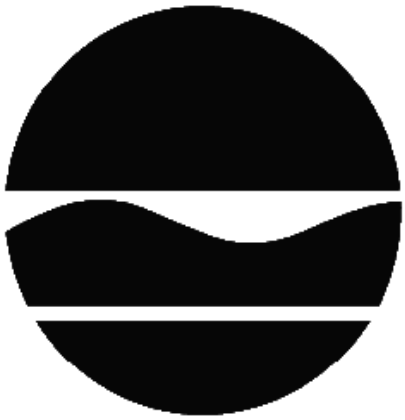
DECISION DOCUMENT

3200 Atlantic Avenue
Brownfield Cleanup Program
Brooklyn, Kings County
Site No. C224289
May 2020



Prepared by
Division of Environmental Remediation
New York State Department of Environmental Conservation

DECLARATION STATEMENT - DECISION DOCUMENT

3200 Atlantic Avenue
Brownfield Cleanup Program
Brooklyn, Kings County
Site No. C224289
May 2020

Statement of Purpose and Basis

This document presents the remedy for the 3200 Atlantic Avenue site, a brownfield cleanup site. The remedial program was chosen in accordance with the New York State Environmental Conservation Law and Title 6 of the Official Compilation of Codes, Rules and Regulations of the State of New York (6 NYCRR) Part 375.

This decision is based on the Administrative Record of the New York State Department of Environmental Conservation (the Department) for the 3200 Atlantic Avenue site and the public's input to the proposed remedy presented by the Department.

Description of Selected Remedy

The elements of the selected remedy are as follows:

1. Remedial Design

A remedial design program will be implemented to provide the details necessary for the construction, operation, optimization, maintenance, and monitoring of the remedial program. Green remediation principles and techniques will be implemented to the extent feasible in the design, implementation, and site management of the remedy as per DER-31. The major green remediation components are as follows:

- Considering the environmental impacts of treatment technologies and remedy stewardship over the long term;
- Reducing direct and indirect greenhouse gases and other emissions;
- Increasing energy efficiency and minimizing use of non-renewable energy;
- Conserving and efficiently managing resources and materials;
- Reducing waste, increasing recycling and increasing reuse of materials which would otherwise be considered a waste;
- Maximizing habitat value and creating habitat when possible;
- Fostering green and healthy communities and working landscapes which balance ecological, economic and social goals;
- Integrating the remedy with the end use where possible and encouraging green and sustainable re-development; and
- Additionally, to incorporate green remediation principles and techniques to the extent feasible in the future development at this site, any future on-site buildings will include, at

a minimum, a 20-mil vapor barrier/waterproofing membrane on the foundation to improve energy efficiency as an element of construction.

2. Excavation

The existing on-site buildings will be demolished and materials which cannot be beneficially reused on site will be taken off-site for proper disposal in order to implement the remedy.

Excavation and off-site disposal of contaminant source areas, will include:

- grossly contaminated soil, as defined in 6 NYCRR Part 375-1.2(u);
- non-aqueous phase liquids;
- soil with visual waste material or non-aqueous phase liquid;
- soil containing total SVOCs exceeding 500 ppm;
- soils which exceed the protection of groundwater soil cleanup objectives (PGWSCOs), as defined by 6 NYCRR Part 375-6.8 for those contaminants found in site groundwater above standards; and
- soils that create a nuisance condition, as defined in Commissioner Policy CP-51 Section G.

All soils in the upper two feet which exceed the restricted residential SCOs will be excavated and transported off-site for disposal. Excavation and removal of any underground storage tanks (USTs), fuel dispensers, underground piping or other structures associated with a source of contamination will occur. Approximately 3,600 cubic yards of contaminated soil will be removed from the site as part of remediation.

The excavation portion of the remedy is shown in Figure 2.

3. Backfill

On-site soil which does not exceed the above excavation criteria may be used below the cover system described in remedy element 4 to backfill the excavation and establish the designed grades at the site. Clean fill meeting the requirements of 6 NYCRR Part 375-6.7(d) will be brought in to complete the backfilling of the excavation and establish the designed grades at the site. The site will be re-graded to accommodate installation of a cover system as described in remedy element 4**.**

4. Cover System

A site cover will be required to allow for restricted residential use of the site in areas where the upper two feet of exposed surface soil will exceed the applicable soil cleanup objectives (SCOs). Where a soil cover is to be used it will be a minimum of two feet of soil placed over a demarcation layer, with the upper six inches of soil of sufficient quality to maintain a vegetative layer. Soil cover material, including any fill material brought to the site, will meet the SCOs for cover material for the use of the site as set forth in 6 NYCRR Part 375-6.7(d). Substitution of other materials and components may be allowed where such components already exist or are a component of the tangible property to be placed as part of site redevelopment. Such components may include, but

are not necessarily limited to: pavement, concrete, paved surface parking areas, sidewalks, building foundations and building slabs. The cover system is shown in Figure 3.

5. Soil Vapor Extraction (SVE)

Soil vapor extraction (SVE) will be implemented to remove volatile organic compounds (VOCs) from the deeper subsurface soil below the excavation and above the water table. VOCs will be physically removed from the soil by applying a vacuum to wells that have been installed into the vadose zone (the area below the ground but above the water table). The vacuum draws air through the soil matrix which carries the VOCs from the soil to the SVE well. The air extracted from the SVE wells will be treated as necessary prior to being discharged to the atmosphere. The SVE pilot test layout is shown in Figure 4.

6. In-Situ Chemical Oxidation (ISCO)

In-situ chemical oxidation (ISCO) will be implemented to treat contaminants in groundwater. A chemical oxidant will be injected into the subsurface to destroy the contaminants in an area located along the western boundary of the site where petroleum-related compounds were elevated in the groundwater. The method and depth of injection will be determined during the remedial design. Prior to the full implementation of this technology, laboratory and/or on-site pilot scale studies will be conducted to more clearly define design parameters. Long term monitoring of the groundwater will be conducted to determine the efficacy of the ISCO remedy. Long term monitoring wells are shown in Figure 5.

7. Institutional Control

Imposition of an institutional control in the form of an environmental easement for the controlled property which will:

- require the remedial party or site owner to complete and submit to the Department a periodic certification of institutional and engineering controls in accordance with Part 375-1.8 (h)(3);
- allow the use and development of the controlled property for restricted residential use as defined by Part 375-1.8(g), although land use is subject to local zoning laws;
- restrict the use of groundwater as a source of potable or process water, without necessary water quality treatment as determined by the NYSDOH or NYCDOH; and
- require compliance with the Department approved Site Management Plan.

8. Site Management Plan

A Site Management Plan is required, which includes the following:

a. An Institutional and Engineering Control Plan that identifies all use restrictions and engineering controls for the site and details the steps and media-specific requirements necessary to ensure the following institutional and/or engineering controls remain in place and effective:

- Institutional Controls: The Environmental Easement discussed in Paragraph 7 above.

– Engineering Controls: The cover system discussed in Paragraph 4, the soil vapor extraction system discussed in Paragraph 5 above, and the in-situ chemical oxidation system discussed in Paragraph 6 above.

This plan includes, but may not be limited to:

- an Excavation Plan which details the provisions for management of future excavations in areas of remaining contamination;
- descriptions of the provisions of the environmental easement including any land use, and groundwater use restrictions;
- a provision for evaluation of the potential for soil vapor intrusion for any occupied buildings on the site, including provision for implementing actions recommended to address exposures related to soil vapor intrusion;
- a provision that should a building foundation or building slab be removed in the future, a cover system consistent with that described in Paragraph 4 above will be placed in any areas where the upper two feet of exposed surface soil exceed the applicable soil cleanup objectives (SCOs);
- provisions for the management and inspection of the identified engineering controls;
- maintaining site access controls and Department notification; and
- the steps necessary for the periodic reviews and certification of the institutional and/or engineering controls.

b. A Monitoring Plan to assess the performance and effectiveness of the remedy. The plan includes, but may not be limited to:

- monitoring of groundwater to assess the performance and effectiveness of the remedy;
- a schedule of monitoring and frequency of submittals to the Department; and
- monitoring for vapor intrusion for any buildings on the site, as may be required by the Institutional and Engineering Control Plan discussed above.

c. An Operation and Maintenance (O&M) Plan to ensure continued operation, maintenance, optimization, monitoring, inspection, and reporting of any mechanical or physical components of the remedy. The plan includes, but is not limited to:

- procedures for operating and maintaining the remedy;
- compliance monitoring of treatment systems to ensure proper O&M as well as providing the data for any necessary permit or permit equivalent reporting;
- maintaining site access controls and Department notification; and
- providing the Department access to the site and O&M records.

Declaration

The remedy conforms with promulgated standards and criteria that are directly applicable, or that are relevant and appropriate and takes into consideration Department guidance, as appropriate. The remedy is protective of public health and the environment.

May 21, 2020
Date

Richard A. Mustico, Director
Remedial Bureau A

DECISION DOCUMENT

3200 Atlantic Avenue
Brooklyn, Kings County
Site No. C224289
May 2020

SECTION 1: SUMMARY AND PURPOSE

The New York State Department of Environmental Conservation (the Department), in consultation with the New York State Department of Health (NYSDOH), has selected a remedy for the above referenced site. The disposal of contaminants at the site has resulted in threats to public health and the environment that would be addressed by the remedy. The disposal or release of contaminants at this site, as more fully described in this document, has contaminated various environmental media. Contaminants include hazardous waste and/or petroleum.

The New York State Brownfield Cleanup Program (BCP) is a voluntary program. The goal of the BCP is to enhance private-sector cleanups of brownfields and to reduce development pressure on "greenfields." A brownfield site is real property, the redevelopment or reuse of which may be complicated by the presence or potential presence of a contaminant.

The Department has issued this document in accordance with the requirements of New York State Environmental Conservation Law and 6 NYCRR Part 375. This document is a summary of the information that can be found in the site-related reports and documents.

SECTION 2: CITIZEN PARTICIPATION

The Department seeks input from the community on all remedies. A public comment period was held, during which the public was encouraged to submit comment on the proposed remedy. All comments on the remedy received during the comment period were considered by the Department in selecting a remedy for the site. Site-related reports and documents were made available for review by the public at the following document repository:

DECInfo Locator - Web Application
https://gisservices.dec.ny.gov/gis/dil/index.html?rs=C224289

Brooklyn Public Library - Arlington Branch
203 Arlington Avenue at Warwick Street
Brooklyn, NY 11207
Phone: 718-277-6105

Receive Site Citizen Participation Information By Email

Please note that the Department's Division of Environmental Remediation (DER) is "going paperless" relative to citizen participation information. The ultimate goal is to distribute citizen participation information about contaminated sites electronically by way of county email listservs. Information will be distributed for all sites that are being investigated and cleaned up in a particular county under the State Superfund Program, Environmental Restoration Program, Brownfield Cleanup Program and Resource Conservation and Recovery Act Program. We encourage the public to sign up for one or more county listservs at http://www.dec.ny.gov/chemical/61092.html.

SECTION 3: SITE DESCRIPTION AND HISTORY

Location: The project site is located on the south side of Atlantic Avenue, between Logan Street and Fountain Avenue in Brooklyn, Kings County, NY. The property lot is an irregularly shaped 0.88-acre parcel identified as Tax Block 4154, Lot 28.

Site Features: The northwest corner of the site is currently occupied by an auto filling station and one-story convenience store. The site is registered on the NYSDEC Petroleum Bulk Storage (PBS) database as Site No. 2-600695. Four underground storage tanks (USTs) were installed in 1996. A warehouse used for auto repair occupies the south-southeast portion of the site. A two-story building on the southwest portion of the site is inaccessible and not currently in use. All on-site structures are currently vacant and scheduled to be demolished prior to remediation. The remainder of the property is an open storage yard densely crowded with used trucks, truck and auto parts, and containers and drums of auto maintenance fluids.

Current Zoning and Land Use: The site lot is zoned C4-4D, a designation denoting commercial centers, with bulk and height regulations, outside central business districts. The surrounding area is generally residential to the south and north with commercial uses along Atlantic Avenue and a public school east of the site, across Logan Street.

Past Uses of the Site: The subject property was generally undeveloped land until sometime between 1887 and 1908. The earliest known site uses were as a carpenter shop, glazer and lumber storage, followed by coal and ice storage and a bottling facility. The most recent uses of the site include a filling station, office building, used auto parts storage and auto repair.

Site Geology and Hydrogeology: The site is located at an elevation of approximately 35 feet above mean sea level, and bedrock is estimated to be present at approximately 500 feet below grade. The overburden is composed predominantly of a shallow fill layer underlain by native sands. Groundwater was encountered at depths ranging from approximately 25 to 29 feet below grade (ft-bg), and the groundwater flow direction is to the south-southwest.

A site location map is attached as Figure 1.

SECTION 4: LAND USE AND PHYSICAL SETTING

The Department may consider the current, intended, and reasonably anticipated future land use of

the site and its surroundings when evaluating a remedy for soil remediation. For this site, alternatives (or an alternative) that restrict(s) the use of the site to restricted-residential use (which allows for commercial use and industrial use) as described in Part 375-1.8(g) were/was evaluated in addition to an alternative which would allow for unrestricted use of the site.

A comparison of the results of the Remedial Investigation (RI) to the appropriate standards, criteria and guidance values (SCGs) for the identified land use and the unrestricted use SCGs for the site contaminants is available in the RI Report.

SECTION 5: ENFORCEMENT STATUS

The Applicant under the Brownfield Cleanup Agreement is a Participant. The Applicant has an obligation to address on-site and off-site contamination. However, the Department has determined that this site does not pose a significant threat to human health or the environment.

SECTION 6: SITE CONTAMINATION

6.1: Summary of the Remedial Investigation

A remedial investigation (RI) serves as the mechanism for collecting data to:

- characterize site conditions;
- determine the nature of the contamination; and
- assess risk to human health and the environment.

The RI is intended to identify the nature (or type) of contamination which may be present at a site and the extent of that contamination in the environment on the site, or leaving the site. The RI reports on data gathered to determine if the soil, groundwater, soil vapor, indoor air, surface water or sediments may have been contaminated. Monitoring wells are installed to assess groundwater and soil borings or test pits are installed to sample soil and/or waste(s) identified. If other natural resources are present, such as surface water bodies or wetlands, the water and sediment may be sampled as well. Based on the presence of contaminants in soil and groundwater, soil vapor will also be sampled for the presence of contamination. Data collected in the RI influence the development of remedial alternatives. The RI report is available for review in the site document repository and the results are summarized in section 6.3.

The analytical data collected on this site includes data for:

- outdoor air
- groundwater
- soil
- soil vapor
- indoor air
- sub-slab vapor

6.1.1: Standards, Criteria, and Guidance (SCGs)

The remedy must conform to promulgated standards and criteria that are directly applicable or that are relevant and appropriate. The selection of a remedy must also take into consideration guidance, as appropriate. Standards, Criteria and Guidance are hereafter called SCGs.

To determine whether the contaminants identified in various media are present at levels of concern, the data from the RI were compared to media-specific SCGs. The Department has developed SCGs for groundwater, surface water, sediments, and soil. The NYSDOH has developed SCGs for drinking water and soil vapor intrusion. For a full listing of all SCGs see: http://www.dec.ny.gov/regulations/61794.html

6.1.2: RI Results

The data have identified contaminants of concern. A "contaminant of concern" is a contaminant that is sufficiently present in frequency and concentration in the environment to require evaluation for remedial action. Not all contaminants identified on the property are contaminants of concern. The nature and extent of contamination and environmental media requiring action are summarized below. Additionally, the RI Report contains a full discussion of the data. The contaminant(s) of concern identified at this site is/are:

benzene	butylbenzene
toluene	benzo(a)anthracene
ethylbenzene	benzo(a)pyrene
xylene (mixed)	benzo(b)fluoranthene
naphthalene	benzo(k)fluoranthene
1,3,5-trimethylbenzene	chrysene
1,2,4-trimethylbenzene	dibenz[a,h]anthracene
n-propylbenzene	indeno(1,2,3-CD)pyrene

The contaminant(s) of concern exceed the applicable SCGs for:

- groundwater
- soil

6.2: Interim Remedial Measures

An interim remedial measure (IRM) is conducted at a site when a source of contamination or exposure pathway can be effectively addressed before issuance of the Decision Document.

The following IRM has been or will be completed at this site based on conditions observed during the RI:

- Extraction of all remaining petroleum fuels currently stored in on-site underground storage tanks (USTs).

6.3: Summary of Environmental Assessment

This section summarizes the assessment of existing and potential future environmental impacts presented by the site. Environmental impacts may include existing and potential future exposure pathways to fish and wildlife receptors, wetlands, groundwater resources, and surface water. The RI report presents a detailed discussion of any existing and potential impacts from the site to fish and wildlife receptors.

Soil and groundwater were analyzed for volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), metals, emerging contaminants, polychlorinated biphenyls (PCBs), and pesticides. Based upon investigations conducted to date, the primary contaminants of concern at the site include petroleum-related VOCs and SVOCs. The soil, soil vapor and groundwater are impacted with petroleum-related VOCs, consistent with the historic and current use of the site for auto repair, vehicle dismantling and a fueling station. Petroleum-related VOCs have been detected in soil, soil vapor and groundwater at concentrations above applicable regulatory and/or ambient levels. SVOCs, particularly polycyclic aromatic hydrocarbons (PAHs), were detected in soil and groundwater above regulatory levels and are likely attributable to the presence of historic fill. Historic fill related metals were detected in shallow soil.

Soil: The results of the RI indicate that petroleum-related VOCs are present from below the existing tanks to the groundwater interface, as well as at the groundwater interface in the western and northwestern portions of the site at levels exceeding applicable standards. Maximum VOC detections exceeding the protection of groundwater soil cleanup objectives (PGSCOs) are as follows: benzene at 24 parts per million, or ppm (PGSCO is 0.06 ppm), toluene at 440 ppm (PGSCO is 0.7 ppm), ethylbenzene at 150 ppm (PGSCO is 1 ppm) and total xylenes at 730 ppm (PGSCO is 1.6 ppm). Maximum VOC detections exceeding the restricted residential soil cleanup objectives (RRSCOs) are as follows: 1,2,4-trimethylbenzene at 290 ppm (RRSCO is 52 ppm), and 1,3,5-trimethylbenzene at 84 ppm (RRSCO is 52 ppm).

Multiple SVOCs, specifically polycyclic aromatic hydrocarbons (PAHs), were detected in two shallow (0-5 ft below grade) on-site soil samples at concentrations exceeding applicable standards. Maximum SVOC detections above RRSCOs are as follows: benzo(a)anthracene at 3.4 ppm (RRSCO is 1ppm), benzo(a)pyrene at 2.7 ppm (RRSCO is 1ppm), benzo(b)fluoranthene at 3.6 ppm (RRSCO is 1ppm), dibenzo(a,h)anthracene at 0.37 ppm (RRSCO is 0.33ppm), and indeno(1,2,3-cd)pyrene at 1.7 ppm (RRSCO is 0.5ppm). PAH concentrations in exceedance of RRSCOs were not detected in soil deeper than 5 feet below grade.

PFAS were detected at low concentrations in 15 of 17 soil samples. The maximum PFAS detection in soil was PFOS at 0.00204 ppb. 1,4-dioxane was not detected in any soil samples.

Data does not indicate any off-site impacts in soil related to this site.

Groundwater: Petroleum-related VOCs (primarily benzene, toluene, ethylbenzene and xylenes -- BTEX) were detected in on-site groundwater samples and off-site downgradient and crossgradient groundwater samples at concentrations exceeding the Class GA Standards, with the highest concentrations generally occurring downgradient of the petroleum source area. Benzene was

detected in exceedance of its Class GA Standard of 1 part per billion (ppb) in eight of 19 samples (max. 10,000 ppb); toluene was detected in exceedance of its Class GA Standard of 5 ppb in four samples (max. 15,000 ppb); ethylbenzene was detected in exceedance of its Class GA Standard of 5 ppb in five samples (max. 3,000 ppb); p/m xylene was detected in exceedance of its Class GA Standard of 5 ppb in eight samples and one duplicate sample (max. 8,900 ppb); o-xylene was detected in exceedance of its Class GA Standard of 5 ppb in four samples (max. 3,700 ppb in MW-5).

A variety of SVOCs, specifically polycyclic aromatic hydrocarbons (PAHs), were detected in on-site groundwater samples and off-site downgradient and crossgradient groundwater samples at concentrations exceeding the Class GA Standards. The highest concentrations of PAHs were detected in MW-13, located onsite and upgradient. Benzo(a)anthracene was detected in six samples, with a maximum concentration of 5.5 ppb compared to its Class GA Standard of 0.002 ppb; benzo(b)fluoranthene was detected in eight samples at a maximum concentration of 10 ppb with a Class GA Standard of 0.002 ppb; benzo(k)fluoranthene was detected in five samples at a maximum concentration of 2.7 ppb with a Class GA Standard of 0.002 ppb; chrysene was detected in five samples at a maximum concentration of 4.6 ppb with a Class GA Standard of 0.002 ppb; and, indeno(1,2,3-cd)pyrene was detected in seven samples at a maximum concentration of 5.6 ppb with a Class GA Standard of 0.002 ppb; naphthalene was detected in exceedance of its Class GA Standard of 10 ppb in five samples at a maximum concentration of 440 ppb.

Several metals, including total antimony, chromium, lead, nickel, and selenium were detected in groundwater samples above Class GA Standards. The naturally-occurring earth metals iron, manganese and sodium were also detected in total and dissolved groundwater samples above Class GA Standards.

PFAS, perfluorooctanoic acid (PFOA) and perfluorooctanesulfonic acid (PFOS) were reported at concentrations of up to 138 and 47.9 parts per trillion (ppt), respectively, exceeding the 10 ppt screening levels for groundwater for each. Individual PFAS exceeding the 100 ppt screening level included PFHxS with a detection of 103 ppt. The total concentration of PFAS, including PFOA and PFOS, were reported at concentrations of up to 377.2 ppt, below the 500 ppt screening level for total PFAS in groundwater. PFAS detections were highest along the site's western boundary and upgradient, potentially indicating an off-site source. 1,4-dioxane was not detected in any groundwater samples.

Data indicates that there are exceedances of groundwater standards for petroleum related VOCs immediately sidegradient of the site and downgradient to a maximum distance of approximately 300 ft south of the site.

Soil Vapor: Soil vapor samples collected from the site indicated elevated concentrations of several petroleum-related compounds, including benzene (max. 473,000 micrograms per cubic meter [ug/m^3]), toluene (max. 239,000 ug/m^3), and ethylbenzene (max. 8,900 ug/m^3). The highest concentrations of petroleum related VOCs were detected in the northwestern portion of the site, near the corner of Logan Street and Atlantic Avenue directly proximal to the fueling station. PCE was detected in one on-site soil vapor sample with a detection of 168 ug/m^3.

Off-Site Property 285L:
A sub-slab soil vapor sample (SS-1) and co-located indoor air sample (IA-1) were collected within a south adjoining property identified as 285L. Offsite exterior soil vapor samples were collected at two locations along Fountain Avenue and Atlantic Avenue, downgradient and upgradient of the site. One ambient air sample was collected during each sampling event.

Low concentrations of petroleum-related VOCs were detected in exterior soil vapor samples in exceedance of the corresponding ambient air concentrations. Concentrations of benzene (max. 12 ug/m^3), toluene (max. 13 ug/m^3), and 2-butanone (max. 74ug/m^3) were detected in both exterior soil vapor samples in exceedance of ambient air concentrations. Xylene was also detected in exceedance of the ambient air concentration in one exterior soil vapor sample, at a concentration of 5 ug/m^3.

Low concentrations of petroleum-related VOCs were also detected in the sub-slab soil vapor sample. Concentrations of benzene (2.15 ug/m^3), toluene (6.56 ug/m^3), 2-butanone (27.3 ug/m^3), and p/m-xylene (2.94 ug/m^3) were detected in the sub-slab soil vapor sample. Low levels of benzene, toluene, and p/m-xylene were also detected in the co-located indoor air sample collected. Benzene was detected at a concentration of 0.671 $\mu g/m^3$; toluene was detected at a concentration of 4.15 $\mu g/m^3$; and p/m-xylene was detected at a concentration of 2.42 ug/m^3.

One chlorinated VOC (cVOC), 1,1,1-trichloroethane (1,1,1-TCA), was detected in the sub-slab soil vapor sample at a concentration of 1.89 ug/m^3. 1,1,1-TCA was not detected in the co-located indoor air sample. Two cVOCs, carbon tetrachloride and tetrachloroethene (PCE), were detected at low concentrations in the indoor air sample, IA-1. Carbon tetrachloride was detected at a concentration of 0.51 ug/m^3 and PCE was detected at a concentration of 0.203 ug/m^3. Carbon tetrachloride and PCE were not detected in the co-located sub-slab soil vapor sample.

Data does not indicate any off-site migration of contaminants in soil vapor.

6.4: Summary of Human Exposure Pathways

This human exposure assessment identifies ways in which people may be exposed to site-related contaminants. Chemicals can enter the body through three major pathways (breathing, touching or swallowing). This is referred to as *exposure*.

People who enter the site may come into contact with site related soil and groundwater contamination if they dig below the surface. Contaminated groundwater at the site is not used for drinking or other purposes and the site is served by a public water supply that obtains water from a different source not affected by this contamination. Volatile organic compounds in the soil vapor (air spaces within the soil) may move into buildings and affect the indoor air quality. This process, which is similar to the movement of radon gas from the subsurface into the indoor air of buildings, is referred to as soil vapor intrusion. Environmental sampling indicates vapor intrusion associated with this site is not a concern for on and offsite buildings.

6.5: Summary of the Remediation Objectives

The objectives for the remedial program have been established through the remedy selection process stated in 6 NYCRR Part 375. The goal for the remedial program is to restore the site to pre-disposal conditions to the extent feasible. At a minimum, the remedy shall eliminate or mitigate all significant threats to public health and the environment presented by the contamination identified at the site through the proper application of scientific and engineering principles.

The remedial action objectives for this site are:

Groundwater

RAOs for Public Health Protection

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

RAOs for Environmental Protection

- Restore ground water aquifer to pre-disposal/pre-release conditions, to the extent practicable.
- Remove the source of ground or surface water contamination.

Soil

RAOs for Public Health Protection

- Prevent ingestion/direct contact with contaminated soil.
- Prevent inhalation of or exposure from contaminants volatilizing from contaminants in soil.

RAOs for Environmental Protection

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

Soil Vapor

RAOs for Public Health Protection

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

SECTION 7: ELEMENTS OF THE SELECTED REMEDY

The alternatives developed for the site and the evaluation of the remedial criteria are presented in the Alternative Analysis. The remedy is selected pursuant to the remedy selection criteria set forth in DER-10, Technical Guidance for Site Investigation and Remediation and 6 NYCRR Part 375.

The selected remedy is a Track 4: Restricted use with site-specific soil cleanup objectives remedy.

The selected remedy is referred to as the Excavation, Cover System, ISCO and SVE remedy.

The elements of the selected remedy, as shown in Figures 2-7, are as follows:

1. Remedial Design

A remedial design program will be implemented to provide the details necessary for the construction, operation, optimization, maintenance, and monitoring of the remedial program. Green remediation principles and techniques will be implemented to the extent feasible in the design, implementation, and site management of the remedy as per DER-31. The major green remediation components are as follows:

- Considering the environmental impacts of treatment technologies and remedy stewardship over the long term;
- Reducing direct and indirect greenhouse gases and other emissions;
- Increasing energy efficiency and minimizing use of non-renewable energy;
- Conserving and efficiently managing resources and materials;
- Reducing waste, increasing recycling and increasing reuse of materials which would otherwise be considered a waste;
- Maximizing habitat value and creating habitat when possible;
- Fostering green and healthy communities and working landscapes which balance ecological, economic and social goals;
- Integrating the remedy with the end use where possible and encouraging green and sustainable re-development; and
- Additionally, to incorporate green remediation principles and techniques to the extent feasible in the future development at this site, any future on-site buildings will include, at a minimum, a 20-mil vapor barrier/waterproofing membrane on the foundation to improve energy efficiency as an element of construction.

2. Excavation

The existing on-site buildings will be demolished and materials which cannot be beneficially reused on site will be taken off-site for proper disposal in order to implement the remedy.

Excavation and off-site disposal of contaminant source areas, will include:

- grossly contaminated soil, as defined in 6 NYCRR Part 375-1.2(u);
- non-aqueous phase liquids;
- soil with visual waste material or non-aqueous phase liquid;
- soil containing total SVOCs exceeding 500 ppm;
- soils which exceed the protection of groundwater soil cleanup objectives (PGWSCOs), as defined by 6 NYCRR Part 375-6.8 for those contaminants found in site groundwater above standards; and
- soils that create a nuisance condition, as defined in Commissioner Policy CP-51 Section G.

All soils in the upper two feet which exceed the restricted residential SCOs will be excavated and transported off-site for disposal. Excavation and removal of any underground storage tanks (USTs), fuel dispensers, underground piping or other structures associated with a source of contamination will occur. Approximately 3,600 cubic yards of contaminated soil will be removed from the site as part of remediation.

The excavation portion of the remedy is shown in Figure 2.

3. Backfill

On-site soil which does not exceed the above excavation criteria may be used below the cover system described in remedy element 4 to backfill the excavation and establish the designed grades at the site. Clean fill meeting the requirements of 6 NYCRR Part 375-6.7(d) will be brought in to complete the backfilling of the excavation and establish the designed grades at the site. The site will be re-graded to accommodate installation of a cover system as described in remedy element 4**.**

4. Cover System

A site cover will be required to allow for restricted residential use of the site in areas where the upper two feet of exposed surface soil will exceed the applicable soil cleanup objectives (SCOs). Where a soil cover is to be used it will be a minimum of two feet of soil placed over a demarcation layer, with the upper six inches of soil of sufficient quality to maintain a vegetative layer. Soil cover material, including any fill material brought to the site, will meet the SCOs for cover material for the use of the site as set forth in 6 NYCRR Part 375-6.7(d). Substitution of other materials and components may be allowed where such components already exist or are a component of the tangible property to be placed as part of site redevelopment. Such components may include, but are not necessarily limited to: pavement, concrete, paved surface parking areas, sidewalks, building foundations and building slabs. The cover system is shown in Figure 3.

5. Soil Vapor Extraction (SVE)

Soil vapor extraction (SVE) will be implemented to remove volatile organic compounds (VOCs) from the deeper subsurface soil below the excavation and above the water table. VOCs will be physically removed from the soil by applying a vacuum to wells that have been installed into the vadose zone (the area below the ground but above the water table). The vacuum draws air through the soil matrix which carries the VOCs from the soil to the SVE well. The air extracted from the SVE wells will be treated as necessary prior to being discharged to the atmosphere. The SVE pilot test layout is shown in Figure 4.

6. In-Situ Chemical Oxidation (ISCO)

In-situ chemical oxidation (ISCO) will be implemented to treat contaminants in groundwater. A chemical oxidant will be injected into the subsurface to destroy the contaminants in an area located along the western boundary of the site where petroleum-related compounds were elevated in the groundwater. The method and depth of injection will be determined during the remedial design. Prior to the full implementation of this technology, laboratory and/or on-site pilot scale studies will be conducted to more clearly define design parameters. Long term monitoring of the groundwater will be conducted to determine the efficacy of the ISCO remedy. Long term monitoring wells are shown in Figure 5.

7. Institutional Control

Imposition of an institutional control in the form of an environmental easement for the controlled property which will:

- require the remedial party or site owner to complete and submit to the Department a periodic certification of institutional and engineering controls in accordance with Part 375-1.8 (h)(3);
- allow the use and development of the controlled property for restricted residential use as defined by Part 375-1.8(g), although land use is subject to local zoning laws;
- restrict the use of groundwater as a source of potable or process water, without necessary water quality treatment as determined by the NYSDOH or NYCDOH; and
- require compliance with the Department approved Site Management Plan.

8. Site Management Plan

A Site Management Plan is required, which includes the following:

a. An Institutional and Engineering Control Plan that identifies all use restrictions and engineering controls for the site and details the steps and media-specific requirements necessary to ensure the following institutional and/or engineering controls remain in place and effective:

– Institutional Controls: The Environmental Easement discussed in Paragraph 7 above.

– Engineering Controls: The cover system discussed in Paragraph 4, the soil vapor extraction system discussed in Paragraph 5 above, and the in-situ chemical oxidation system discussed in Paragraph 6 above.

This plan includes, but may not be limited to:

- an Excavation Plan which details the provisions for management of future excavations in areas of remaining contamination;
- descriptions of the provisions of the environmental easement including any land use, and groundwater use restrictions;
- a provision for evaluation of the potential for soil vapor intrusion for any occupied buildings on the site, including provision for implementing actions recommended to address exposures related to soil vapor intrusion;
- a provision that should a building foundation or building slab be removed in the future, a cover system consistent with that described in Paragraph 4 above will be placed in any areas where the upper two feet of exposed surface soil exceed the applicable soil cleanup objectives (SCOs);
- provisions for the management and inspection of the identified engineering controls;
- maintaining site access controls and Department notification; and
- the steps necessary for the periodic reviews and certification of the institutional and/or engineering controls.

b. A Monitoring Plan to assess the performance and effectiveness of the remedy. The plan includes, but may not be limited to:

- monitoring of groundwater to assess the performance and effectiveness of the remedy;
- a schedule of monitoring and frequency of submittals to the Department; and
- monitoring for vapor intrusion for any buildings on the site, as may be required by the Institutional and Engineering Control Plan discussed above.

c. An Operation and Maintenance (O&M) Plan to ensure continued operation, maintenance, optimization, monitoring, inspection, and reporting of any mechanical or physical components of the remedy. The plan includes, but is not limited to:

- procedures for operating and maintaining the remedy;
- compliance monitoring of treatment systems to ensure proper O&M as well as providing the data for any necessary permit or permit equivalent reporting;
- maintaining site access controls and Department notification; and
- providing the Department access to the site and O&M records.

0 210 420 630 840 Feet

N
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Figure 1
C224289 - 3200 Atlantic Avenue
Site Location Map
3200 Atlantic Avenue, Brooklyn
Kings County, NY

Legend

- Remediation Site
- Site Border

Legend

- Excavation to 2 ft-bg
- Excavation to 14 ft-bg
- Project Site

Service Layer Credits: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri

Tax Lot Source: http://gis.nyc.gov/taxmap/map.htm
Site Layout: MHG, Cellar Floor Plan, A-100.00 8/31/18

0 15 30 60 Feet

Site

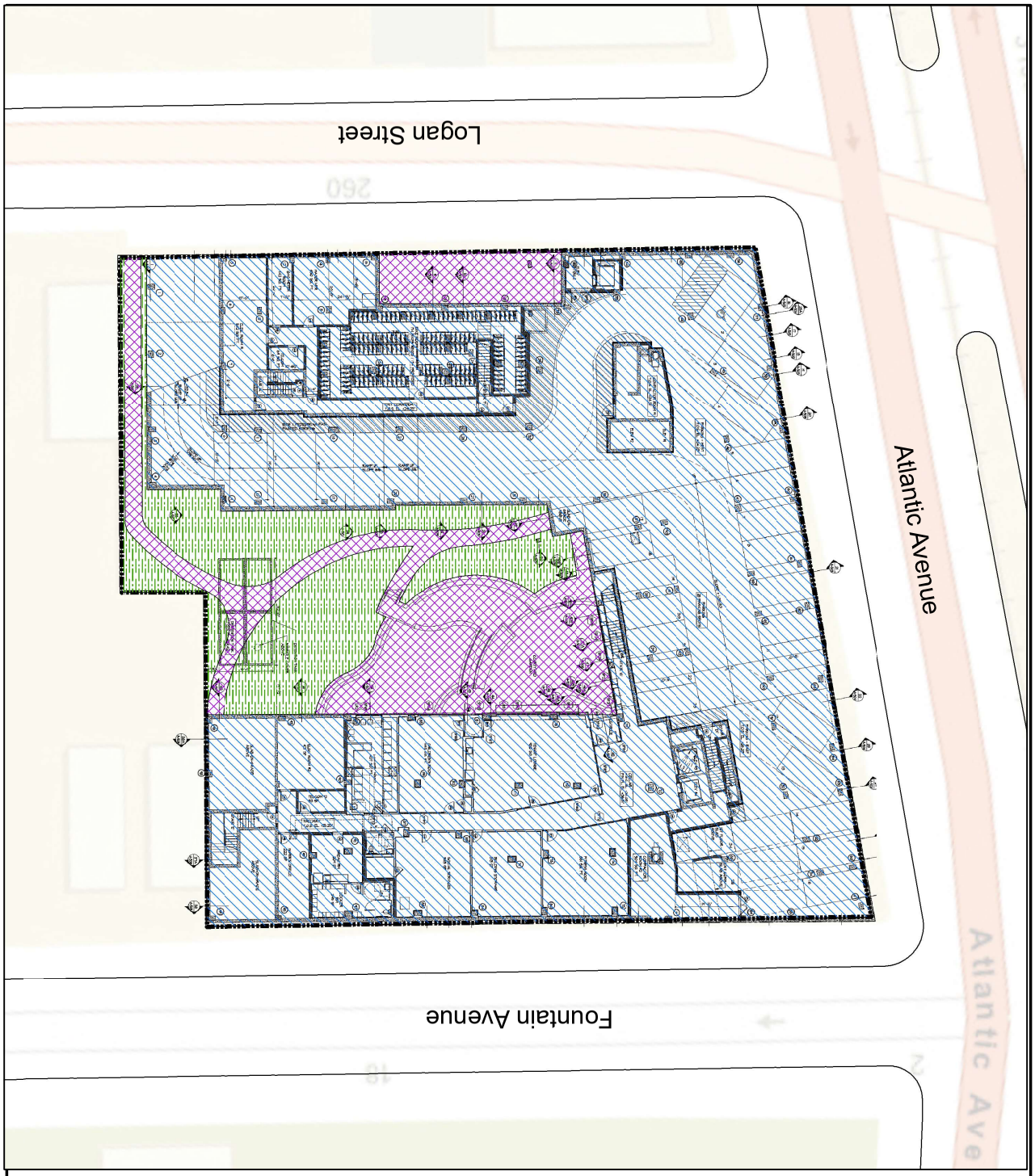
3200 Atlantic Avenue
Brooklyn, New York
Block 4154, Lot 28

TENEN ENVIRONMENTAL
Tenen Environmental, LLC
121 West 27th Street
Suite 702
New York, NY 10001
O: (646) 606-2332
F: (646) 606-2379

Drawn By	Checked By	Date	Scale
LM	MC	May 2020	As Noted

Drawing Title: **Extent of Remedial Excavation**

Drawing No: Figure 2



Legend

- Vapor Barrier and Minimum 5-inch Concrete Slab
- 4-inch Poured Concrete
- 2-feet Clean Soil
- Project Site

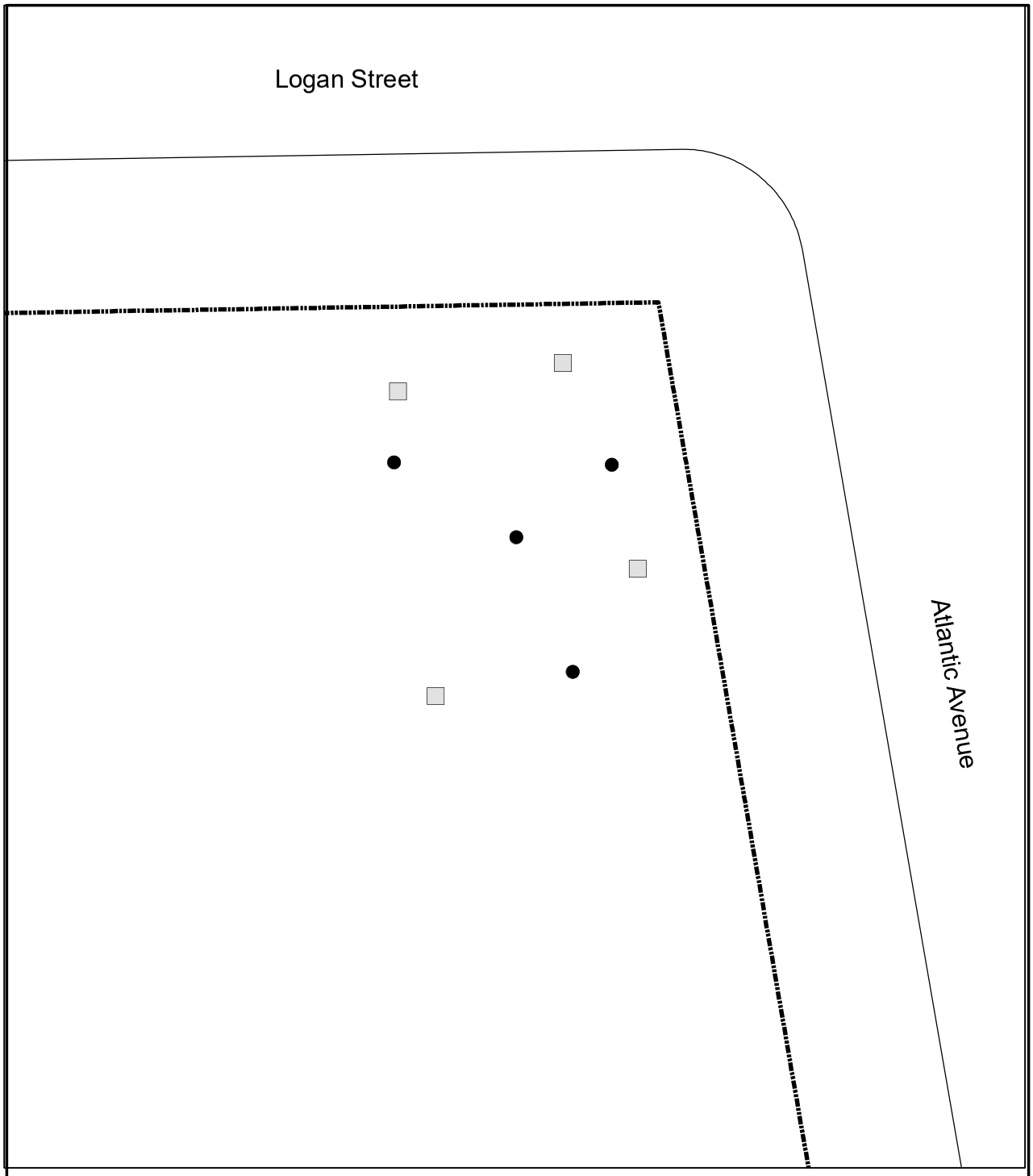
0 15 30 60 Feet

Service Layer Credits: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri

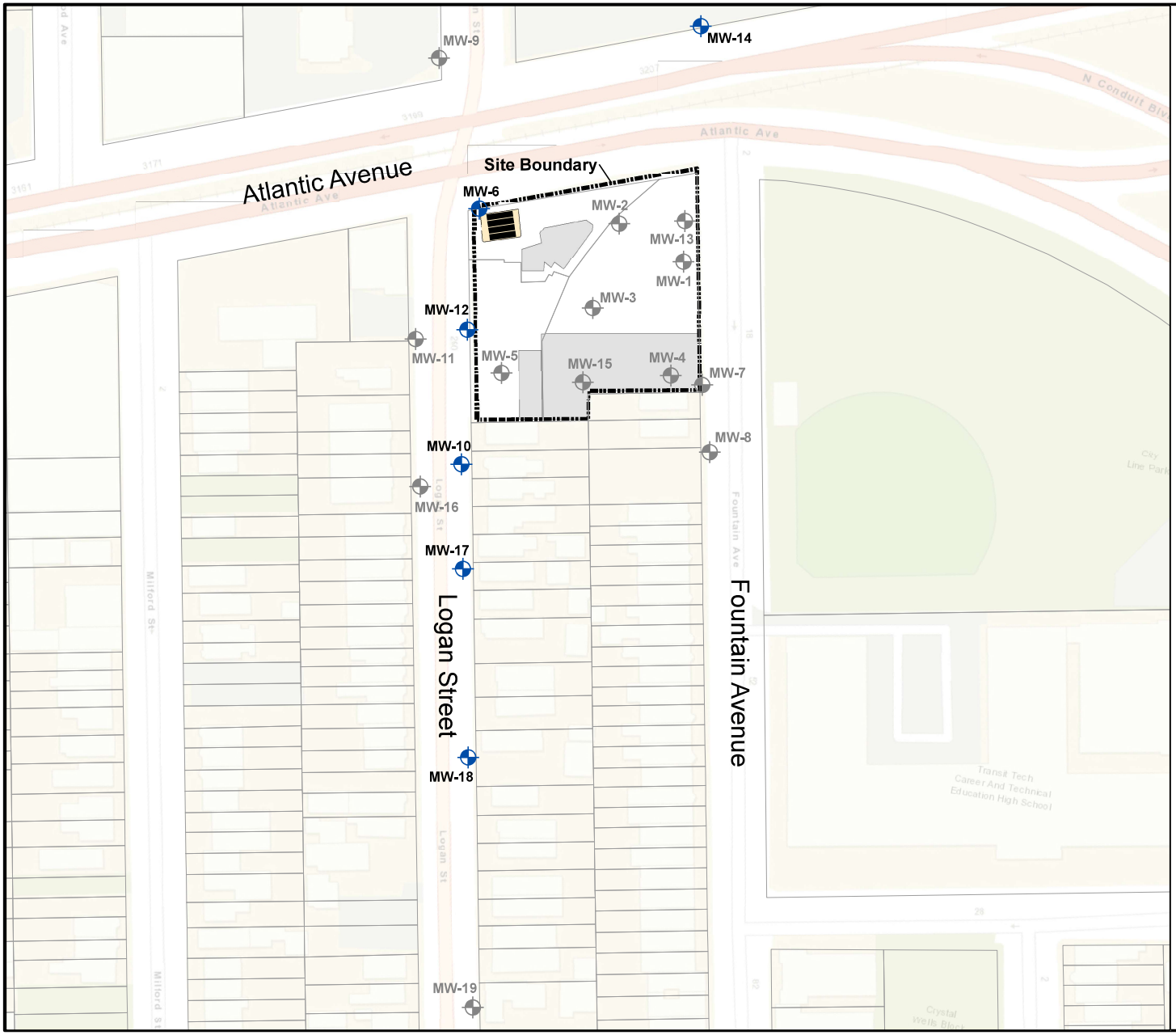
Tax Lot Source: http://gis.nyc.gov/taxmap/map.htm

Site Layout: MHG, Cellar Floor Plan, A-100.00 8/31/18

Drawing Title: **Remedial Cover Locations**	Drawn By: LM	Tenen Environmental	Site: **3200 Atlantic Avenue Brooklyn, New York Block 4154, Lot 28**
	Checked By: AP		
Drawing No: Figure 3	Date: July 2019	Tenen Environmental, LLC 121 West 27th Street Suite 702 New York, NY 10001 O: (646) 606-2332 F: (646) 606-2379	
	Scale: As Noted		



Drawing Title: **Soil Vapor Extraction (SVE) Pilot Test Layout**	Drawn By: LM	TENEN ENVIRONMENTAL	Site: **3200 Atlantic Avenue Brooklyn, New York Block 4154, Lot 28**
	Checked By: MC	Tenen Environmental, LLC 121 West 27th Street Suite 702 New York, NY 10001 O: (646) 606-2332 F: (646) 606-2379	
Drawing No: Figure 4	Date: August 2019		
	Scale: As Noted		



Legend

- Proposed Post-Remedial Groundwater Sampling Location
- Permanent Monitoring Well - Not to be Sampled
- MapPluto_18V2p1
- (4) 4,000 Gallon Gasoline Tanks
- Tank Field Pad
- Project Site
- On-site Buildings

Notes:

1. MW-10, MW-12 and MW-18 were previously installed as part of the Remedial Invesitgation, and will be sampled as part of this investigation.
2. MW-6 will be re-installed in the sidewalk on Atlantic Avenue as-shown, adjacent to it's current location.

Service Layer Credits: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri

Tax Lot Source: http://gis.nyc.gov/taxmap/map.htm

0 45 90 180 Feet

Site: 3200 Atlantic Avenue, Brooklyn, New York, Block 4154, Lot 28

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Drawn By	Checked By	Date	Scale
LM	AP	October 2019	As Noted

Drawing Title: Proposed Post-Remedial Groundwater Sampling Locations

Drawing No: Figure 5