing slurry at the base of the excavation prior to release of hydraulic control to promote biological degradation of residual petroleum impacts in the groundwater
- Construction and maintenance of a composite cover consisting of either two feet of clean fill in areas with no building, or waterproofing and a concrete slab. The five-foot-wide strip within the easement along 112th Place will be capped with concrete or asphalt.

- If needed, import of materials to be used for backfill and cover in compliance with: (1) the Part 375 Unrestricted Use SCOs (UUSCOs) and (2) all Federal, State and local rules and regulations for handling and transport of material;
- Preparation of a Final Engineering Report (FER) to document the implemented remedial actions;
- Development of a Site Management Plan (SMP) for long term management of residual contamination as required by an Environmental Easement, including plans for: (1) Institutional and Engineering Controls, (2) monitoring, and (3) reporting;

Remedial activities will be performed at the Site in accordance with this NYSDEC-approved RAWP. Any deviations from the RAWP will be promptly reported to NYSDEC for approval and detailed in the FER.

REMEDIAL ACTION WORK PLAN

1.0 INTRODUCTION

LGA Hospitality, LLC entered into a Brownfield Cleanup Agreement (BCA) with the New York State Department of Environmental Conservation (NYSDEC) in April 2013, to investigate and remediate an approximately 0.37-acre property located at 112-12 – 112-18 and 112-24 Astoria Boulevard, in Queens, New York. LGA Hospitality, LLC is a Volunteer in the Brownfield Cleanup Program.

The proposed use of the Site is commercial. When completed, the Site will be developed with a six-story concrete building containing 126 hotel rooms. The building will also have a cellar and two sub-cellars below grade, with parking on the sub-cellar levels. Vertical access to the building will be provided by two passenger elevators serving all nine levels, a freight elevator connecting the first floor to the cellar level, and a car elevator that will provide vehicular access to the sub-cellar parking. Excavation for the cellar and sub-cellar will extend to approximately 36 feet below grade (ft-bg), with excavation to approximately 42-44 feet ft-bg at the elevator cores.

This Remedial Action Work Plan (RAWP) summarizes the nature and extent of contamination as determined from data gathered during the Remedial Investigation (RI), performed between August and November 2013.

The RAWP provides an evaluation of a Track 4 cleanup and other applicable remedial measure alternatives, their associated costs, and the recommended and preferred remedy to address on-Site contamination. The remedy described in this document is consistent with the procedures defined in DER-10 and complies with all applicable standards, criteria and guidance. The remedy described in this document also complies with all applicable Federal, State and local laws, regulations and requirements.

1.1 Site Location and Description

The Site is a 0.37-acre (16,141 square foot) parcel located at the intersection of Astoria Boulevard and 112th Place in the East Elmhurst section of Queens, New York. The Site is located on Block 1706 and includes lots 5, 9 and 11. The addresses associated with the Site are 112-12 to 112-18 and 112-24 Astoria Boulevard. The Site is bordered to the east by 112th Place followed by a parking facility, to the west by a four-story apartment building with a basement and a vacant lot, both followed by 112th Street, to the north by Astoria Boulevard and the eastbound entrance to the Grand Central Parkway, and to the south by the rear yard of a two-story family house with a basement. Lot 5 measures approximately 66 feet by 124 feet and Lots 9 and 11 each measure approximately 42 feet by 110 feet. A boundary map is attached to the BCA as required by Environmental Conservation Law (ECL) Title 14 Section 27-1409. The 0.38-acre property is fully described in Appendix B – Metes and Bounds. A Latitude/Longitude for the starting point is included. A location map for the Site is provided as Figure 1. A map of the current Site layout is included as Figure 2.

1.2 Contemplated Site Redevelopment Plan

The Remedial Actions being performed under the RAWP are intended to make the Site protective of human health and the environment consistent with the contemplated end use. The proposed development plan and end use are described here to provide the basis for this assessment.

The Site will be developed with a six-story building to be used as a hotel. The building will contain 126 hotel rooms and a mechanical floor above grade and a cellar and two sub-cellars (sub-cellars 1 and 2) below grade. The sub-cellars will be used for parking. Vertical access to the building will be provided by two passenger elevators serving the six levels and mechanical floor above grade and the cellar and subcellar 1 level, a service elevator connecting the first floor to the cellar and subcellar 1 levels, and two car elevators that will provide vehicular access to the sub-cellar parking levels.

The first floor of the building is the entry level and contains the main lobby, reception/concierge desk, office, sitting areas, bar/lounge, business center bar prep room, and bicycle storage room. The loading dock is located at this level on the south side of the building, along 112th place. The main lobby is located along Astoria Boulevard. The 126 guest rooms are located on the second through sixth floors. There are 14 rooms on the second floor and 28 rooms on each floor at the third through sixth floors.

The building covers approximately 9,581 square feet of lot area, with a first floor footprint of 6,770 square feet. Below ground, the gross area of the cellar and sub-cellar levels expands to 15,504 square feet each.

Automobile access to the Site will be on the north side, along Astoria Boulevard, where a paved driveway will lead to a drop-off area, one accessory off-street parking space, and two car elevators at the rear of the building. Truck access to the loading dock will be located at the southeast corner of the property, along 112th Place.

Excavation for the cellar and sub-cellar will extend to approximately 36 feet below grade (ft-bg), with excavation to approximately 42-44 ft-bg at the elevator cores.

The proposed Building Plans are included in Appendix C.

1.2 Description of Surrounding Property

Land uses in the immediate vicinity of the Site are primarily residential and commercial, with some industrial use. To the north, the Site is bordered by Astoria Boulevard, followed by green space adjacent to the Grand Central Parkway entrance ramp. The lots to the west and southwest are occupied by multi-family residential housing, with one- and two family houses on the properties to the south. Moving further west, there is increasing industrial and commercial use. To the east, the Site is bordered by 112th Place, with parking occupying most of the block across 112th Place. The nearest recreation area is Hinton Park, located approximately 850 feet south of the Site.

Based on a review of the New York City Mayor's Office of Environmental Remediation's (OER's) Searchable Property Environmental E-Database (SPEED), no hospitals or schools are present within 500 feet of the Site. One day care facility, the Malcolm X Day Care Center, is located at 11112 Northern Boulevard, approximately 475 feet south of the Site, in the upgradient direction of Site groundwater flow.

2.0 DESCRIPTION OF REMEDIAL INVESTIGATION FINDINGS

The Site was investigated in accordance with the scope of work described in the RI Work Plan submitted to NYSDEC on April 2, 2013 and approved by NYSDEC on April 12, 2013.

2.1 Site History

The currently vacant Site formerly contained a gasoline filling station that was developed with a one-story house with a crawl space, two one-story masonry buildings, and an attached partial two-story masonry building. The second floor of the partial two-story building was occupied by the former Site owner. The ground floors of the two one-story buildings were used for auto repair operations. Based on historical information, the use of the Site as a filling station began in approximately 1928 and was discontinued in 2004. However, the use of the Site for auto repair continued until 2007. Prior to 1928, the use of the property was residential.

A 2006 Phase I ESA identified a total of 17 USTs containing gasoline, diesel and/or fuel oil, with capacities ranging from 275 to 4,000 gallons, but noted that the exact number of USTs could not be determined. Reportedly, most of the USTs were closed in-place, although the method of closure was not specified. Several abandoned pump islands and two hydraulic lifts were also identified. The locations of the USTs identified in the Phase I ESA are shown on Figure 2. The Phase I ESA also noted that water used to rinse floors in the vehicle repair areas appeared to have a petroleum sheen and was discharged to a drainage grate at the rear of the building, The Phase I ESA identified the presence of the USTs, piping and dispenser islands and the discharge of rinse water to the exterior storm grate as environmental conditions warranting a Phase II Site investigation. Subsequent Phase II investigations were performed in 2008 and 2009 and a spill investigation and groundwater monitoring was carried out between 2010 and 2012. These investigations are discussed in Section 2.3.

2.2 Geological Conditions

2.2.1 Geology

According to the United States Geological Survey (USGS) Flushing, New York Topographic Quadrangle Map (2010), the Site elevation is approximately 30 feet (NAVD). Based on the USGS map and observation of the local topography, the Site and surrounding area generally slope downward slightly to moderately from south to north (toward Flushing Bay). There is an approximately 30-foot change in elevation from the Site to Flushing Bay, which is approximately 650 feet to the north/northeast. Historic Sanborn Fire Insurance Maps prior to 1930 show the shore of Flushing Bay as formerly located within 100 feet north of the Site. Maps dated between 1930 and 1950 indicate that the area north of the Site was filled in order to accommodate the construction of the Grand Central Parkway.

The boring logs from the October 2009 Phase II investigation indicated that the Site is covered by five to seven feet of surface soil classified as fill material consisting of asphalt, concrete, rock fragments and fine- to medium-grained, brown silty sand. At the locations of the borings installed during the RI the fill layer ranged from nine to 24 ft-bg. The fill contained some ash, cinders, coal, and brick fragments and is underlain by layers of gray and brown silt, hard clayey silt, and fine- to medium-grained sand with trace gravel.

2.2.2 Hydrogeology

Groundwater has been measured at depths of approximately 25 to 30 ft-bg. Several rounds of water level measurements, collected in the three surveyed monitoring wells installed in June 2010, indicated that groundwater flows in a northwest direction toward Flushing Bay. The groundwater flow directions calculated from a monitoring well survey conducted on November 20, 2013 confirms the presumed direction of groundwater flow.

Groundwater beneath the Site is characterized as Class GA. The best usage for Class GA groundwater is as a source of potable water. Groundwater is not utilized as a source of potable water at the Site. Potable water for the Site is supplied by the City of New York from upstate New York reservoirs.

No surface water bodies exist on the Site. The closest surface water body is Flushing Bay, located approximately 650 feet north/northwest of the Site.

2.3 Summary of Remedial Investigations Performed

This section presents the methodology and findings of the previous investigations conducted on-Site and off-Site as well as the findings of the 2013 remedial investigation performed by Tenen.

2.3.1 Summary of Prior Investigations

Investigations and sampling efforts conducted between 2006 and 2012 are described in the following reports:

- Phase I Environmental Site Assessment, Former Gasoline Station, 112-12 Astoria Boulevard, Queens, New York. Galdun Frankel Environmental, August 15, 2006
- Phase II Subsurface Investigation, 112-12 – 112-24 Astoria Boulevard. Associated Environmental Services, September 15, 2008.
- Additional Soil and Groundwater Investigation, 112-12 – 112-24 Astoria Boulevard/Block 1706, Lots 5, 9, & 11. Associated Environmental Services, October 22, 2009 (misdated as 2008).
- NYSDEC Spill #0806500, 112-12 – 112-24 Astoria Boulevard, Remedial Action Plan Letter. J.R. Holzmacher P.E., LLC, November 1, 2010
- NYSDEC Spill #0806500, 112-12 – 112-24 Astoria Boulevard, Remedial Action Plan and HASP. J.R. Holzmacher P.E., LLC, February 11, 2011
- J.R. Holzmacher P.E., LLC, May 24, 2012 Groundwater Sampling

The 2006 Phase I ESA performed by GFE identified a total of 17 underground storage tanks (USTs) containing gasoline, diesel and/or fuel oil, with capacities ranging from 275 to 4,000 gallons; several abandoned pump islands, and. two hydraulic lifts. The Phase I ESA also noted that water used to rinse floors in the vehicle repair areas appeared to have a petroleum sheen and was discharged to a drainage grate at the rear of the building, The presence of the USTs, piping

and dispenser islands and the discharge of rinse water to the exterior storm grate were identified as environmental conditions warranting a Phase II Site investigation.

In August 2008, in order to address the New York City Department of City Planning (NYCDCP) E-designation requirements and the findings of the Phase I ESA, Associated Environmental Services, Ltd. (AES) conducted a Phase II environmental investigation which included a geophysical survey and installation of nine soil borings (GP-1 though GP-9). Seventeen shallow and deep soil samples and five groundwater samples were collected and analyzed for volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), priority pollutant (PP) metals, pesticides, and polychlorinated biphenyls (PCBs).

Soil samples were collected from shallow (0-2 ft-bg) and deep (13-15 to 23-25 ft-bg) intervals. Petroleum-related VOCs and fill-related SVOCs and PP metals were present at levels exceeding then-applicable New York State Department of Environmental Conservation (NYSDEC) Technical and Administrative Guidance Memorandum (TAGM) #4046 Recommended Soil Cleanup Objectives (RSCOs) at multiple locations. Petroleum-related VOCs and naphthalene were also detected above the NYS Part 375-6.8(a) Unrestricted Use Soil Cleanup Objectives (UUSCOs).

Regarding the shallow samples, elevated concentrations of petroleum-related VOCs (naphthalene, trimethylbenzenes, and xylenes) were detected in GP-8. SVOCs (primarily fill-related, with the exception of naphthalene) were detected at six locations (GP-3, GP-5, GP-6, GP-7, GP-8 and GP-9), metals at four locations (GP-1, GP-3 GP-5, and GP-9), and PCBs at GP-3. Staining and petroleum odors were noted in one shallow sample and a petroleum spill (Spill No. 0806500) was reported to the NYSDEC.

At the deeper sample intervals, petroleum-related VOCs, primarily BTEX, were detected above the RSCOs at three locations (GP-3, GP-5, and GP-8). SVOCs, including naphthalene, were detected above the RSCOs in deep soil sample GP-8. Metals were detected in GP-4 (13-15') at concentrations above their respective RSCOs.

Petroleum-related VOCs, including BTEX and MTBE, were detected above the Division of Water Technical and Operational Guidance Series (TOGS) 1.1.1 Class GA Water Quality Standards and Guidance Values (Class GA Standards) in four of the five groundwater samples (GW-2 through GW-5), with concentrations of individual parameters ranging from 6 ug/L to 153 ug/L. VOCs were not detected above Class GA standards in sample GW-1. No SVOCs were detected above the Class GA Standards. Chromium, copper, iron, magnesium, manganese, sodium, nickel and lead were detected above the Class GA standards in unfiltered groundwater samples GW-1 through GW-5. Elevated levels of lead and chromium were detected in filtered groundwater samples GW-1 and GW-3.

The October 2009 soil and groundwater sampling conducted by AES focused on delineation of impacts identified in the 2008 investigation. An additional six soil borings (GP-10 though GP-15) were installed and the deepest dry soil sample or sample exhibiting the highest PID readings was collected. One groundwater sample was also collected at each boring location. Samples were analyzed for STARS-List VOCs and SVOCs and the results compared to the NYSDEC RSCOs

and Class GA Standards.

Elevated PID readings, slight staining and a petroleum odor were observed at depth in borings GP-10, GP-11, GP-12, GP-13 and GP-15, with the highest readings noted at 15-30'. Results for soil sample GP-10 (20-25') indicated levels of petroleum-related VOCs, including BTEX compounds and naphthalene, above their respective RSCOs at concentrations ranging from 1.3 mg/kg to 118.6 mg/kg. Several of these petroleum-related VOCs were also detected above the Part 375 Unrestricted Use SCOs. No SVOCs were detected in soil samples GP-10 through GP-15 at concentrations above the RSCOs.

Groundwater samples GW-6 through GW-11 contained elevated levels of petroleum-related VOCs at concentrations above the Class GA Standards, including: ethylbenzene (9.75 to 731 ug/L), isopropylbenzene (15.1 to 278 ug/L), naphthalene (45.9 to 1,381 ug/L), 1,2,4-trimethylbenzene (69.9 to 5,954 ug/L), 1,3,5-trimethylebenzene (27.6 to 1,867 ug/L), total xylene (16.5 to 2,354.3 ug/L), sec-butylbenzene (102 ug/L), MTBE (533 ug/L), benzene (54 to 333 ug/L), p-isopropyltoluene (26.6 to 88.9 ug/L), n-propylbenzene (12.1 to 400 ug/L), tert-butylbenzene (36.8 ug/L),and toluene (8.53 to 25.6 ug/L). No SVOCs were detected at concentrations above Class GA standards with the exception of naphthalene (analyzed as part of the VOC scan) at locations GW-7, GW-8, GW-9, GW-10 and GW-11.

The first investigation to address conditions downgradient of the Site was conducted by J.R. Holzmacher (JRH) in June 2010 to address Spill No. 0806500. The investigation included installation of three borings and monitoring wells (MW-1 through MW-3) at off-Site locations immediately adjacent to the property boundary and collection of soil and groundwater samples at each location.

Elevated PID readings were recorded from 10 to 30 feet below grade in the unsaturated and saturated zone samples collected from boring MW-1, located downgradient of the Site, with insignificant or zero PID readings measured between 35 feet and 60 feet below grade. The analytical results for the soil samples obtained from boring GW-1 at depths of 10 to 15 feet and 25 to 30 feet indicated that elevated levels of petroleum-related VOCs were detected at concentrations above their respective NYSDEC RSCOs (and subsequently-promulgated Unrestricted Use SCOs). Total VOCs detected in soil samples MW-1 (10-15 feet) and MW-1 (25-30 feet) were 490.400 and 1,202.690 mg/kg, respectively. No VOCs were detected in borings MW-2 and MW-3, located crossgradient and upgradient of the Site, respectively.

Consistent with the soil VOC concentrations at MW-1, groundwater samples from MW-1 contained elevated total BTEX of 7,960 ug/L and MTBE at a concentration of 6,500 ug/L. Low levels of most VOCs were detected in the samples collected from monitoring wells MW-2 and MW-3, with the exception of benzene (4.1 ug/L in sample MW-2), isopropylbenzene (5.2 ug/L in sample MW-2) and MTBE (11 ug/L in sample MW-3), all above their respective Class GA standards.

Based upon a well survey and several rounds of water level measurements, groundwater was determined to flow northwesterly toward Flushing Bay. The subsurface investigation report was submitted to the NYSDEC in June 2010.

As requested by NYSDEC, an additional two rounds of groundwater sampling were performed in December 2010 and May 2012. Elevated petroleum-related VOCs were detected in both rounds of sampling. Elevated petroleum-related VOC concentrations were observed in all three wells in June and December 2010. The June 2010 sampling indicated total VOCs in groundwater at concentrations of 18,759 ug/L (MW-1), 35.87 ug/L (MW-2) and 33.1 ug/L (MW-3). In December 2010, total VOC concentrations in MW-1, MW-2, and MW-3 were 3,391.4 ug/L, 2,255 ug/L and 391.41 ug/L, respectively. In May 2012, total VOC concentrations in all three wells decreased to 1,412.2 ug/L (MW-1), 31.26 ug/L (MW-2) and 12.01 ug/L (MW-3). The information provided in the June 2012 groundwater sampling report indicated a drop of approximately three feet in the water table below the Site, possibly attributable to extensive dewatering in the area.

In summary, the sampling conducted between 2008 and 2012 indicated elevated levels of petroleum-related compounds in soils at concentrations exceeding the then-current Technical and Administrative Guidance Memorandum (TAGM) Recommended Soil Cleanup Objectives (RSCOs) and the current New York State Part 375 6-8(a) Unrestricted Use Soil Cleanup Objectives (SCOs). Metals and SVOCs, particularly polyaromatic hydrocarbons (PAHs), were also detected at concentrations significantly above the RSCOs and the Unrestricted Use SCOs in surface soils, as were PCBs at one shallow sample location Previously-detected groundwater contaminants above New York State Class GA standards were primarily petroleum-related and consistent with the former use of the Site as a gasoline filling station. Petroleum constituents (BTEX and MTBE) were also detected above the regulatory levels in an offsite downgradient monitoring well, indicating that groundwater impacts extended beyond the property boundary.

2.3.2 BCP Remedial Investigation – August-November 2013

From August through November 2013, further investigation was performed by Tenen Environmental to characterize the nature and extent of soil, groundwater, and soil vapor contamination on the Site to determine if contaminant levels related to historic Site operations threaten public health or the environment. The 2013 RI is described in the Remedial Investigation Report dated February 2014 and included the following:

- Three test pits excavated in the areas of previously detected geophysical anomalies
- Installation of soil borings at ten locations (SB-1 through SB-10)
- Collection of 14 soil samples at depths ranging from 23 to 36 feet below grade (ft-bg)
- Installation of two permanent (MW-4 and MW-5) and three temporary (TW-1 through TW-3) groundwater monitoring wells; groundwater samples were collected from these five newly-installed and three existing wells (MW-1 through MW-7)
- Collection of soil vapor samples at seven locations (SV-1 through SV-7) along the southern and western property boundaries

Analytical results for soil, groundwater and soil vapor were compared to the following:

- Soil – NYSDEC Unrestricted Use, Protection of Groundwater and Restricted-Commercial Use Soil Cleanup Objectives (SCOs).

- Groundwater – NYSDEC Division of Water Technical and Operational Guidance Series (TOGS) 1.1.1 Class GA Water Quality Standards and Guidance Values (Class GA Standards).
- Soil vapor – ambient air concentrations.

Test pits installed during the RI uncovered three 550-gallon USTs, two connected to fill ports in the sidewalk along 112th Place and the third tank located on the southeast part of the Site. This area is the location of ten USTs, which were reportedly closed-in-place in 1982; however, no additional tanks were uncovered during the test pitting.

Petroleum-related VOCs and SVOCs were detected in soils at levels above the Unrestricted Use SCOs near the area of former gasoline/diesel storage tanks. No VOCs or SVOCs were detected in the soil samples collected from at or slightly above the excavation depth of approximately 36 ft-bg. Petroleum-related VOCs and SVOCs were detected in groundwater above the Class GA Standards in two on-site locations near the former buried tanks and one downgradient off-site location. Petroleum-related VOCs were detected above the ambient air concentrations at all locations with the exception of one location near the southern Site boundary, where the samples were run at a high dilution factor, resulting in reporting limits above the ambient air concentrations; therefore, the presence of VOCs at this location cannot be discounted

Chlorinated solvents were not detected in soils with the exception of methylene chloride, assumed to be a laboratory contaminant, and tetrachloroethylene (PCE), detected in trace amounts near the southern property boundary. Chloroform, assumed to be a laboratory contaminant, was detected in groundwater samples collected from two temporary wells. PCE, at a concentration above the Class GA standard, was detected at one location, near the southern (upgradient) property boundary. Chlorinated solvents were not detected in groundwater at the remaining sample locations. PCE was detected in soil vapor samples collected along the western and southern (upgradient) Site boundaries. Groundwater sampling did not indicate PCE levels above Class GA standards, with the exception of the sample nearest the upgradient property boundary. The distribution of groundwater impacts does not support a relationship between chlorinated solvent concentrations in groundwater and soil vapor and the elevated concentrations in soil vapor are likely due to an off-site source being transported through groundwater and soil vapor media.

Metals and fill-related SVOCs were detected in shallow soils during the 2008 and 2009 investigations. With the exception of naphthalene, detected at one location, no SVOCs above the SCOs were identified in the RI sampling, indicating that the historic fill has not impacted the underlying native material

3.0 CONTAMINATION CONDITIONS

3.1 Conceptual Model of Site Contamination

Petroleum-related contaminants, primarily associated with former on-Site gasoline storage tanks, have impacted soil and groundwater on the Site. The elevated concentrations of these contaminants in soil vapor are likely related to elevated concentrations in groundwater and residual contamination in soil. Petroleum-related VOCs have been detected in soil, groundwater and soil vapor at concentrations above applicable regulatory and/or ambient levels. Chlorinated solvents were detected in soil vapor at levels above ambient air concentrations at all locations, with the highest concentrations at the western and southern (upgradient) Site boundaries. Historic investigations indicate fill-related metals and SVOCs, particularly PAHs, above regulatory levels in surface soils throughout the Site.

Prior investigations identified petroleum-related VOCs in soil extending to approximately 15 feet below grade, the deepest interval sampled. The 2013 RI sampling identified petroleum-related compounds at two locations at approximately 23-25 feet below grade; both locations are near the area of former underground gasoline storage tanks. Based on the types, concentrations and distribution of petroleum-related contaminants, their presence is likely related to the historic operations on the Site.

Elevated levels of chlorinated solvents have been identified in soil vapor at several locations adjacent to the southern and western property boundaries. However, chlorinated compounds were not detected on-Site in soil or groundwater above regulatory levels, with the exception of PCE in groundwater at the southern (upgradient) Site boundary. No on-Site source has been identified for the elevated soil vapor PCE concentrations at the southern (upgradient) and western Site boundaries, and the distribution of groundwater impacts does not support a relationship between chlorinated solvent concentrations in groundwater and elevated concentrations of these compounds in soil vapor. Based on these considerations, the elevated concentrations in soil vapor are likely due to an upgradient off-site source being transported through groundwater and soil vapor media. PCE levels above the Class GA Standards were not detected in the two closest downgradient groundwater sample locations, MW-5 and TW-2. The results of the follow up investigation indicated a concentration of 13 ug/L of PCE in groundwater in the vicinity of SV-6. The property directly upgradient of the Site has historically been residential. However, a review of the historic Sanborn maps for the Site and vicinity indicates several historic and current potential upgradient sources, including lumber/woodworking, a glassworks, a copper and wire factory and plumbing supply, all located upgradient on the Site block; and an auto sales/service operation, across 112th Place to the southeast.

The PAHs and metals present in the on-Site fill material were not observed in samples of soil below the fill layer or in groundwater, indicating that these constituents have not migrated into native soils or groundwater.

3.2 Identification of Standards, Criteria and Guidance

The following standards, criteria, and guidance were used during the evaluation of Site data for the purpose of remedy selection.

Soil
6 NYCRR Part 375-6(b)/CP-51 Restricted Commercial Use SCOs. The Track 4 Restricted-Commercial Use SCOs (RCUSCOs) are presented in Table 1. Although the RCUSCOs will be used for evaluation of residual soil on-Site, for purposes of comparison, on-Site soil analytical results will also be compared to the 6 NYCRR Part 375-6(a) Unrestricted Use SCOs (UUSCOs) and the 6 NYCRR Part 375-6(b)/CP-51 Protection of Groundwater SCOs (PGWSCOs).

Groundwater
Division of Water Technical and Operational Guidance Series (TOGS) 1.1.1 Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations – Class GA (Class GA Standards). The Class GA Standards are presented in Table 2.

Soil Vapor
Ambient air concentrations as measured during the Remedial Investigation.

3.3 Soil/Fill Contamination

This section summarizes the soil analytical results for the Site, including the samples collected immediately offsite at locations MW-1 through MW-3 in 2010.

3.3.1 Summary of Soil/Fill Data

Only one compound, 1,2,4-trimethylbenzene, was identified at a single location at a concentration above the Restricted Commercial Use SCO (RCUSCO). Petroleum and chlorinated VOCs were detected in 13 out of 42 samples; eleven samples contained VOCs above the then current TAGM RSCOs and/or the Part 375 Unrestricted Use and/or Protection of Groundwater SCOs. The VOC analytical results are presented in Table 3.

Only one SVOC, naphthalene, was detected above the RCUSCO in one sample. Of the 42 samples collected, 35 were analyzed for SVOCs. These compounds, primarily fill-related, with the exception of naphthalene, were detected in all 35 samples, and detected above the RSCOs and/or UUSCOs in nine samples. The SVOC analytical results are presented in Table 4.

Of the 17 samples collected in the 2008 AES investigation, five samples contained metals at concentrations above the RSCOs. Soils were not analyzed for metals in subsequent investigations. Metals analytical results are presented in Table 5.

3.3.2 Comparison of Soil/Fill with SCGs – 2013 RI Sampling

Table _6_ contains a summary of samples that exceeded the UUSCOs and/or RCUSCOs for all soil/fill at the Site. Petroleum-related VOCs and SVOCs were detected in two borings (SB-4 and SB-7) at concentrations above the UUSCOs at locations near known gasoline and/or diesel tanks.

One VOC, 1,2,4-trimethylbenzene, was detected above the RCUSCO in SB-4, at the groundwater interface. No VOCs or SVOCs were detected above the UUSCOs in the soil samples collected from slightly above or below the revised excavation depth of 33 ft-bg.

Several SVOCs, typically found in historic urban fill were detected above UUSCOs at three locations (SB-4, SB-5, and SB-7). The following fill-related SVOCs were detected at concentrations exceeding the UUSCOs: fluoranthene, benzo(a)anthracene, benzo(b)fluoranthene, chrysene, phenanthrene, pyrene, biphenyl, 2-methylnaphthalene, and dibenzofuran. No SVOCs were detected above the RCUSCOS.

3.4 On-Site and Off-Site Groundwater Contamination

This section summarizes the groundwater sampling analytical results for the Site, including results from three off-Site downgradient wells installed in 2010..

3.4.1 Summary of Groundwater Data

Non-aqueous phase liquid (NAPL) was not detected in any of the monitoring wells. VOCs were detected in 28 out of the 30 groundwater samples collected between 2008 and 2013, with concentrations above the Class GA groundwater standards in 23 samples. VOC analytical results are presented in Table 7.

SVOC analysis was performed on 22 of the 30 groundwater samples collected. SVOCs were detected in 17 samples, with 14 samples containing SVOCs (primarily naphthalene) at concentrations above the Class GA standards.

3.4.2 Comparison of Groundwater with SCGs – 2013 RI Sampling

Petroleum-related VOCs were detected at two on-Site (MW-4 and MW-5) and one off-Site (MW-1) locations at concentrations above the Class GA standards. PCE, a chlorinated VOC, was detected above the Class GA standard at one on-Site location, TW-3. Other VOCs, which may be associated with historic auto repair operations, were detected in six samples.

A summary of the VOCs detected at concentrations exceeding the Class GA groundwater standards is provided in Table 8.

3.5 On-Site Soil Vapor Contamination

3.5.1 Summary of Soil Vapor Data

Soil vapor sampling was not conducted prior to the 2013 RI. VOCs were detected in each of the eight samples collected with petroleum-related VOCs above ambient concentrations in seven samples. The presence of these compounds at the one remaining location cannot be discounted due to the sample being run at a high dilution factor. Several other VOCs, possibly associated with historic auto repair operations, were detected above ambient levels in six samples. Elevated levels of one chlorinated solvent, PCE, were detected in six of the eight samples, with the highest concentrations in the two samples collected from one location at the extreme upgradient property boundary.

3.5.2 Comparison of Soil Vapor Data with SCGs

Petroleum-related VOCs in soil vapor were detected above ambient concentrations at seven locations (SV-1 through 5 and SV-7). One or more non-petroleum-related VOCs (dichlorofluoromethane and carbon disulfide) were identified above ambient concentrations at sample locations SV-1 through SV-5 and SV-7. PCE was detected above background levels at all seven sample locations with the highest concentrations of 10,000 ug/m3 and 24,3000 ug/m3, identified at SV-6, at the upgradient property boundary. Concentrations of VOCs in soil vapor are provided in Table 9.

4.0 ENVIRONMENTAL AND PUBLIC HEALTH ASSESSMENTS

4.1 Qualitative Human Health Exposure Assessment

A qualitative exposure assessment (EA) has been completed in accordance with Section 3.3(c)4 of DER-10 and the NYSDOH guidance for performing a qualitative EA (NYSDEC DER-10; Technical Guidance for Site Investigation and Remediation; Appendix 3B). The qualitative exposure assessment evaluates the potential for populations to be exposed to Site contaminants.

An exposure pathway describes the means by which an individual may be exposed to contaminants originating from a site. An exposure pathway has five elements: (1) a contaminant source; (2) contaminant release and transport mechanisms to an exposed population; (3) a receptor population; (4) a route of exposure; and (5) a point of exposure to a receptor population. Potential contaminant receptors include the following populations:

- Site workers (primarily environmental professionals and contractors)
- Construction workers, visitors or trespassers
- Future hotel guests
- Future on-Site workers and utility workers
- Off-Site residents/building occupants
- Off-Site maintenance workers

The following potential exposure routes are considered incomplete:

Groundwater Ingestion

New York City code and the environmental easement for the Site prohibit the use of groundwater for potable purposes. This pathway is incomplete.

Inhalation of Vapors by Future Building Occupants and Maintenance Workers

Remediation will include excavation of Site soils to a depth of approximately 36 feet (below the groundwater table), application of chemical oxidants and/or oxygen release slurry, if necessary, and installation of waterproofing beneath the future Site building, all of which will eliminate this pathway.

The following potential exposure routes are considered complete:

Inhalation of Vapors and Particulates by On-Site Environmental and Construction Workers

During excavation and soil handling, on-Site personnel and construction workers may be exposed to dust and vapors via inhalation.

Dermal Contact with Soil by On-Site Environmental and Construction Workers

During excavation and soil handling, on-Site personnel and construction workers may be exposed to contaminants in soil via dermal contact.

Dermal Contact with Groundwater by On-Site Environmental and Construction Workers

Excavation will extend to below the groundwater table and dewatering will be conducted. Site workers may be exposed to groundwater during these activities.

Inhalation of Vapors and Particulates by Off-Site Residents/Building Occupants

Soil excavation and removal may generate dust and vapors that could be inhaled by off-Site residents/building occupants and maintenance personnel.

The above potential exposures are limited to the remediation/construction phase of the proposed development and are temporary and of limited duration. Adherence to health and safety protocols will address worker exposure to contaminated soil vapors, particulates and groundwater. Potential exposure of off-Site residents and building occupants will be addressed by implementation of the Community Air Monitoring Plan (CAMP) referenced in Section 7.4 of this RAWP and summarized in Section 5.0 of the HASP provided in Appendix A.

4.2 Remedial Action Objectives

The goals of remediation are to remove the on-Site sources of petroleum, remove residual soil impacts to the extent practical so as to allow for the Site's intended commercial use, and reduce the concentrations of contaminants in groundwater and soil vapor to levels acceptable to the NYSDEC and NYSDOH. Based on the results of the remedial investigations conducted at the Site, the following Remedial Action Objectives (RAOs) have been identified:

4.2.1 Soil

Several USTs have been identified at the Site and may be contributing to soil contamination (and eventually, impacts to groundwater and soil vapor).

Petroleum-related VOCs and SVOCs have been detected at concentrations above the RCUSCOs, at a depth of 23-24 ft-bg. Fill-related SVOCs, metals and PCBs have been detected in the shallow fill material at concentrations below the RCUSCOs but above the UUSCOs.

RAOs for Public Health Protection

- Prevent ingestion/direct contact with contaminated soil.
- 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

Petroleum-related VOCs and SVOCs have been detected on- and off-Site in the groundwater. Chlorinated solvents have been detected on-Site in groundwater samples collected along the upgradient border.

RAOs for Public Health Protection

- Prevent ingestion of groundwater containing contaminant levels exceeding drinking water standards.
- Prevent contact with, or inhalation of, volatiles emanating from contaminated groundwater.

RAOs for Environmental Protection

- Restore the groundwater aquifer to pre-release conditions, to the extent practicable
- Remove on-Site sources, if any, of ground water contamination

4.2.3 Soil Vapor

Petroleum-related compounds have been detected and/or are assumed to be present in soil vapor across the Site. Chlorinated solvents have been detected in the soil vapor along the upgradient border of the Site.

RAOs for Public Health Protection

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

5.0 DESCRIPTION OF REMEDIAL ACTION WORK PLAN

5.1 Evaluation of Remedial Measures

The remedial alternatives for soil, groundwater and soil vapor are discussed in the following sections. Each alternative was evaluated based on the following remedy selection factors (as defined in DER-10, Section 4.2):

- Protection of human health and the environment
- Conformance with standards, criteria and guidelines
- Long-term effectiveness and performance
- Reduction in toxicity, mobility or volume
- Short-term effectiveness and performance
- Implementability
- Cost effectiveness
- Community acceptance
- Land use

The results of the remedial alternatives analyses are summarized below. The alternatives considered to address potential contamination in soil and existing contamination in soil vapor and groundwater are discussed below:

5.1.1 Soil

Two remedial alternatives were considered to address petroleum- and fill-related impacts in the soil.

Alternative 1 – Deep Excavation and Off-Site Disposal. Excavation as part of Site redevelopment will allow for the removal of the bulk of the contaminant mass at the Site. All USTs, which are potentially sources of petroleum impacts, will also be removed. The excavation will extend below the groundwater table, thereby removing the petroleum compounds present above the RCUSCOs at the groundwater interface. Shallow fill-related impacts will also be addressed.

The only area that will not be excavated, except as may be required for capping, is a five-foot street-widening easement along 112th Place. In addition, a two- to eight-inch, offset seismic gap is required along the southern and western boundaries.

A CAMP (included in the HASP, Appendix A) and Soil/Materials Management Plan (Appendix D) will be implemented during the excavation to address potential impacts to human health and the environment. End-point and sidewall samples will confirm the removal of soil to concentrations below RCUSCOs. Please note that sidewall samples collected within the easement may require Site-specific SCOs.

Excavation below the groundwater is consistent with the development plan, which will allow for more off-street parking and, presumably, greater community acceptance.

Alternative 2 – Soil Vapor Extraction with Shallow Excavation and Off-Site Disposal. Shallow petroleum- and fill- related impacts would be addressed through excavation, including removal of all USTs. Deeper petroleum impacts could be addressed using soil vapor extraction (SVE), which is appropriate for the lighter petroleum (i.e., gasoline) constituents detected at the Site. However, given the relatively tight soil formation and extensive (both vertically and horizontally) distribution, an SVE system was not considered to be cost-effective. It is also not consistent with the development plan to have off-street parking.

5.1.2 Groundwater

Two remedial alternatives for groundwater have been considered and are described below.

Alternative 1 – Construction Dewatering and Natural Attenuation. Elevated concentrations of petroleum-related compounds have been detected on-Site. Elevated levels of chlorinated solvents have also been detected in the extreme upgradient border of the Site. Construction dewatering will be required in order to maintain a dry excavation for constructing the slab at the proposed depth. The entire groundwater column, except within the easement, will be removed from the Site. The groundwater will be removed using an engineered well-point system with treatment as necessary to meet the New York City Department of Environmental Protection (NYCDEP) Limitations for Effluent to Sanitary or Combined Sewers. Treatment will likely be a combination of a settling tank, activated carbon vessels and oil-water separators. The dewatering system will be approved by NYCDEP.

NYSDEC defines natural attenuation as "Relying on natural (physical, chemical, or biological) processes to reduce mass, toxicity, mobility, volume or concentration of compounds in earth or groundwater." The processes potentially occurring on-Site following release of hydraulic control include a combination of biological degradation, dispersion, dilution, sorption and volatilization. Post-remedial groundwater monitoring will be completed to document the effects of these processes. Addressing potential sources, i.e. excavation of soil to development depth and removal of any USTs that are encountered will also facilitate contaminant attenuation.

Alternative 2 – Construction Dewatering and RegenOx/ORC Injections. Construction dewatering as described in Alternative 1 will be completed.

Prior to release of hydraulic control, a combination of Regenesis' RegenOx™ and Oxygen Release Compound *Advanced*™ (ORC-A) will be applied to the base of the excavation, if necessary. The determination will be made based on effluent samples from the dewatering system and will be made in coordination with NYSDEC. RegenOx is a chemical oxidant that is appropriate for both petroleum and solvent compounds. ORC-A increases the likelihood of aerobic biological degradation by providing oxygen, typically a limiting factor, over several months. Post-remedial groundwater monitoring will be completed to document the effects of the oxidant application.

5.1.3 Soil Vapor

One remedial alternative was considered to address the elevated levels of petroleum and chlorinated VOCs present in the soil gas at the Site.

Alternative 1 – Waterproofing and Capping. The building slab will extend into groundwater and, therefore, soil vapor will not be generated below the slab. Waterproofing will be placed below the slab and all sub-grade walls, which will prevent groundwater from entering the building. Occupied spaces are not present within the easement; this area will be capped with concrete or asphalt and any soil vapor generated will dissipate in the ambient air.

5.2 Standards, Criteria and Guidance (SCGs)

The Remedial Action SCGs are listed below.

SCG	Scope / Application
NYSDEC Brownfield Cleanup Program Guide (draft 2004)	General program guidance
NYSDEC CP-51 / Soil Cleanup Guidance (2010)	RCUSCOs for soil
NYSDEC DER-10 Technical Guidance for Site Investigation and Remediation (2010)	End-point sampling methodology; UST closure
NYSDEC TOGS 1.1.1 Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations (1998)	Class GA Standards for groundwater
NYSDOH Guidance for Evaluating Soil Vapor Intrusions in the State of New York (2006)	Soil vapor guidance
NYSDOH Generic Community Air Monitoring Plan	Plan for monitoring dust and volatile organics resulting from construction activities
New York State Codes, Rules and Regulations (NYCRR) Title 6 Part 360 – Solid Waste Management Facilities	Off-site disposal of waste for facilities in NYC
New York State Codes, Rules and Regulations (NYCRR) Title 6 Part 364 – Waste Transporter Permits	Transporter requirements for off-site disposal of waste
6 NYCRR Part 370 – Hazardous Waste Management System	Disposal of hazardous waste, if encountered
6 NYCRR Part 375 – Environmental Remediation Programs (December 2006)	General administrative guidance
6 NYCRR Part 376 – Land Disposal Restrictions	Disposal of hazardous waste, if encountered
6 NYCRR Part 750 – State Pollutant Discharge Elimination System (SPDES) Regulations	Discharge of wastewater and stormwater
Code of Federal Regulations (CFR) Title 29 Part 1910.120 - Hazardous Waste Operations and Emergency Response Standard	Worker safety
29 CFR Title 29 Part 1926 - Safety and Health Regulations for Construction	Worker safety
40 CFR Parts 144 and 146 – Underground Injection Control Program	Injection of chemicals into the groundwater
Title 15, Rules of the City of New York (RCNY), Chapter 19 - Use of the Public Sewers	Discharge of groundwater to the municipal sewer system
NYCDEP Limitations for Effluent to Sanitary or Combined Sewers	Discharge of groundwater to the municipal sewer system

5.3 Selection of the Preferred Remedial Actions

The preferred on-Site remedial actions for the Site include excavation of Site soils to at least 36 ft-bg within the building footprint, construction dewatering, injection of RegenOx and/or ORC, if necessary, installation of an engineered cap and groundwater monitoring. Implementation of these on-Site remedial actions will result in a Track 4 remediation that, in conjunction with institutional and engineering controls, will be protective of human health and the environment. The Site source of petroleum contamination (i.e., the leaking USTs) will be removed. Site soils will meet the RCUSCOs beneath the footprint of the building; end-point sampling will document the soils left in place beneath the building and within the easement. Soil gas will not be present beneath any occupied spaces as the building will extend into the groundwater. Groundwater will be treated, if necessary, through construction dewatering and injection of chemicals to treat the bulk of any remaining petroleum contaminants and/or provide oxygen over several months to promote biological decomposition; groundwater sampling will be conducted at the downgradient border to document the groundwater conditions.

The following land-use factors were considered in selecting these remedial measures.

Land Use Factor	Remedy Evaluation Result
Zoning	Remedy is consistent
Applicable comprehensive community master plans or land use plans	Remedy is consistent (not within a Brownfield Opportunity Area)
Surrounding property uses	Remedy is consistent
Citizen participation	Remedy is consistent; CPP requirements implemented regardless of selected remedy
Environmental justice concerns	None identified
Land use designations	Remedy is consistent
Populations growth patterns	Remedy is consistent
Accessibility to existing infrastructure	Remedy is consistent
Proximity to cultural resources	None identified
Proximity to natural resources	None identified
Off-Site groundwater impacts	Remedy removes the source of the petroleum contamination and treats on-Site groundwater impacts. Groundwater will be monitored at the downgradient border following implementation of the remedy. The nearest downgradient property is approximately 550 feet north of the Site.
Proximity to floodplains	Site is not within the 500 year flood zone
Geography and geology of the Site	Remedy is consistent
Current Institutional Controls	None currently present

6.0 REMEDIAL ACTION PROGRAM

6.1 Governing Documents

6.1.1 Site Specific Health and Safety Plan

A Site Specific HASP has been created for the site and is included in Appendix A. All remedial work performed under this plan will be in full compliance with governmental requirements, including Site and worker safety requirements mandated by Federal OSHA. An emergency contact sheet with names and phone numbers is included in Table 1 of the HASP and defines the specific project contacts for use by NYSDEC and NYSDOH in the case of a day or night emergency. The HASP and requirements defined in this RAWP pertain to all remedial and invasive work performed at the Site until the issuance of a Certificate of Completion.

6.1.2 Quality Assurance Project Plan

A Quality Assurance Project Plan (QAPP) has been created for the site to address quality control and quality assurance procedures for all site sampling, including post excavation end-point sampling and groundwater sampling, and is included in Appendix E.

6.1.3 Soil/Materials Management Plan

The Soil/Materials Management Plan (SMMP) includes plans for managing all soils/materials that are disturbed at the Site. The SMMP includes provisions for sediment and erosion control and stormwater management. The development is less than one acre in area and a Stormwater Pollution Prevention Plan (SWPPP) is not required to be submitted to NYSDEC Division of Water.

The SMMP, which describes procedures for excavation, handling, storage, and transport and disposal is included in Appendix D.

6.1.4 Community Air Monitoring Plan

The purpose of the Community Air Monitoring Plan (CAMP) is to protect downwind receptors (e.g., residences, businesses, schools, nearby workers, and the public) from potential airborne contaminants released as a direct result of the Remedial Action being performed at the Site. A summary of the CAMP plan is included in Section 5.0 of the HASP, which is presented in Appendix A.

6.1.4 Citizen Participation Plan

The Citizen Participation Plan (CPP) enables citizens to participate more fully in decisions that affect their health, environment, and social well-being. The CPP will be updated throughout the Remedial Action in response to any community feedback. The CPP is included in Appendix F.

6.2 General Remedial Construction Information

6.2.1 Project Organization and Emergency Contacts

An organization chart with emergency contacts is included in Table 10. Resumes of key personnel involved in the Remedial Action are presented in the QAPP, included as Appendix E.

6.2.2 Remedial Engineer

The Remedial Engineer (RE) for this project will be Matthew M. Carroll, P.E. The RE is a registered professional engineer (PE) licensed by the State of New York. The RE will have primary direct responsibility for implementation of the remedial program for the LGA Hotel Site (NYSDEC BCA Index No. C241142-02-13; Site No. C241142). The RE will certify in the Final Engineering Report (FER) that the remedial activities were observed by qualified environmental professionals under his supervision and that the remediation requirements set forth in the RAWP and any other relevant provisions of ECL 27-1419 have been achieved in conformance with that Plan. Other RE certification requirements are listed later in this RAWP.

The RE will coordinate the work of other contractors and subcontractors involved in all aspects of remedial construction, including soil excavation, stockpiling, characterization, removal, air monitoring, emergency spill response, import of back fill material (if any), and management of waste transport and disposal. The RE will be responsible for all appropriate communication with NYSDEC and NYSDOH.

The RE will review all pre-remedial plans submitted by contractors for compliance with this RAWP and will certify compliance in the FER.

6.2.3 Remedial Action Construction Schedule

A general Remedial Action construction schedule is included in Table 11.

6.2.4 Utility Markout and Easement Layout

The Volunteer and its contractors are solely responsible for the identification of utilities that might be affected by work under the RAWP and implementation of all required, appropriate, or necessary health and safety measures during performance of work under this RAWP. The Volunteer and its contractors are solely responsible for safe execution of all invasive and other work performed under this RAWP. The Volunteer and its contractors must obtain any local, State or Federal permits or approvals pertinent to such work that may be required to perform work under this RAWP. Approval of this RAWP by NYSDEC does not constitute satisfaction of these requirements.

6.2.5 Required Permits

A complete list of all local, regional and national governmental permits, certificates or other approvals or authorizations required to perform the remedial and development work is attached in Table 12. This list includes a citation of the law, statute or code to be complied with, the

originating agency, and a contact name and phone number in that agency. This list will be updated in the FER.

6.2.6 Site Security and Signage

A fence is currently in place around the Site. The fence will be maintained and expanded as required throughout the Remedial Action. A project sign will be erected at the entrance to the Site prior to the start of any remedial activities; sign details and specifications will be provided to the NYSDEC Project Manager prior to its commissioning. Sidewalks adjacent to the Site will be maintained with barriers to protect the public.

6.2.7 Estimated Remedial Action Costs

The estimated costs to implement the Remedial Action is $3,262,500. An itemized summary of estimated costs is included as Table 13. This table will be revised based on actual costs and included in the FER.

6.2.8 Deviations from the Remedial Action Plan

During the implementation of the RAWP, any material deviation from the RAWP will be noted and immediately brought to the attention of the RE. The RE or his/her representative will contact the NYSDEC Project Manager and determine if the deviation necessitates a formal RAWP modification and NYSDEC approval. If no formal RAWP modification is required, the deviation will be noted in the Site reports and explained in the FER.

7.0 REMEDIAL ACTION IMPLEMENTATION: EXCAVATION

As discussed in Section 5.3, the components of the remedial action include excavation and off-Site disposal of soil above the RCUSCOs within the footprint of the building, construction dewatering, chemical oxidation and/or support of biological degradation of residual groundwater contamination, installation of waterproofing beneath the building and capping of the easement.

The Site will be excavated to at least 36 ft-bg within the proposed building footprint. The mat foundation of the proposed structure will rest on native soils. As further described below, the major components of the excavation remedial action including characterization for disposal; implementation of the SMMP and CAMP; excavation and off-Site disposal of impacted materials; closure of all encountered USTs; and, end-point sampling.

Potential migration of off-Site contamination onto the Site will not affect the future use of the building due to the installation, operation and maintenance of engineering controls including waterproofing and a composite cover system, as detailed in Sections 10.1.1.1 and 10.1.1.2.

7.1 Estimated Material Removal Quantities

The estimated quantity of soil/fill to be removed from the Site for development purposes is approximately 21,000 cubic yards (CY).

7.2 Soil Characterization

All soil will be disposed in accordance with NYSDEC requirements, which will require characterization sampling. Soil will be collected according to a grid system. Discrete and composite samples in accordance with typical disposal facility requirements in order to characterize the soil. Samples will be field composited (as necessary), labeled and submitted for laboratory analysis. A field record, including PID readings, will be kept to document the materials encountered and support all sampling decisions. All samples will be analyzed for VOCs, SVOCs, pesticides, PCBs and metals on the New York Part 375 SCOs and CP-51 lists and the New Jersey combined Soil Cleanup Criteria lists. In addition, samples will be analyzed for total petroleum hydrocarbons (TPH), toxicity characteristic leachate procedure (TCLP) metals, RCRA characteristics and paint filter test (PFT). These analyses are commonly required by regulated disposal facilities.

Approximately 21,000 CY of soil will be generated during excavation for the basement. At a rate of approximately one sample per 1,000 CY, 21 samples will be collected in order to characterize this volume of soil. This sample frequency reflects typical disposal facility requirements for soils generated in New York City. Please note that there is no standard number of samples required for all facilities and, therefore, additional samples or analytes may be required at a later date.

7.3 Soil/Materials Management Plan (SMMP)

Soil and materials management on-Site will be conducted in accordance with the SMMP and as described below. The main goal of the SMMP is to handle all potentially contaminated soil and

manage activities associated with soil in a manner that prevents contamination from reaching the community, workers, future occupants and workers, and the environment. Contaminated soil must be managed in a manner that ensures removal, transport, and disposal such that it fulfills applicable regulatory requirements. The means and methods to meet this goal are included in the SMMP, included as Appendix D.

7.4 Community Air Monitoring Plan (CAMP)

The main goal of the CAMP is to keep objectionable odors, VOCs and/or particulate from reaching the surrounding community. The NYSDOH Generic CAMP, which includes monitoring for VOCs and particulates, will be implemented.

Should objectionable odors be produced during excavation, the area to be disturbed at any one time will be limited and, if necessary, foam cover will be utilized (Rusmar Incorporated AC-645 Long Duration Foam or approved equivalent), following the manufacturer's recommended application rate.

The CAMP is included as Section 5.0 of the HASP, which is presented in Appendix A.

7.5 Materials Transport Off-Site

All transport of materials will be performed by licensed haulers in accordance with appropriate local, State, and Federal regulations, including 6NYCRR Part 364. Haulers will be appropriately licensed and trucks properly placarded.

All trucks leaving the Site will exit on Astoria Boulevard. For points north, east and south, trucks will proceed east on Astoria Boulevard to the Van Wyck Expressway (Route 678). For points west, trucks will proceed west on Astoria Boulevard to the Grand Central Parkway. Any trucks over 12' 6" or with more than three axles and/or ten tires must remain on Astoria Boulevard to 21st Street in Astoria, Queens. The Van Wyck Expressway and the Grand Central Parkway are major highways that will direct trucks either west towards disposal facilities in New Jersey or Pennsylvania or east towards disposal facilities in Long Island.

This is the most appropriate route and takes into account: (a) limiting transport through residential areas and past sensitive sites; (b) use of city mapped truck routes; (c) limiting total distance to major highways; (d) promoting safety in access to highways; and, (e) overall safety in transport. All trucks loaded with Site materials will exit the vicinity of the Site using only the most-current New York City Department of Transportation (NYCDOT)-approved truck routes (currently the 2011-2012 New York City Truck Route Map).

Trucks will be prohibited from stopping and idling in the neighborhood outside the project Site. Egress points for truck and equipment transport from the Site will be kept clean of dirt and other materials during Site remediation and development.

Material transported by trucks exiting the Site will be secured with covers. If loads contain wet material capable of producing free liquid, truck liners will be used.

All trucks will be washed prior to entering the City streets. Truck wash waters will be collected and disposed through the dewatering system.

7.6 UST Removal

All encountered USTs will be registered (if not already registered) and closed in conformance with all applicable federal, state and local regulations, including those defined in DER-10 and 6NYCRR Parts 612 and 613. Eight on-Site USTs are currently registered under the New York State Petroleum Bulk Storage program. However, based upon a review of historic information and the results of the RI test pitting, additional USTs are likely present at the Site. USTs will be registered and deregistered with the PBS program. NYSDEC will be notified seven days prior to removal of the USTs. The USTs will be removed by a contractor licensed by the New York City Fire Department (FDNY) in accordance with the procedures set forth in the American Petroleum Institute (API) Recommended Practice 1604 entitled "Removal and Disposal of Used Underground Storage Tanks".

7.7 Monitoring Well Decommissioning

On-site monitoring wells will be decommissioned in accordance with NYSDEC Groundwater Monitoring Well Decommissioning Policy (CP-43), dated November 3, 2009. In the event that monitoring wells MW-1 and MW-2 will also be destroyed in the course of constructing the sub-grade components of the building, these will also be decommissioned.

7.8 Remedial Performance Evaluation (Post-Excavation End-Point Sampling)

End-point samples will be collected from the base of the excavation every 900 square feet (SF) and from the sidewalls of the excavation every 30 linear feet (LF), in accordance with DER-10. The end-point samples will be analyzed for VOCs, SVOCs and metals. Figure 3 presents a generalized post excavation sampling location map. End-point samples will be collected from the base of and sidewalls of the excavation for the building and the easement.

All post-excavation sample results will be compared with the RCUSCOs. Any soils not meeting the RCUSCOs within the building excavation will be removed and the area backfilled with clean fill meeting the criteria outlined in this RAWP. Site-specific SCOs will be negotiated with NYSDEC if the soil within the easement does not meet the RCUSCOs. The RCUSCOs are listed in Table 1.

8.0 REMEDIAL ACTION IMPLEMENTATION: GROUNDWATER TREATMENT

As discussed in Section 5.3, the components of the remedial action to address groundwater impacts include construction dewatering to address the bulk of groundwater contamination and, if necessary, injection of chemicals to address residual contamination.

The Site will be excavated to at least 36 ft-bg within the proposed building footprint, which is approximately six to eleven feet below the groundwater interface. The construction dewatering system will consist of perimeter well points connected to a common header and piped to the NYCDEP combined sewer system. Prior to release of hydraulic control, a sample will be collected from the dewatering system effluent. In coordination with NYSDEC, it will be determined if chemicals need to be injected before construction of the mat slab, to treat the bulk of any remaining petroleum contaminants and/or provide oxygen over several months to promote biological decomposition.

8.1 Construction Dewatering

All dewatering fluids, will be handled, transported and disposed in accordance with applicable federal, state and local regulations. Dewatering fluids will be discharged into the New York City sewer system. The Site is located within the NYCDEP Bowery Bay service area. Prior approval will be obtained from NYCDEP, which regulates discharges to the New York City sewers under 15 RCNY, Chapter 19.

Groundwater data will be provided to NYCDEP demonstrating that the groundwater meets the NYCDEP Limitations for Effluent to Sanitary or Combined Sewers criteria. The dewatering fluid will be pretreated, as necessary, to meet the NYCDEP discharge criteria.

A Wastewater Quality Control Permit will be obtained from the NYCDEP Bureau of Water Treatment (BWT). It is assumed that the discharge will be less than 10,000 gallons per day and that approval is not required from the Bureau of Water and Sewer Operations (BWSO) based on the flow rate.

If discharge to the NYCDEP sewer system is not appropriate, the dewatering fluids will be managed by transportation and disposal at an off-Site treatment facility. Discharge of water generated during remedial construction to surface waters (i.e. a stream or river) is prohibited without a SPDES permit issued by NYSDEC.

8.2 Chemical Injections

Following construction dewatering, residual contamination may remain in the groundwater. This will be determined by sampling the effluent of the construction dewatering system prior to release of hydraulic control. If necessary, the residual contamination will be addressed through chemical oxidation and/or enhanced biological degradation.

Additional pre-design groundwater samples will be collected from temporary monitoring wells after excavation to development depth and prior to the release of hydraulic control and analyzed for VOCs. Effluent samples will be analyzed for VOCs and SVOCs. Based on the results, a combination of Regenesis' RegenOx™ and Oxygen Release Compound *Advanced*™ (ORC-A) will be applied to the base of the excavation. Based on pre-remedy groundwater concentrations, Regenesis confirmed that the combination of RegenOx and ORC would be appropriate for the detected compounds.

RegenOx is a chemical oxidant that is appropriate for both petroleum and solvent compounds. According to Regenesis' literature, RegenOx is a "solid alkaline oxidant" that uses a "sodium percarbonate complex with a multi-part catalytic formula". The oxidation potential is similar to that of Fenton's reaction (using hydrogen peroxide, H_2O_2) and produces water and carbon dioxide as breakdown compounds.

ORC-A increases the likelihood of aerobic biological degradation by providing oxygen, typically a limiting factor, over several months. According to Regenesis' literature, ORC-A is a "proprietary formulation of food-grade, calcium oxy-hydroxide that produces a controlled-release of molecular oxygen".

The application of either compound, regardless of the method, is considered Class V Well under the EPA Underground Injection Control (UIC) Program. Class V Wells are "used to inject non-hazardous fluids underground". A UIC Permit will be obtained prior to application of either compound.

8.3 Remedial Performance Evaluation (Post-Remediation Groundwater Sampling)

Post-remedial groundwater sampling will be completed in accordance with a Site Management Plan (SMP). Groundwater samples will likely be collected quarterly from well MW-1 and MW-2 for two years (i.e., eight quarters). Samples will be collected in accordance with the QAPP and results will be reported in the Annual Report required by the SMP, as detailed in Section 11.2.

In the course of constructing the sub-grade building components, it is likely that groundwater-monitoring wells MW-1 and MW-2 will be destroyed. These wells will be decommissioned in accordance with Section 7.7 and reinstalled in accordance with the SMP.

Groundwater samples will be collected for analysis of VOCs and SVOCs.

9.0 RESIDUAL CONTAMINATION TO REMAIN ON-SITE

The successful implementation of the Remedial Action will result in the following:

- All soil left on-Site will meet RCUSCOs or, if within the easement, capped in accordance with this RAWP.
- Residual contamination may remain in the groundwater but on-Site sources have been removed and groundwater has been treated, if necessary, with the goal of eventually meeting the Class GA Standards.
- There are no potential soil vapor impacts to inhabitable spaces at the Site.

Since residual contaminated groundwater may remain and contaminated soil vapor may exist beneath the easement after the remedy is complete, Engineering and Institutional Controls (ECs and ICs) are required to protect human health and the environment. These ECs and ICs are described below. Long-term management of EC/ICs and of residual contamination will be executed under a Site-specific Site Management Plan (SMP) that will be developed and included in the FER.

ECs will be implemented to protect public health and the environment by appropriately managing residual contamination. The Controlled Property (the Site) will have two primary EC systems. These are:

- Composite Cover System; and,
- Post-Remedial Groundwater Monitoring.

The composite cover system is a long-term EC. While post-remedial groundwater monitoring is part of the selected remedy, it is presented as an EC because it will continue after the FER is submitted. The FER will report residual contamination on the Site in tabular and map form. This will include presentation of exceedances of both UUSCOs and RCUSCOs.

10.0 ENGINEERING CONTROLS

10.1 Engineering Control Systems -On Site

As discussed above, two engineering controls (ECs) will be present at the Site: a composite cover system and post-remedial groundwater monitoring. The ECs will be established in an Environmental Easement assigned to the property by the titleholder and will be implemented under a SMP included in the FER. The post-remedial groundwater monitoring is considered an EC only because it will be implemented following submittal of the FER. The conceptual approach, general system design, maintenance and monitoring (OM&M) requirements and criteria for termination of each of these systems are described below.

10.1.1 Description of Engineering Controls

10.1.1.1 Composite Cover System

Exposure to groundwater and soil vapor associated with residual contaminated groundwater and/or soil will be prevented by an engineered, composite cover system that will be constructed on the Site.

This composite cover system beneath the building will be comprised of waterproofing and a concrete building slab. The waterproofing will be Grace Construction Products Preprufe® 300R and 160R. The waterproofing will consist of a pre-applied membrane that integrally bonds to poured concrete. Preprufe 300R membrane will be used under the foundation slab while Preprufe 160R will be applied to the below grade foundation walls. Waterproofing specifications are provided in Appendix G. The concrete slab will be at least one-foot thick, and ranging up to three-feet, four-inches thick, beneath the entire building.

This composite cover system outside the building, predominantly within the easement, will be comprised of a minimum four-inch thick concrete or asphalt slab.

The location of each remedial cover type used on the Site is shown on Figure 4. The SMP will outline the procedures required in the event the composite cover system and underlying residual contamination are disturbed as well as planned inspections of the composite cover system.

10.1.1.2 Post-Remedial Groundwater Monitoring

Elevated levels of VOCs have been detected in the groundwater at the Site. Residual contaminants may remain following construction dewatering and, if necessary, will be treated with injections of chemicals to destroy the bulk of any remaining petroleum contaminants and/or provide oxygen over several months to promote biological decomposition.

Groundwater will be monitoring by sampling monitoring wells MW-1 and MW-2 in accordance with the SMP.

Long-term monitoring (eight quarterly events) of the groundwater will be conducted to determine the efficacy of the Remedial Action. All monitoring wells will be sampled on a quarterly basis for VOCs. Monitoring well locations are shown on Figure 2.

10.1.2 Criteria for Termination of Remedial Systems

10.1.2.1 Composite Cover System

The composite cover system is a permanent control and the quality and integrity of this system will be inspected at defined, regular intervals in perpetuity.

10.1.2.2 Long-Term Groundwater Monitoring

Groundwater monitoring to assess the efficacy of the Remedial Action is planned for eight quarters after the completion of the Remedial Action.

Monitoring will continue until permission to discontinue is granted in writing by NYSDEC and NYSDOH. Monitoring activities will be outlined in the SMP.

11.0 INSTITUTIONAL CONTROLS

Institutional Controls (ICs) will be required to manage residual soil/fill and other media and ensure that the Site ECs remains protective of public health and the environment. The ICs will be established in an Environmental Easement assigned to the property by the titleholder and will be implemented under a SMP included in the FER. Two ICs will be required as part of the Remedial Action, an Environmental Easement and a Site Management Plan (SMP).

11.1 Environmental Easement

The Environmental Easement renders the Site a Controlled Property. The Environmental Easement will incorporate the ICs required to implement, maintain and monitor the ECs, prevent future exposure to residual contamination by controlling disturbances of the subsurface soil and restrict the use of the Site to commercial uses only, unless discontinued or modified with the approval of NYSDEC.

11.2 Site Management Plan

The SMP is the last phase of remediation and begins with the approval of the Final Engineering Report and issuance of the Certificate of Completion (COC) for the Remedial Action. The SMP is submitted as part of the FER, but will be written as a complete and independent document. Site management requirements continue in perpetuity or until released in writing by NYSDEC. The property owner is responsible to ensure that all Site management responsibilities defined in the Environmental Easement and SMP are performed.

The SMP is intended to provide a detailed description of the procedures required to manage residual contamination left in place at the Site following completion of the Remedial Action in accordance with the BCA with the NYSDEC. This includes: (1) development, implementation, and management of all Engineering and Institutional Controls; (2) development of a plan to operate and maintain any treatment, collection, containment, or recovery systems (including, where appropriate, preparation of an Operation and Maintenance Manual); and (3) submittal of Site Management Reports, performance of inspections and certification of results, and demonstration of proper communication of Site information to NYSDEC.

To address these needs, this SMP will include three plans: (1) an Engineering and Institutional Control Plan for implementation and management of EC/ICs; (2) an Operation and Maintenance Plan for implementation of remedial containment systems; and (3) a Site Management Reporting Plan for submittal of data, information, recommendations, and certifications to NYSDEC.

Additional information on the SMP is included in Section 12.4.

12.0 REPORTING

This section outlines the reporting requirements for the Site. All daily and monthly reports will be included in the FER. Job-site record keeping for all remedial work will be appropriately documented. These records will be maintained on-Site at all times during the project and be available for inspection by NYSDEC and NYSDOH staff.

12.1 Weekly Reports

Weekly reports will be submitted to NYSDEC and NYSDOH Project Managers by the end of each week following the reporting period and will include:

- An update of progress made during the reporting week;
- Locations of work and quantities of material imported and exported from the Site;
- References to alpha-numeric map for Site activities;
- A summary of any and all complaints with relevant details (names, phone numbers);
- A summary of CAMP findings, including excursions; and,
- An explanation of notable Site conditions.

Weekly reporting will be conducted during active Site remediation periods including soil excavation, air monitoring, soil segregation, off-Site disposal, end point sampling, waterproofing installation, pouring of the concrete foundation slab and capping of the easement.

Weekly reports are not intended to be the mode of communication for notification to the NYSDEC of emergencies (accident, spill, etc.), requests for changes to the Remedial Action Plan or other sensitive or time critical information. However, such conditions must also be included in the weekly reports. Emergency conditions and changes to the Remedial Action Plan will be addressed directly to NYSDEC Project Manager via personal communication.

Weekly reports will include a description of weekly activities keyed to an alphanumeric map for the Site that identifies work areas. These reports will include a summary of air sampling results, odor and dust problems and corrective actions, and any complaints received from the public.

A Site map that shows a predefined alphanumeric grid for use in identifying locations described in reports submitted to NYSDEC is provided as Figure 5.

The NYSDEC assigned project number will appear on all reports.

12.2 Monthly Reports

Monthly reports will be submitted to NYSDEC and NYSDOH Project Managers by the 10th day of the following month and will include:

- Activities relative to the Site during the previous reporting period and those anticipated for the next reporting period, including a quantitative presentation of work performed (i.e., tons of material exported and imported, etc.);

- Description of approved activity modifications, including changes of work scope and/or schedule;
- Sampling results received following internal data review and validation, as applicable; and,
- An update of the remedial schedule including the percentage of project completion, unresolved delays encountered or anticipated that may affect the future schedule, and efforts made to mitigate such delays.

12.3 Final Engineering Report

A Final Engineering Report (FER) will be submitted to the NYSDEC Project Manager within 90 days of completing the remedial action. This FER will include the following:

1. Certification by the RE that the data generated is useable and meets the remedial requirements;
2. Certification by the RE that any financial assurance mechanisms required by the NYSDEC have been executed;
3. Certification by the RE that the remedial work conformed to the RAWP;
4. Certification by the RE that dust, odor, and vapor control measures were implemented during invasive work and conformed with the RAWP;
5. Certification by the RE that all the remedial waste was transported and disposed in accordance with the RAWP;
6. Certification by the RE that the source approval and sampling of imported acceptable fill was completed in a manner consistent with the methodology of the RAWP;
7. Summary of the remedy and all remedial actions completed;
8. Description of any problems encountered and their resolutions;
9. Description of the deviations from the approved RAWP;
10. Listing of waste streams, quantity of materials disposed, and where they were disposed;
11. Analytical QA/QC completed for the environmental media sampling during the remedial activities, including DUSR or other data validation;
12. List of the remediation standards applied to the remedial actions;
13. List of all applicable local, regional, and national governmental permits, certificates, or other approvals required for the remedial and development work;
14. Tables and figures containing all pre- and post-remedial data, including volumes of soil removed (as applicable);
15. Description of source and quality of fill (as applicable);
16. “As-built” drawings including remediation areas, waterproofing and permanent composite cover structures;
17. Air quality and dust monitoring data, including any supporting documentation on the decisions made based on the data;
18. Copies of all the submitted periodic reports; and
19. Copies of all manifests of off-site transport of waste material.

All documents and reports submitted to the NYSDEC will be in both hard copy and in digital format on CD. These digital documents shall be in PDF form and, where appropriate, supplemented by photos and Microsoft Excel files. Laboratory analytical data will be submitted

in an electronic data deliverable (EDD) format that complies with the NYSDEC's electronic data warehouse standards.

Photographs will be taken of all remedial activities and submitted to NYSDEC in digital format after completion of active Site remediation. Photos will illustrate all remedial program elements and will be of acceptable quality. Representative photos of the Site prior to any Remedial Actions will be provided. Representative photos will be provided of each contaminant source, source area and Site structures before, during and after remediation. Photos will be submitted to NYSDEC on CD or other acceptable electronic media and will be sent to NYSDEC's Project Manager (2 copies) and to NYSDOH's Project Manager (1 copy). Each CD will have a label and a general file inventory structure that separates photos into directories and sub-directories according to logical Remedial Measure components. A photo log keyed to photo file ID numbers will be prepared to provide explanation for all representative photos.

12.4 Site Management Plan

A SMP will be implemented under this Remedial Action as a Track 1 remediation is not proposed. The SMP will be submitted with the FER. The SMP will be designed to maintain the institutional and engineering controls and to provide inspection and evaluation frequencies to verify the protection of human health and the environment at the Site. Specifically, the effectiveness of the engineering controls will be evaluated to confirm that the engineering controls are intact and the institutional controls are adhered to and enforced. A licensed engineer will certify the results of this inspection and review in a report submitted to the NYSDEC within 90 days after the anniversary of the certificate-of-completion date. Any lapses in the engineering or institutional controls noted in the annual review will be required to be corrected expeditiously and the NYSDEC notified of the correction. The SMP will include the following:

1. Introduction with purpose, summary of remediation and site conditions;
2. List of required engineering and institutional controls;
3. Monitoring plan that includes annual inspection and review requirements;
4. Post-remediation groundwater monitoring plan;
5. Site maintenance requirements;
6. Citizen Participation Plan;
7. Personnel organization and responsibilities;
8. Health and Safety Plan;
9. Records and forms;
10. Emergency Contingency Plan; and
11. Copies of Environmental Easement and applicable Site plans, including electronic versions.