FORMER ARKANSAS CHEMICAL CO., INC SITE
74 WALLABOUT STREET
BROOKLYN, NEW YORK
BCP NO. C224172
NYSDEC SPILL NO. 12-13721

REMEDIAL ALTERNATIVES EVALUATION
&
REMEDIAL WORK PLAN

SUBMITTED TO:

New York State Department of Environmental Conservation
Division of Environmental Remediation
625 Broadway
Albany, New York 12233-7016

PREPARED FOR:

74 Wallabout LLC
505 Flushing Avenue, Suite 1D
Brooklyn, New York 11205

PREPARED BY:

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PWGC Project Number: RAB1301

AUGUST 2014

PWGC
Strategic Environmental Engineering Solutions

P.W. GROSSER CONSULTING PC
PROJECT No. RAB1301

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74 WALLABOUT STREET
BROOKLYN, NEW YORK

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CERTIFICATION

I, PAUL K. BOYCE certify that I am currently a New York State registered professional engineer (PE), as defined in 6 New York Codes, Rules and Regulations (NYCRR) Part 375, and that this Remedial Alternative Evaluation and Remedial Work Plan were prepared in accordance with all applicable statutes and regulations and in substantial conformance with the Division of Environmental Remediation (DER) Technical Guidance for Site Investigation and Remediation (DER-10) and that all activities were performed in full accordance with the DER-approved work plan and any DER-approved modifications.

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.

PAUL K. BOYCE	08.29.14	Paul Boyce
PE Name	Date	Signature

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

1.0 INTRODUCTION

P.W. Grosser Consulting Engineer & Hydrogeologist, PC (PWGC) has prepared the following Remedial Alternatives Evaluation and Remedial Work Plan for the Former Arkansas Chemical Company Site located at 74 Wallabout Street in Brooklyn, New York. This was prepared on behalf of 74 Wallabout, LLC as part of the remediation under New York State Department of Environmental Conservation's (NYSDEC's) Brownfield Cleanup Program (BCP).

1.1 Site Description and history

1.1.1 *Site Description*

The subject property is approximately 0.91 acres in area and is currently undeveloped. The site was formerly improved with a 44,700 square foot, two- to three-story warehouses which were demolished between July and August 2013, an accessory at-grade parking and loading area at the northwest corner of the lot, and a smaller fenced-in parking area at the southwest corner of the lot. The property is bordered on the north by Wallabout Street and residential property, on the east by a hotel and school, on the west by Kent Avenue and residential and commercial properties, and on the south by Flushing Avenue and a vacant lot and commercial property.

The site is currently planned for development of a multi-story mixed use building. A Vicinity Map is included as **Figure 1**; a Site Plan with proposed redevelopment is included as **Figure 2**.

1.1.2 *Site History*

Combinations of residential, mixed and commercial buildings were demolished and several commercial buildings and a portion of the recently demolished commercial building were constructed at the subject site in 1926 and 1927. A commercial building was demolished prior to 1950 and the southern asphalt parking area was constructed at the subject site. A commercial building was demolished and the remaining portion of the current commercial building was constructed at the subject site in 1945. A commercial building was demolished prior to 1965 and the northern asphalt parking area was constructed at the subject site.

A review of available New York Telephone Address Directories, New York City Department of Buildings (NYCDOB) Certificates of Occupancy, and available Sanborn Fire Insurance Maps indicated the subject site was utilized in the past by a chemical manufacturer, furniture manufacturer, shelving company, paint and varnish manufacturer, lumber company, cable and rope company, packaging company, plastic processing company, a cleaner industries company and a housewares and household chemicals distributing company. No determination regarding the usage, storage or disposal of hazardous wastes while these facilities were in operation could be made.

1.1.3 *Regional Geology / Hydrogeology*

The subject property is located over the Long Island aquifer system, which underlies all of Nassau, Suffolk, Kings (Brooklyn), and Queens Counties. The unconsolidated aquifer formations form a southward-dipping wedge that

attains a maximum thickness in Kings County of approximately eight-hundred (800) feet in southeast area of Brooklyn. Overlying bedrock in the area is the Lloyd, Magothy, Jameco, and Upper Glacial aquifer systems. The Upper Glacial aquifer overlies all underlying units and is found at the surface in nearly all of Kings and Queens Counties.

The site overlies an interconnected aquifer system consisting of the upper glacial deposits and the underlying Magothy Formation. Depth to groundwater in the underlying glacial aquifer is approximately 12 feet below ground surface (bgs). The lithologic description of the sediments from soil borings installed during previous investigations at the site identifies the materials as fill material to approximately eight feet below grade underlain by layers of fine to medium silty sands and silt.

Regional groundwater flow direction is east-southeast to west-northwest. Municipal water supply is provided by the New York City Department of Environmental Protection.

1.1.4 *Site Topography*

The site is located approximately 15 feet above mean sea level. The topography of the site and general area is relatively flat with a slight downward slope to the northwest.

No erosion of surface areas was noted. Precipitation discharges into the municipal sewer/storm water system with no evidence of overland flow away from the site towards surface-water bodies.

The nearest surface-water body is the Wallabout Channel located approximately ½ mile to the northwest (see **Figure 1**). Based upon site topography, overland flow to this surface-water body is unlikely.

1.1.5 *Current and Future Site Use*

The site is currently undeveloped. The proposed development would consist of a 7-story mixed use building consisting of approximately 135 residential units (approx.150,000 gross square feet), ground floor retail space (approx. 29,000 gross square feet), and a below-grade accessory garage with approximately 60 parking spaces. In addition, approximately 5,000 square feet of the site would remain undeveloped fronting Flushing Avenue and will be given to the adjacent existing private school (Yeshiva Bnos Ahavas Israel), to facilitate its expansion with a 5-story addition (approx. 18,000 gross square feet) in the future. Redevelopment of the site will include excavation to a minimum depth of ten feet across the entire property.

1.1.5.1 Surrounding Land Use

The property is bordered on the north by Wallabout Street and residential property, on the east by a hotel and school, on the west by Kent Avenue and residential and commercial properties, and on the south by Flushing Avenue and a vacant lot and commercial property. The residential areas have municipal water service.

2.0 PREVIOUS INVESTIGATIONS/REMEDIAL EFFORTS

2.1 Phase I Environmental Site Assessment (ESA) (2006)

Middleton Environmental, Inc. (MEI) conducted a Phase I ESA for the site in October 2006. The Phase I ESA identified several historical uses of environmental concern including, a chemical company (Arkansas Chemical Co., Inc.), a paint and varnish manufacturing company, a rope manufacturing company, a plastic processing company, a cleaner industries company, a soap company, a wood working company, a lumber company, a shelving company, and a houseware and household chemicals distributing company (Lee Distributors). No specific determination regarding the usage, storage or disposal of hazardous wastes/materials while these businesses were in operation could be made, however a 1948 Certificate of Occupancy identified permissible use at the site as the manufacture and storage of paints and varnishes. The Phase I ESA also identified suspect underground storage tanks (USTs), storm water drywells and several metal floor plates of unknown usage at the site.

2.2 Phase II ESA (2007)

PWGC conducted a Phase II ESA for the site in January 2007. The purpose of the Phase II ESA was to address the recognized environmental conditions specified in the MEI Phase I ESA Report. Due to access limitations, the Phase II ESA was limited to the northern half of the site. No investigation was conducted on the southern half of the property. The Phase II ESA included a geophysical survey of accessible areas and a subsurface investigation consisting of the installation of 8 soil borings to depths between 4.5-16 feet bgs.

A geophysical survey was performed on December 22, 2006. Due to access limitations, the geophysical was limited to the northern half of the site. Due to the nature of the existing reinforced concrete slab, a magnetometer survey was not performed. NOVA Geophysical and Environmental Services (NOVA) of Douglaston, New York performed a Ground Penetrating Radar (GPR) and Noggin's Concrete Imaging survey to locate anomalies indicative of buried USTs at the site. GPR profiles collected within the northeast corner of the existing building appeared to be consistent with the size and shape of six (6) 550-gallon USTs. Additionally, six vent lines (connected to the suspected USTs) were located on the northeast corner of the building. Additional anomalies suspected to be scrap metal or concrete rubble were also identified across the site.

Four borings were installed around the identified anomaly located at the northeast corner of the site and the remaining four borings were spread across the site. Three groundwater samples were collected from the borings advanced near the USTs. Groundwater was encountered at approximately 12 feet bgs. The Phase II ESA included analysis of soil and groundwater samples for volatile organic compounds (VOCs) and semi-volatile organic compounds (SVOCs).

While the subsurface conditions around the USTs did not indicate evidence of a release, the Phase II ESA did identify an area beneath the paved portion of the site with elevated SVOC concentrations that exceed what would typically be associated with historic fill.

Visual/olfactory evidence of impact and/or elevated photoionization detecter (PID) readings were reported at several boring locations. A total of six soil samples and three groundwater samples were submitted for analysis.

Acetone was detected above NYSDEC Part 375 Unrestricted Use Soil Cleanup Objectives (UUSCOs) in one of the six soil samples analyzed. Acetone is a common laboratory contaminant. Several SVOCs were detected in each of the samples above NYSDEC Part 375 UUSCOs and one sample collected contained SVOCs concentrations above NYSDEC Part 375 Industrial Use SCOs. The concentrations of SVOCs at this location may indicate an as yet unidentified source of contamination. Based upon these findings and the historic use of the site, the Phase II ESA recommended additional investigation which would include the entire site as well as analysis for a wider range of potential contaminants of concern (COCs) that better reflect the past site uses (e.g. pesticides, polychlorinated biphenyls (PCBs) and heavy metals).

Acetone was detected in the three groundwater samples submitted for analysis; one sample contained acetone concentrations above NYSDEC groundwater guidance value. Acetone is a common laboratory contaminant. Several SVOCs were detected in each of the three samples at concentrations exceeding NYSDEC groundwater standards.

2.3 Supplemental Phase II ESA (2012)

Prior to being accepted into the NYSDEC BCP, PWGC conducted a Supplemental Phase II ESA in December 2012 to characterize the southern half of the site and to further delineate the extent of elevated SVOCs identified during the January 2007 Phase II ESA. The Supplemental Phase II ESA included a subsurface investigation consisting of the installation of eight soil borings (SB009 – SB016) to a depth of 20 feet bgs, three groundwater monitoring wells (MW001 – MW003), and three temporary soil vapor sampling ports (SV001 – SV003).

One VOC, 2-butanone, was detected above NYSDEC Part 375 UUSCOs in one of the eight soil samples analyzed. Several SVOCs were detected in four of the ten collected samples above NYSDEC Part 375 UUSCOs. The concentrations in one (SB013) of the four elevated samples was comparable to the concentrations seen in SB-8 during the Phase II ESA performed in 2007. Pesticides were detected in four of the ten soil samples above NYSDEC Part 375 UUSCOs. Metals were detected in twelve of the thirteen samples above NYSDEC Part 375 UUSCOs and mercury exceeded the NYSDEC Part 375 Industrial Use SCO in four of the soil samples.

Three groundwater monitoring wells were installed at the site to determine groundwater quality. Light non-aqueous phase liquid (LNAPL) was observed in one of the three newly installed groundwater monitoring wells (MW002). Groundwater samples were collected from the two groundwater monitoring wells not containing LNAPL and from two temporary groundwater points to determine groundwater quality. In addition, an LNAPL sample was collected for identification.

One VOC, naphthalene, was detected in one of the groundwater samples above NYSDEC Guidance Value.

Several SVOCs were detected in each of the four groundwater samples above NYSDEC Ambient Water Quality Standards (AWQS). Several metals were detected in both the total and dissolved groundwater samples above NYSDEC AWQS; however mercury was not detected above the AWQS in the dissolved groundwater samples. The LNAPL was determined to most closely match gasoline.

Three temporary soil vapor samples were collected at the site to determine soil vapor concentrations. Several VOCs were detected in each of the three samples. None of the compounds associated with the New York State Department of Health (NYSDOH) decision matrices were detected.

2.4 Remedial Investigation (2013)

A Remedial Investigation (RI) was performed at the site in 2013 by PWGC. The scope of work for the RI was detailed in a RI Work Plan dated June 2013, and a RI Work Plan Addendum dated July 1, 2013. Field work for the RI was completed between July and August 2013, and is documented in a draft RI Report dated September 2013. The final RI Report was submitted on April 30, 2014. The scope of work for the RI consisted of:

- Geophysical Investigation
- Characterization of pits and concrete vault
    - Removal and proper disposal of liquids and sediment
    - Installation of two shallow soil samples beneath two structures found to have earthen bottoms
- Installation of seven soil borings.
    - Collection and analysis of soil samples from 0-2 feet, 6-8 feet, and 10-12 feet
- Installation of three temporary groundwater sampling points.
- Installation of four observation wells and two groundwater monitoring wells
    - Monitoring of all site wells
    - Sampling of new wells not containing LNAPL
- Installation of four soil vapor points

The geophysical investigation identified one additional anomaly at the site which shows similar characteristics of a 550-gallon UST located in the northwest parking area of the site. No additional new anomalies were identified. An additional UST was identified during removal of the concrete slab in the southwest portion of the site.

One large concrete vault and fifteen pits were located within the building slab at the site. Sediment within the structures was found to contain elevated levels of VOCs, SVOCs, metals, and pesticides. Liquids and sediment were removed from each structure so that a visual inspection could be performed on the base of each structure. All but two structures were found to have solid concrete bottoms and be in sound condition. Shallow soil samples were collected beneath the structures in contact with the subsurface.

Seven soil borings were conducted throughout the site to a depth of 12 to 14 feet bgs, soil samples were collected, characterized, and analyzed. Analytical results indicated that soils across the entire site contained elevated concentrations of VOCs, SVOCs, pesticides, and metals to a depth of ten feet below grade. SVOCs

and metals were elevated at a depth greater than eight feet. The concentrations were fairly uniform with the exception of significantly higher SVOCs and metals in the center of the property and in the northwest corner of the property.

Two groundwater monitoring wells, four observation wells and three temporary groundwater sampling points were installed at the site. The newly installed groundwater monitoring wells were developed within 48 hours of installation. The newly installed monitoring wells and observation wells were monitored along with the existing groundwater monitoring wells at the subject site. LNAPL was identified in two groundwater monitoring wells (MW002 and MW005) and three observation wells (OB001, OB002, and OB004). Groundwater samples were collected from groundwater monitoring wells and observation wells not containing LNAPL and the three temporary groundwater sampling points. Analytical results identified minor petroleum impacts in the vicinity of the LNAPL plume, SVOC and metals impacts across the site. Impacts were relatively minor with the exception of metals at the SB022 location which contained elevated levels of lead and mercury within the dissolved groundwater sample.

Four soil vapor points were installed onsite, sampled, and analyzed. Several VOCs were detected in each of the four samples. One VOC, trichloroethene (TCE), was detected above the NYSDOH decision matrices level of 50 $\mu g/m^3$.

The RI concluded the following:

- The static water table elevation at the site is between 5 feet in the northwest portion of the property were the elevation of the site is significantly lower to 9 feet bgs. Recent work has shown that groundwater has been measured at approximately 7 feet bgs in off-site monitoring wells.
- Groundwater beneath the site flows toward the west-northwest.
- An LNAPL plume is present in the southwestern portion of the property. The LNAPL was identified as gasoline in nature from laboratory analysis. The LNAPL was thickest at the MW005 location (4.95 feet). The source of LNAPL is likely related to the UST in the southwest portion of the property. Further observations subsequent to the RI have identified the oil as either #4 or #6 fuel oil.
- Soil across the site contains VOCs, SVOCs, pesticides, and/or metals above UUSCOs. Two hot spot areas were identified in the center of the property and the northwest corner which contained significantly higher concentrations of SVOCs and metals. Contaminants are likely inherent in the fill material beneath the subject property. Soil contamination generally decreased with depth and only SVOCs and metals were detected above UUSCOs in the soils below ten feet bgs.
- Groundwater at the site has minor detections of VOCs, SVOCs, and/or dissolved metals above Guidance Values or AWQS. The compounds detected were also detected in the soils beneath the site and are likely migrating from the soil into the groundwater. There does not appear to be significant groundwater impact migrating off the site with the exception of the LNAPL plume in the southwest portion of the property.
- The fate and transport of contaminants identified is a function of the properties of the individual

contaminants, the geology and hydrogeology of the site, and available pathways for the contaminants to migrate. The following factors were considered when determining the fate and transport of the contaminants identified on-site: the relatively small size of the Site, the concentrations and locations of soil, groundwater, and soil vapor impact within the Site, and the measured groundwater flow direction towards the northwest. Based upon these factors, the LNAPL plume has likely migrated beneath Kent Avenue and there is potential for off-site soil vapor impact from the LNAPL plume.

- The possible on-site exposure pathways are by ingestion, inhalation, or dermal exposure to workers during construction activities or to site trespassers. Off-site exposure scenarios include inhalation of particulates during construction and possible off-site LNAPL migration. These exposures would likely not be extensive given the intermittent nature and duration or the site construction activities. There is no plausible off-site ingestion or dermal exposure pathway. Vapor migration into the on-site buildings and vapor exposure to future residences is a possible exposure pathway dependent on the extent of LNAPL.
- Because of the relatively small size of the Site and the observed levels of onsite impact in soil, groundwater and soil vapor, future onsite populations are potential receptors if appropriate Institutional Controls / Engineering Controls (ICs/ECs) are not properly implemented.

2.5 Interim Remedial Measure

The Interim Remedial Measure Work Plan (IRMWP) was submitted in October 2013 and approved by NYSDEC in November 2013. IRM activities included the following:

- Delineation of chromium (SB017 6'-8') and mercury (SB015 8'-10') hot spots (**Figure 3**),
- Removal of out-of-service USTs (**Figure 4**),
- Characterization of subsurface soils around removed USTs (**Figure 5**),
- Excavation and disposal of soils across the site to a minimum depth of ten feet below grade. Final excavation depths will be based on results of post-excavation confirmatory sampling and NYSDEC approval (**Figure 6**),
- Removal of LNAPL
- Application of Oxygen Release Compound (ORC) and/or Chemical Oxidant (if applicable),
- Installation of a vapor barrier (**Figure 7**), and
- Backfill to grade with clean fill the portion of the site to be used for future school expansion (**Figure 7**).

Additionally, a combination of generic and site specific soil cleanup objectives were identified for the site. Levels of VOCs, pesticides and PCBs in the deepest soil samples collected at the site (10-12 feet bgs) contained concentrations below Part 375 UUSCOs. However several SVOCs and metals exceeded UUSCOs. For the purposes of the IRM, the following cleanup objectives were used to determine when IRM soil removal was completed:

- UUSCOs for VOCs, Pesticides, and PCBs,
- Protection of groundwater SCOs for SVOCs,
- Restricted residential SCOs for all metals except arsenic and mercury,

- Arsenic SCO of 40 milligrams per kilogram (mg/kg),
- Mercury SCO of 5.7 mg/kg.

2.5.1 *Subsequent IRM Modifications*

2.5.1.1 Acetone SCOs

On July 30, 2014, PWGC received approval for an additional site-specific SCO modification for acetone. The site-specific SCO for acetone was established at the restricted residential SCO of 100 mg/kg.

2.5.1.2 LNAPL Mitigation and Remediation

On July 25, 2014, PWGC submitted an IRMWP Clarification letter detailing remediation procedures being implemented to mitigate the potential for LNAPL located in the sidewalk from migrating back onto the site once on-site LNAPL removal has been completed and end-point samples are collected. Mitigation and remedial efforts include:

- Steel Sheeting along the perimeter for shoring purposes will act as a barrier between the LNAPL in the sidewalk and the site;
- LNAPL is being removed from off-site wells by Vacuum Enhanced Fluid Recovery (VEFR) events and hand bailing;
- Dewatering of on-site groundwater/LNAPL to approximately 12 feet bgs in areas where LNAPL is present on-site; and,
- The area with on-site LNAPL will be backfilled with stone and the vapor barrier and concrete installed.

2.5.1.3 Alternative Vapor Barrier

On July 10, 2014, PWGC submitted an IRM addendum to NYSDEC. The addendum proposed a substitution for the vapor barrier material identified in the IRM Work Plan. The addendum identified the alternative vapor barrier as a Class A vapor barrier in accordance with ASTM-E 1745 and equivalent to the originally proposed vapor barrier. PWGC received approval from NYSDEC for the alternate vapor barrier system on July 11, 2014.

The IRM is currently being implemented and all work under the IRM will be documented in the Final Engineering Report (FER).

3.0 AOCS/COCS BY MEDIA

3.1 Extent of Contamination in Soil

The following was utilized for the evaluation of contamination in soil:

1. Subsurface soil samples were collected from the two foot interval below refusal depth (4-6 feet) or the water table (9-11 feet) during the Phase II Investigation (December 2006). Subsurface soil samples were analyzed for the presence of VOCs and SVOCs.
2. Subsurface soil samples were collected from varying depths and at least one interval from each boring during the Supplemental Phase II Investigation (December 2012). Subsurface soil samples were analyzed for the presence of VOCs, SVOCs, pesticides, PCBs, and metals.
3. Subsurface soil samples were collected at three depths during the RI Investigation; 0-2 feet bgs, 6-8 feet bgs, and 10-12 feet bgs and from beneath two pits found to have contact with the subsurface. Subsurface soil samples were analyzed for the presence of VOCs, SVOCs, pesticides, PCBs, and metals.

Analytical results identified the presence of:

- Several VOCs were detected above UUSCOs including acetone in SB-1, SB-2, SB-3, SB-4, SB-6, SB-8, SB019, SB022, and SB023, benzene in SB022, p/m-xylene in SB021 and SB022, and trichloroethene in SB022. Contamination was limited to the shallow intervals (0-2 feet and 6-8 feet).
- Several SVOCs were detected above UUSCOs in several soil borings including acenaphthene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, dibenzofuran, fluorine, ideno(a,2,3-cd)pyrene, naphthalene, phenanthrene, and/or pyrene. SVOCs were significantly higher in the 4-6 foot interval from SB-8, the 6-8 foot interval from SB013, SB018, and SB021 when compared to the rest of the samples.
- Several metals were detected above UUSCOs in several of the borings including arsenic, barium, cadmium, chromium, copper, lead, mercury, nickel and zinc. In general, concentrations were highest in the shallow soil intervals and decreased in the deeper intervals.
- Pesticides, Alpha-BHC, 4,4'-DDD and/or 4,4'-DDT, were detected above UUSCOs in several of the samples. The detections were limited to the shallow soil intervals and were not detected in the deepest soil interval (10-12 feet).

The presence of SVOCs, pesticides, and metals is likely attributed to fill material at the site. The highest concentrations were observed between four and eight feet below grade. Spread or migration of contaminants is likely a result of physical processes and should be limited to the soils immediately beneath the site and localized groundwater.

3.2 Extent of Contamination in Groundwater

The following was utilized for the evaluation of contamination in groundwater:

1. Three groundwater samples collected adjacent to the UST during the Phase II Investigation (December 2006). Groundwater samples were analyzed for VOCs and SVOCs.

2. Three permanent and two temporary groundwater monitoring wells were installed during the Supplemental Phase II Investigation (December 2012). Groundwater samples were collected from four of the five wells and analyzed for the presence of VOCs, SVOCs, pesticides, PCBs, and metals. LNAPL was observed in one well and not sampled.
3. Two groundwater monitoring wells, four observation wells and three temporary groundwater sampling points were installed during the RI (July and August 2013). Groundwater samples were analyzed for the presence of VOCs, SVOCs, pesticides, PCBs, and metals. LNAPL was observed in two wells and not sampled.

Groundwater analytical results identified the presence of:

- LNAPL was observed in three monitoring wells. The LNAPL was determined to most closely match gasoline.
- Several VOCs were detected above AWQS. Acetone was detected above its Guidance Value in GW-2, naphthalene was detected above Guidance Value in GW013, and benzene was detected above AWQS in OB003. Acetone is a common laboratory contaminant. No other VOCs were detected above AWQS or Guidance Values.
- Several SVOCs were detected above AWQS in multiple groundwater samples (GW-1, GW-2, GW-3, GW011, GW013, MW001, MW005, SB020(GW) and SB021(GW)) including acenaphthene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, ideno(a,2,3-cd)pyrene, fluorine, naphthalene, phenanthrene, and pyrene. The detections were relatively low and are not indicative of a release condition with the exception of MW005 which contained LNAPL.
- Several metals were detected above AWQS in each of the dissolved groundwater samples including antimony, iron, lead, manganese, mercury, and sodium. Lead and mercury were limited to one sample (SB022). The other metals detected are relatively common in groundwater and are likely naturally occurring due to the composition of soils in the aquifer.

The presence of VOCs in groundwater at the site is likely related to the gasoline LNAPL plume; SVOC and metals impact is likely related to the presence of historic urban fill material beneath the site. The spread or migration of contaminants is likely to be localized and dependent on groundwater flow direction and velocity.

3.3 Extent of Contamination in Soil Gas

During the Supplemental Phase II ESA completed in 2012, three temporary soil vapor samples were collected at the site to determine soil vapor concentrations. Several VOCs were detected in each of the three samples. None of the compounds associated with the NYSDOH decision matrices were detected.

During the RI completed in 2013, four soil vapor points were installed onsite, sampled, and analyzed. Several VOCs were detected in each of the four samples. One VOC (TCE) was detected above the NYSDOH decision matrices level of 50 µg/m^3.

4.0 QUALITATIVE HUMAN EXPOSURE ASSESSMENT

The overall purpose of the Qualitative Human Exposure Assessment is to evaluate and document how people might be exposed to site related contaminants and to identify and characterize the potentially exposed population(s) now and under reasonably anticipated future use of the site. To evaluate if an exposure pathway exists, the exposure assessment should assess the quality, representativeness, and adequacy of the available data. In addition, the qualitative exposure assessment should consider the nature of populations currently exposed or that has the potential to be exposed to site related contaminants both on-site and off-site and describe the reasonably anticipated future land use of the site and affected off-site areas.

4.1 Contaminant Source

The subject site is located at 74 Wallabout Street in Brooklyn, New York and is currently a 0.91 acre vacant lot enclosed with construction fence. The site was formerly improved with a 44,700 square foot, two to three-story warehouses which were demolished between July and August 2013, an accessory at-grade parking and loading area at the northwest corner of the lot, and a smaller fenced-in parking area at the southwest corner of the lot. The site has been historically utilized by a chemical company (Arkansas Chemical Co., Inc.), a paint and varnish manufacturing company, a rope manufacturing company, a plastic processing company, a cleaner industries company, a soap company, a wood working company, a lumber company, a shelving company, and a housewares and household chemicals distributing company (Lee Distributors).

Investigations at the subject site have identified the presence of LNAPL in the southwestern portion of the property, levels of SVOCs and metals exceeding UUSCOs throughout the site, and low levels of VOCs and pesticides in isolated sampling locations.

The source of LNAPL is likely related to an UST identified in the southwest portion of the property. Elevated levels of SVOCs and metals and minor detections of VOCs and pesticides within the subsurface are likely related to the presence of urban fill material beneath the subject site. The highest concentrations were observed in samples collected from four to eight feet bgs.

4.2 Contaminant Release and Transport

LNAPL is present at the soil/water table interface in the southwestern portion of the property. LNAPL as pure product was likely released from the UST and infiltrated the subsurface soils and groundwater beneath the southwestern portion of the property.

Elevated levels of SVOCs and metals and minor detections of VOCs and pesticides are present in subsurface soils at the site. The highest concentrations were observed in the center of the property and in the northwestern corner of the property. SVOCs and metals are likely related to the urban fill material observed beneath the site as potential source areas were ruled out.

LNAPL has been observed to be contained to the southwestern portion of the property and in adjacent off-site monitoring wells. Impact into the East River is unlikely due to its approximately one half mile southeast distance from the site.

SVOCs and metals detected within subsurface soils are also present in groundwater at the site. The concentrations in the groundwater are relatively minor and appear to be contained to the site.

Elevated concentrations of several VOCs were detected at concentrations greater than NYSDOH AGVs and/or USEPA TSGCs in on-site soil vapor samples collected. Off-site exposure scenarios include inhalation of particulates during construction and possible off-site LNAPL migration. Vapor migration into the on-site buildings and vapor exposure to future residences is a possible exposure pathway dependent on the extent of LNAPL.

4.3 Points and Routes of Exposure

The VOCs, SVOCs, metals, and pesticides detected at the site can have adverse effects on human health and can be absorbed after ingestion, inhalation, or dermal exposure.

The possible on-site soil exposure pathways are by ingestion, inhalation, or dermal exposure by a person on the site (trespasser or construction worker). Ingestion, inhalation, and dermal exposure of workers at the site during construction would not likely be extensive given the intermittent nature of exposure. Off-site exposure scenarios include inhalation of particulates during construction. These exposures would likely not be extensive given the intermittent nature and duration of the site construction activities. There are no plausible off-site ingestion or dermal exposure pathways.

Once development is completed the entire site would be covered by either a concrete surface or two feet of clean fill material. Ingestion and dermal contact would therefore not be a plausible exposure pathway once construction is completed. A route of exposure through inhalation of soil vapor will be minimized by removing the most impacted soils and LNAPL during redevelopment. In addition, a waterproofing membrane will be installed as part of the construction of the building and will also satisfy the requirements of a vapor barrier to further reduce the potential for inhalation exposure from remaining levels of VOCs at the site.

There is a limited off-site pathway for ingestion or inhalation exposure since the constituents of concern and LNAPL have the potential to migrate off-site with the natural movement of groundwater. The groundwater pathway is not a complete route of exposure because the site is within the boundary of New York City which is supplied with potable water by surface reservoirs that are located outside of the New York City area. Thus there are no public drinking water wells in the vicinity of the site that would complete the route of exposure for ingestion. Although vapor intrusion is possible if LNAPL and its constituents migrate with groundwater flow beneath adjacent buildings, on-site vapor data does not indicate a potential for off-site vapor concerns.

4.4 Characterization of Potential Receptor Populations

The subject site is located at 74 Wallabout Street in Brooklyn, New York and is currently a 0.91 acre vacant lot enclosed with construction fence. The property is bordered on the north by Wallabout Street and residential property, on the east by a hotel and school, on the west by Kent Avenue and residential and commercial properties, and on the south by Flushing Avenue and a vacant lot and commercial property. The neighboring properties also consist of densely populated residential and commercial properties.

Because of the relatively small size of the Site, the observed levels of on-site impact in soil, groundwater and soil vapor, and off-site migration of LNAPL, future on-site and off-site populations are potential receptors if appropriate ICs/ECs are not properly implemented.

4.5 Qualitative Human Health Exposure Assessment Summary Table

The following table provides a summary of the routes of exposure:

Environmental Media & Exposure Route	Human Assessment
Direct contact with surface soils	• Public access is restricted by fencing. • The majority of source area soils will be removed during redevelopment. • Construction workers can come into contact during development. • Future contact will be prevented by engineering controls such as a composite cap system.
Direct contact with subsurface soils	• Workers can come into contact if they complete ground intrusive work at the site.
Direct contact with groundwater	• Workers can come into contact if they complete ground intrusive work at the site.
Ingestion of groundwater	• Groundwater is not utilized for drinking water. New York City public drinking water is supplied from reservoirs outside of the New York City area. • There are no known domestic water supply wells in the area.
Inhalation of air	• The majority of source area soils and LNAPL will be removed during redevelopment. • Workers can come into contact if they complete ground intrusive work at the site. • An engineering control (i.e. composite cap system/vapor barrier) will be installed on site as part of the final remedy to mitigate the potential for vapor entering the building.
Direct contact with surface waters	• Groundwater discharges to surface waters to the west-northwest are not anticipated based upon on-site groundwater concentrations and the distance to the water body.

5.0 REMEDIAL ALTERNATIVES EVALUATION

This section presents an analysis of remedial actions that can potentially be achieved under the BCP.

5.1 Remedial Action Objectives

The final remedial measures must satisfy Remedial Action Objectives (RAOs). RAOs are site-specific statements that convey goals for minimizing or eliminating substantial risk to human health and the environment.

Appropriate RAOs for this site are:

1. Prevention of ingestion or direct contact with soil that contains contaminants above SCOs
2. Mitigate contaminate migration to groundwater and the discharge of contaminants off-Site

In addition to achieving RAOs, NYSDEC's BCP calls for remedy evaluation in accordance with DER-10. The remedial actions have been identified and developed based on the following criteria:

- **Overall Protection of Public Health and the Environment**. This criterion is an evaluation of the remedy's ability to protect public health and the environment, assessing how risks posed through each existing or potential pathway of exposure are eliminated, reduced, or controlled through removal, treatment, engineering controls, or institutional controls.
- **Compliance with Standards, Criteria, and Guidance (SCGs)**. Compliance with SCGs address whether a remedy will meet applicable environmental laws, regulations, standards, and guidance.
- **Long-Term Effectiveness and Permanence.** The criterion evaluates the long-term effectiveness of the remedy after implementation. If wastes or treated residuals remain on-site after the selected remedy has been implemented, the following items are evaluated:
    - the magnitude of the remaining risk (i.e., will there be any significant threats, exposure pathways, or risks to the community and the environment from the remaining wastes or treated residuals)
    - the adequacy of the engineering and institutional controls intended to limit risk
    - the reliability of these controls, and
    - the ability of the remedy to continue to meet RAOs in the future
- **Reduction of Toxicity, Mobility or Volume with Treatment.** This criterion evaluated the remedy's ability to reduce the toxicity, mobility, or volume of Site contamination. Preference is given to remedies that permanently and significantly reduce the toxicity, mobility, or volume of the wastes at the Site.
- **Short-term Effectiveness**. Short-term effectiveness is an evaluation of the potential short-term adverse impacts and risks of the remedy upon the community, the workers, and the environment during construction and/or implementation. This includes a discussion of how the identified adverse impacts and health risks to the community or workers at the Site will be controlled, and the effectiveness of the controls. This criterion also includes a discussion of engineering controls that will be used to mitigate short term impacts (i.e., dust control measures), and an estimate of the length of time needed to achieve the remedial objectives.
- **Implementability**. The implementability criterion evaluates the technical and administrative feasibility of implementing the remedy. Technical feasibility includes the difficulties associated with the construction and the ability to monitor the effectiveness of the remedy. For administrative feasibility, the availability of the necessary personnel and material evaluated along with the potential difficulties in obtaining specific

operating approvals, access for construction, etc.

- **Cost.** Capital, operation, maintenance, and monitoring costs are estimated for the remedy and presented on a present worth basis.
- **Community Acceptance.** This criterion evaluates the public's comments, concerns, and overall perception of the remedy.

5.2 Alternatives Evaluation

The development consists of a 7-story mixed use building consisting of approximately 135 residential units (approx.150,000 gross square feet), ground floor retail space (approx. 29,000 gross square feet), and a below-grade accessory garage with approximately 60 parking spaces. The alternatives evaluation is based on the future development of the property and the completion of the IRM.

The alternatives include:

- The implementation of an Environmental Easement and Site Management Plan based upon the IRM completed work (Track 4)and,
- Unrestricted Use Cleanup (Track1)

5.2.1 *Implementation of an Environmental Easement and Site Management Plan (Track 4)*

The implementation of an Environmental Easement and Site Management Plan alternative will be implemented to manage remaining contamination at the site until the Environmental Easement is extinguished in accordance with New York State Environmental Conservation Law (ECL) Article 71, Title 36. The SMP will include:

- A summary of remedial investigation findings and remedial actions;
- A description of the Environmental Easement;
- An Engineering and Institutional Controls Plan. ECs would include the inspection of the composite cover system and the certification of the Environmental Easement. ICs at the Site would include groundwater use restriction and a use restriction allowing restricted residential use of the Site, but preventing less restrictive land use (i.e., unrestricted use) and an excavation work plan for future soil excavation work;
- A Site Monitoring Plan (SMP) that includes a site-wide inspection program to assure that the IC/ECs (i.e. vapor barrier and composite cover) have not been altered and remain effective, and defines engineering controls for the future school construction;
- A schedule and guidelines for Inspections Reporting and Certifications including Periodic Review.

5.2.1.1 Overall Protection of Public Health

This alternative is fully protective of human health and the environment and successfully achieves all RAOs for the Site. The SMP will include Site-wide Inspection program to assure that the IC/ECs on the Site have not been altered and remain effective.

5.2.1.2 Compliance with SCGs

This alternative is fully protective of human health and the environment and successfully achieves all RAOs for the Site. The SMP will include a Site-wide inspection program to assure that the IC/ECs placed on the Site have not been altered and remain effective.

5.2.1.3 Long-Term Effectiveness and Permanence

Removal of impacts to levels specified in sections 2.1.5 and 2.1.6 are expected to be achieved. As such, this alternative is expected to provide long-term effectiveness and permanence.

5.2.1.4 Reduction of Toxicity, Mobility, or Volume with Treatment

Through removal of impacted soil/fill exceeding the SCOs and the removal of LNAPL in groundwater, this alternative permanently and significantly reduced the toxicity, mobility, and volume of Site contamination. This alternative would also eliminate residual VOC soil impacts and, along with the vapor barrier installation, eliminate vapor intrusion concerns. The SMP will include a site-wide Inspection program to assure that the IC/ECs on the Site have not been altered and remain effective. Accordingly, this alternative satisfies this criterion.

5.2.1.5 Short-Term Effectiveness

The short-term adverse impacts and risks to the community, workers, and environment during implementation of this alternative will be related to soil exposure during excavation. Barriers/fencing will be placed around the Site to prevent trespassing. VOC and dust monitoring will performed during excavation and soil removal activities to assure conformance with NYSDOH-approved community air monitoring action levels. The potential for chemical exposures and physical injuries were reduced through safe work practices including proper personal protective equipment, environmental monitoring, and appropriate decontamination procedures. The alternative is expected to achieve the RAOs for the Site in approximately six months.

5.2.1.6 Implementability

No technical or action-specific administrative implementability issues are associated with implementation of this alternative.

5.2.1.7 Cost

SMP implementation and annual certification is estimated at approximately $5,000 to $10,000 per year. Estimated costs are detailed in **Appendix A**.

5.2.1.8 Community Acceptance

The RI Work Plan and IRMWP were advertised and made available for comment. No comments opposing the work were received. Community acceptance is evaluated based on comments to be received from the public in response to Fact Sheets and other planned Citizen Participation activities.

5.2.2 *Unrestricted Use Alternative*

The unrestricted use alternative would necessitate remediation of all soil/fill to unrestricted use SCOs and groundwater to AWQS. At a minimum, this work would involve additional remedial work for soil below the water table and groundwater. For unrestricted use scenarios, excavation and off-site disposal of impacted soil is generally regarded as the most applicable remedial measure, because ICs cannot be used to supplement the remedy. As such, the unrestricted use alternative assumes that excavation will continue until all endpoint soil samples achieve levels at or below UUSCOs. It is assumed that soil will be removed to 20 feet bgs. Additionally, it is assumed that dewatering occurring during excavation will effectively remediate groundwater to AWQS.

5.2.2.1 Overall Protection of Public Health

The unrestricted use alternative would achieve the corresponding Part 375 SCOs, which are designed to be protective of human health under any reuse scenario.

5.2.2.2 Compliance with SCGs

Similar to the Generic and Site-Specific Cleanup alternative soil/fill removal activities, the unrestricted use alternative would need to be performed in accordance with applicable, relevant, and appropriate standards, guidance, and criteria.

5.2.2.3 Long-Term Effectiveness and Permanence

The unrestricted use alternative would achieve removal of all residual impacted soil/fill and groundwater. Therefore, no soil/fill exceeding the UUSCOs or groundwater exceeding AWQS would remain on the Site. As such, the unrestricted use alternative would provide long-term effectiveness and permanence. Post-remedial monitoring and certifications would not be required.

5.2.2.4 Reduction of Toxicity, Mobility, or Volume with Treatment

Through removal of all impacted soil and groundwater, the unrestricted use alternative would permanently and significantly reduce the toxicity, mobility, and volume of Site contamination.

5.2.2.5 Short-Term Effectiveness

The short-term adverse impacts and risks to the community, workers, and environment during implementation of the unrestricted use alternative are similar to the Generic and Site-Specific Cleanup alternative and are controllable, but would increase the duration of time the community, workers and the environment is exposed to fugitive dust and off-site exposures during remediation.

5.2.2.6 Implementability

No technical implementability issues would be encountered in construction of the unrestricted use alternative. Administrative implementability issues may include the need for rezoning of the area since single family residential, agricultural, and other unrestricted uses are not consistent with current zoning or the reasonably anticipated future use of the Site.

5.2.2.7 Cost

The capital cost for this alternative is approximately $7,577,034. Estimated costs are detailed in **Appendix A**.

5.2.2.8 Community Acceptance

The RI Work Plan and IRMWP were advertised and made available for comment. No comments opposing the work were received. Community acceptance is evaluated based on comments to be received from the public in response to Fact Sheets and other planned Citizen Participation activities.

5.3 Recommended Remedial Measure

Based on the Alternatives Analysis evaluation, alternative no. 1 -the soil cleanup to Track 4 the implementation of Environmental Easement and an SMP is the recommended final remedial step for the Site.

6.0 REMEDIAL WORK PLAN

This Remedial Work Plan has been developed to ensure that the following controls established and the IRM actions are maintained. These include:

- A remedial excavation is currently being performed in accordance with the IRMWP which will result in the removal of soils which exceed site specific SCOs for the site as documented with endpoint soil sampling which are:
    - UUSCOs for VOCs (less acetone), Pesticides, and PCBs,
    - Protection of groundwater SCOs for SVOCs,
    - Restricted residential SCOs for acetone and all metals except arsenic and mercury,
    - Arsenic SCO of 40 milligrams per kilogram (mg/kg),
    - Mercury SCO of 5.7 mg/kg.
- A site cover will be required to allow for restricted residential use of the site. The cover will consist either of the structures such as buildings, pavement, sidewalks comprising the site development or a soil cover in areas where the upper two feet of exposed surface soil will exceed the applicable SCOs. Where the soil cover is required it will be a minimum of two feet of soil, meeting the SCOs for cover material as set forth in 6 NYCRR Part 375-6.7(d). The soil cover will be placed over a demarcation layer, with the upper six inches of the soil of sufficient quality to maintain a vegetation layer.
    - The portion of the site to be used for future school construction will be temporarily backfilled with soil that meets unrestricted use criteria until such time construction begins. Upon final construction the portion of the site will meet the cover requirements detailed above.
- Imposition of an IC in the form of an environmental easement for the controlled property that:
    - Requires the remedial party or site owner to complete and submit to the Department a periodic certification of IC/ECs in accordance with Part 375-1.8 (h)(3);
    - Allows the use and development of the controlled property for restricted residential, commercial and industrial uses as defined by Part 375-1.8(g), although land use is subject to local zoning laws;
    - Restricts the use of groundwater as a source of potable or process water, without necessary water quality treatment as determined by the NYSDOH or City Department of Health, and;
    - Requires compliance with the Department approved SMP.

The implementation of an SMP includes an IC/EC Plan that identifies all use restrictions and ECs 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:

- ICs: The Environmental Easement discussed above.
- ECs: The site cover discussed above.

The SMP will include, 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;
- Provisions for the management and inspection of the identified ECs;
- Maintaining site access controls and Department notification, and;
- The steps necessary for the periodic reviews and certification of the IC/ECs.

6.1 Engineering Controls

ECs (vapor barrier/composite cover) will be installed to prevent exposure to potential residual contamination at the site. Details of the installation will be documented in the FER.

6.2 Institutional Controls

In addition to the implementation of the NYSDEC approved remedial alternative, the use of ICs will be put in place for the site to provide notice that residual impact is present, and restrict/limit exposures to potential exposure pathways.

Imposition of an IC in the form of an environmental easement for the controlled property that:

- Requires the remedial party or site owner to complete and submit to the Department a periodic certification of IC/ECs in accordance with Part 375-1.8 (h)(3);
- Allows the use and development of the controlled property for restricted residential, commercial and industrial uses as defined by Part 375-1.8(g), although land use is subject to local zoning laws;
- Restricts the use of groundwater as a source of potable or process water; and
- Requires compliance with the Department approved SMP.

6.3 Site Management Plan

A SMP is required, which includes the following:

1. An IC/EC Plan that identifies all use restrictions and ECs for the site and details the steps and media-specific requirements necessary to ensure the following IC/ECs remain in place and effective:
    - ICs: Environmental Easement
    - ECs: The vapor barrier and composite cover

    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;
    - A prevision for evaluation of the potential for soil vapor intrusion for any buildings developed on the site, including provisions for implementing actions recommended to address exposures related to soil vapor intrusion;
    - Descriptions of the provisions of the environmental easement including any land use and

groundwater use restrictions;

- Provisions for the management and inspection of the identified ECs;
- Maintaining site access controls and Department notification; and
- The steps necessary for the periodic reviews and certification of the IC/ECs.

2. A Monitoring Plan to assess the performance and effectiveness of the remedy. The plan includes, but may not be limited to:
    - A schedule of monitoring and frequency of submittals to the Department.

Following NYSDEC approval of the SMP, inspection reports and certifications will be submitted to the NYSDEC, initially on an annual basis. The periodic inspection certification, to be signed by a professional engineer or other qualified environmental professional, will certify that the ICs have not been modified or altered, and no violations of the SMP have been observed. When modifications to the site or ICs have been observed, the certification will provide a description of the modifications observed and a proposed corrective action measure to address the deficiency.

7.0 REFRENCES

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PWGC, April 2014, Draft Remedial Investigation Report, 74 Wallabout Street Brooklyn, New York.

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NYSDEC, Division of Technical and Administrative Guidance, October 27, 1989, Memorandum #4031 - Fugitive Dust Suppression and Particulate Monitoring Program at Inactive Hazardous Waste Sites

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NYSDEC, Division of Environmental Restoration, 6 NYCRR Part 375 Subpart 6, Remedial Program Soil Cleanup Objectives.

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

NYSDOH, June 25, 2007, Memo to NYSDEC "Re: Soil Vapor / Indoor Air Matrices."

6 NYCRR Part 375 – Environmental Remediation Programs, December 2006

6 NYCRR Part 376 - Land Disposal Restrictions, September 2006

29 CFR Part 1910.120 - Hazardous Waste Operations and Emergency Response

USEPA, SOP # 2001 General Field Sampling Guidelines, SOP# 2012 Soil Sampling, and SOP# 2006 Sampling Equipment Decontamination

Figures

SUBJECT SITE VICINITY

74 WALLABOUT STREET
BROOKLYN, NEW YORK

0 ¼ ½ ¾ 1 Miles

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Project:	RAB1301
Date:	8/27/2013
Designed by:	BB
Drawn by:	JMC
Approved by:	AL
Figure No:	1

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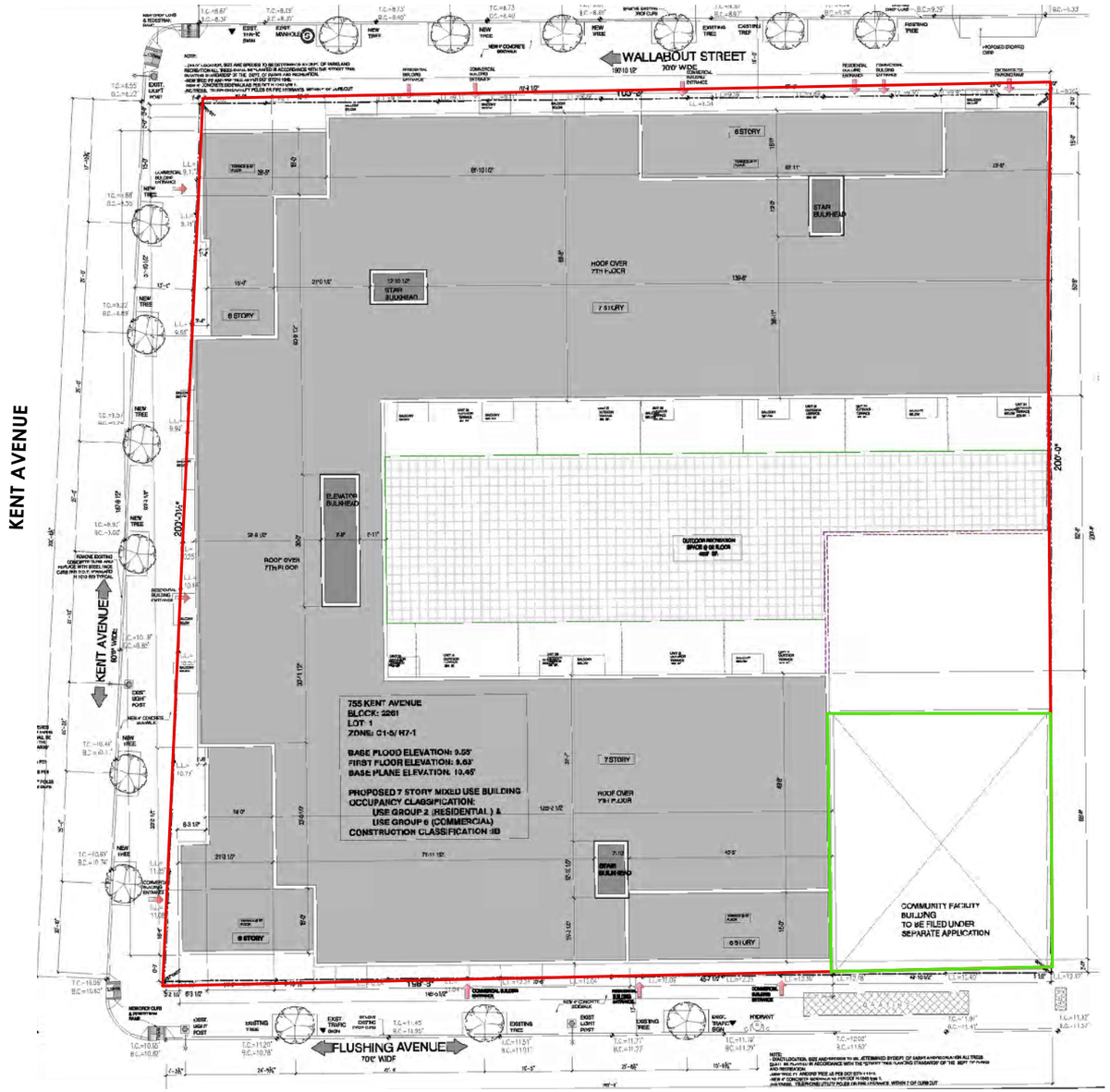

WALLABOUT STREET

FLUSHING AVENUE

School Parcel

Subject Site Parcel

SITE PLAN WITH PROPOSED DEVELOPMENT

74 WALLABOUT STREET
BROOKLYN, NEW YORK

0 40 80 120 160 Feet

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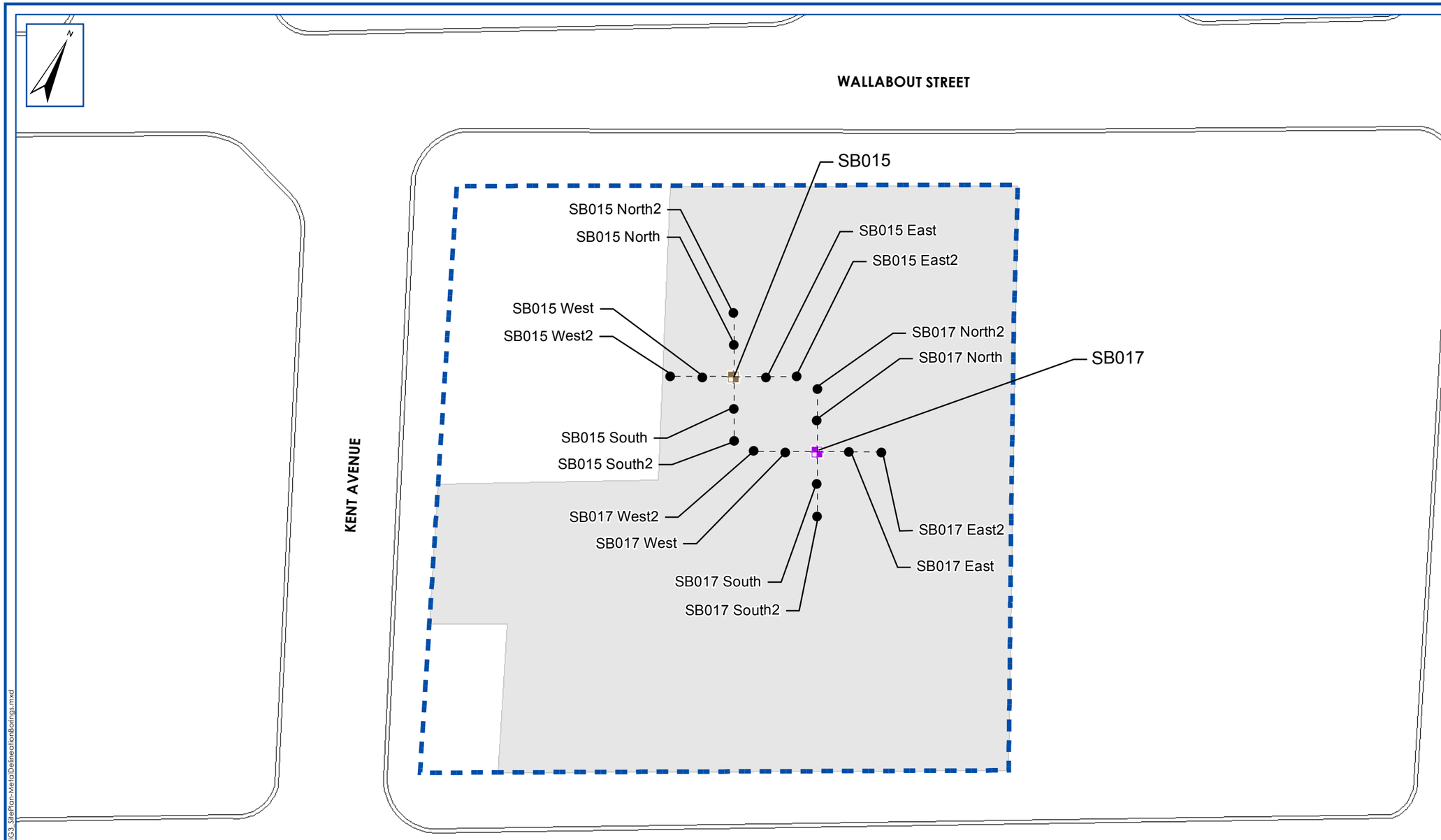
FIGURE NO: 2

SHEET:

Document Path: Z:\GIS\Projects\M-R\RAB\1301\mxd\files\RWP\FIG2_SitePlanWithProposedDevelopment.mxd



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- 2012 Soil Boring Locations
- 2013 Soil Boring Locations
- Step-Out Boring Location
- Lot 1 Proposed Development Site
- Former Building
- Curbline

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FIGURE NO: 3

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SITE PLAN - METAL DELINEATION PLAN

74 WALLABOUT STREET
BROOKLYN, NEW YORK

0 40 80 120 160 Feet

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Underground Storage Tanks
Approximate UST Location
Lot 1 Proposed Development Site
Former Building
Curbline

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FIGURE NO: 4

SHEET:

SITE PLAN - USTs

74 WALLABOUT STREET
BROOKLYN, NEW YORK

0 50 100 150 200 Feet

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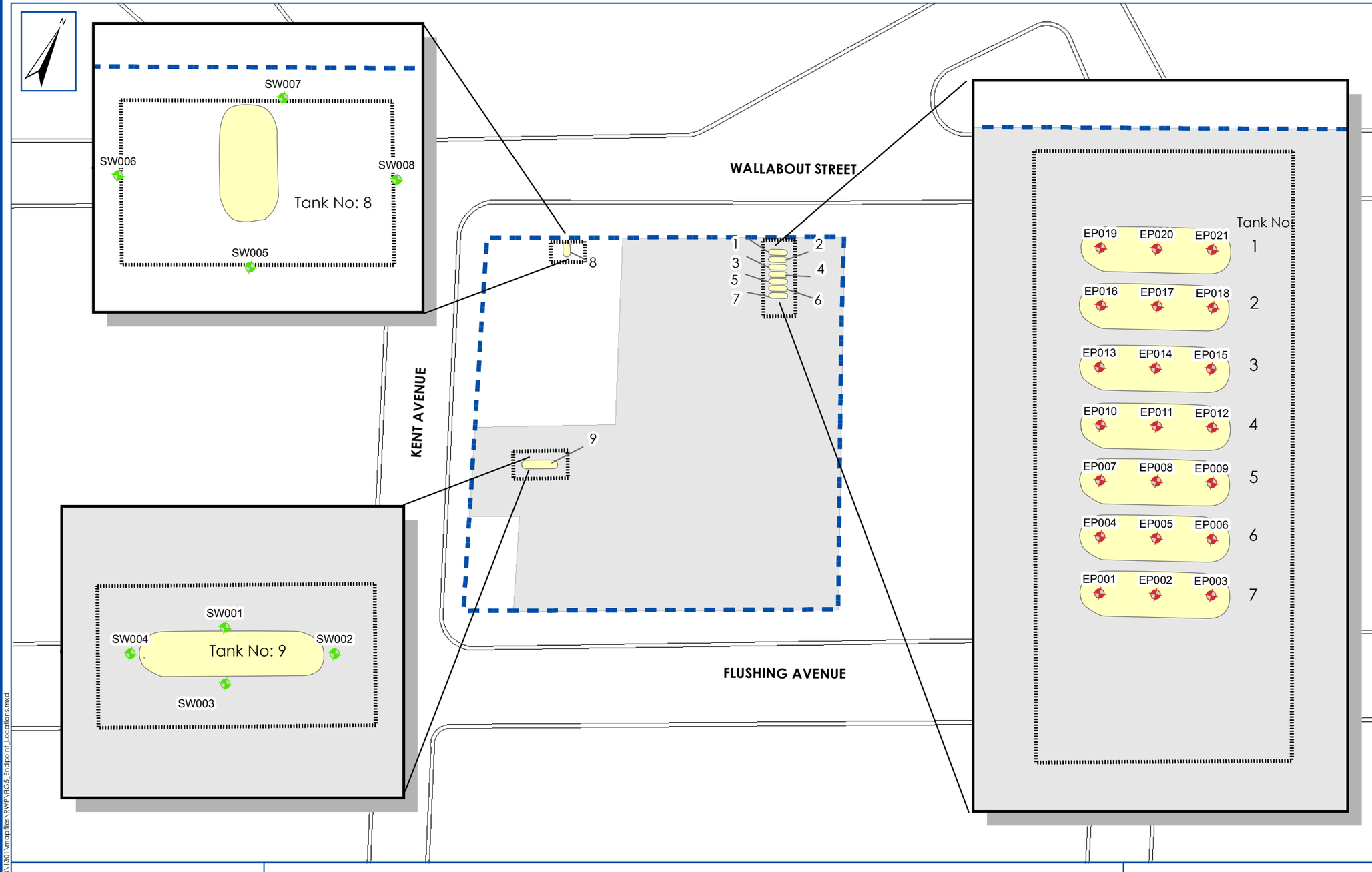

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Removed UST Locations
Side Wall Samples
End Point Samples
Lot 1 Proposed Development Site
Former Building
Curbline

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UST LOCATION MAP & END POINT LOCATIONS

74 WALLABOUT STREET
BROOKLYN, NEW YORK

0 70 140 210 280 Feet

Note:
Analytes (VOCs, Metals, and Pesticides) shown exceed NYSDEC Unrestricted Use SCO.
Analytes (SVOCs) shown exceed NYSDEC Protection of Groundwater SCO.
J-The analyte was positively identified: the associated numerical value is the approximate concentration of the analyte in the sample.

FIGURE NO: 5

SHEET:

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ENDPOINT SAMPLING LOCATIONS

74 WALLABOUT STREET
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0 50 100 150 200 Feet

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- Proposed Confirmatory Sample Location (VOCs, SVOCs, Metals, Pesticides, PCBs)
- Proposed ConfirmatorySample Location (Metals, SVOCs)
- Underground Storage Tanks
- Approximate UST Location
- Lot 1 Proposed Development Site
- Curbline

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FIGURE NO: 6

SHEET:

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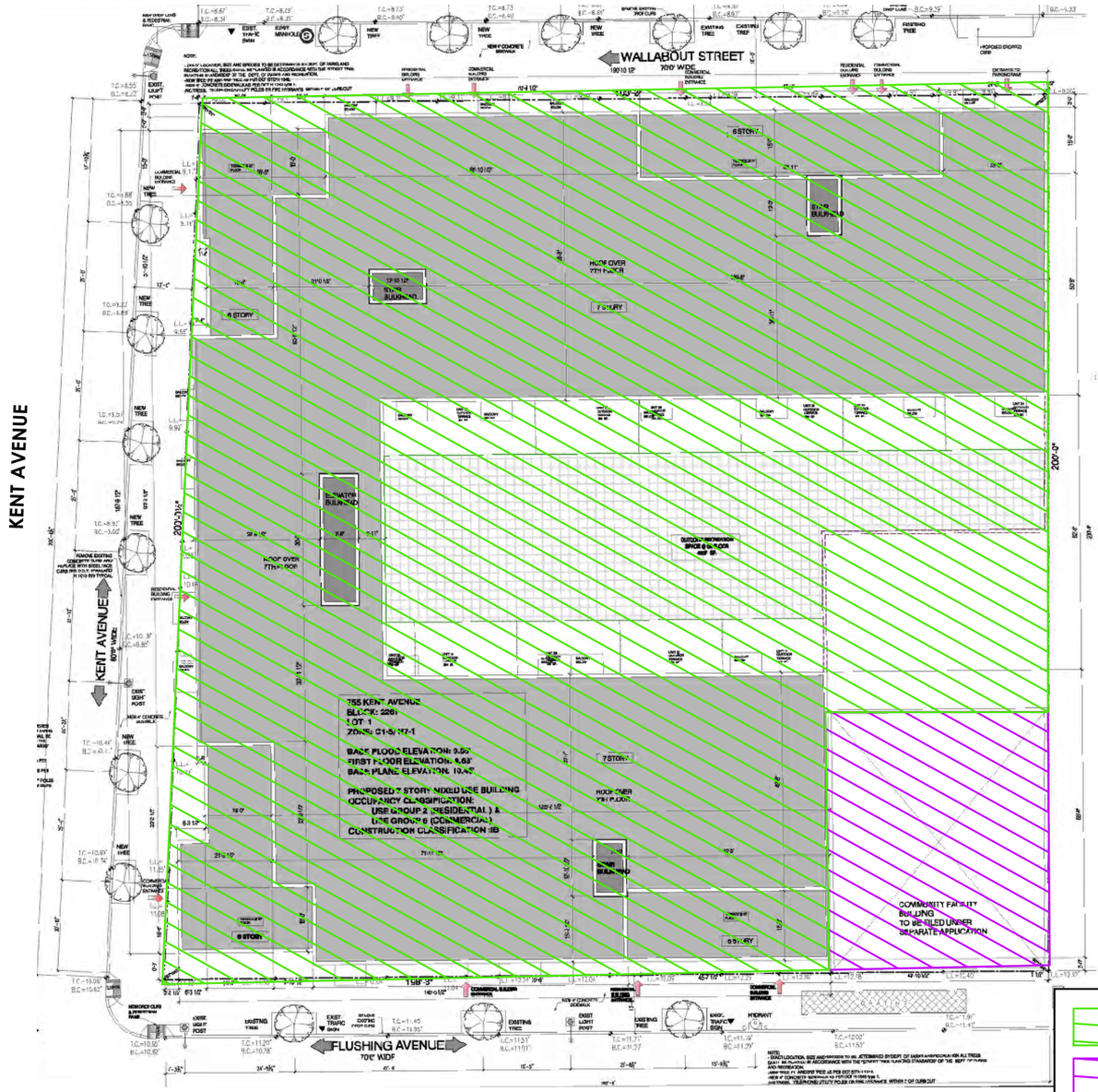

COMPOSITE COVER PLAN

74 WALLABOUT STREET
BROOKLYN, NEW YORK

0 40 80 120 160 Feet

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FIGURE NO: 7

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Appendix A

Cost Estimates

Cost Estimate

RAB1303

Remedial Alternatives Analysis

74 Wallabout Street, Brooklyn, New York

Service Provided	RS Means CSI	Rate	Unit	Quantity	Unit	Total
Alternative 1						
Implementation of a Site Management Plan						
Environmental Consulting (reporting and oversight on a yearly basis)			Each.	1	Each.	$5,000-$10,000
Alternative 2						
Excavation of All Contaminated Soil/Debris from 10 to 20ft Below Ground Surface and Backfilling (does not include costs for IRM implementation)						
Chain Link Fence - 8' High	32 31 13.20 0920	$43.50	L.F.	793	L.F.	$ 34,496
Double Swing Gate - 8' High	32 31 12.20 5080	$1,825.00	Each.	2	Each.	$ 3,650
Erosion and Sediment Control - Slit Fence	31 25 14.16 1100	$1.27	L.F.	793	L.F.	$ 1,007
Mobilization/Demobilization		$3,000.00	Each.	2	Each.	$ 6,000
Underground Storage Tank Removal	Vendor Quote		Each.		Each.	$ 40,000
Excavating, Front End Loader, 3.0 C.Y.	31 23 16.42 1250	$2.09	B.C.Y.	5477.7778	B.C.Y.	$ 11,449
Excavating, Excavator, 3.5 C.Y.	31 23 16.41 0305	$1.59	B.C.Y.	5477.7778	B.C.Y.	$ 8,710
Impacted Soil Transportation and Disposal	Vendor Quote	$275.00	Ton	12325	Ton	$ 3,389,375
Clean Backfill For Site & Community Facility Building Location	Vendor Quote	$9.00	C.Y.	13374.097	C.Y.	$ 120,367
Clean Topsoil For Site & Community Facility Building Location	Vendor Quote	$17.50	C.Y.	736.78241	C.Y.	$ 12,894
Material Delivery	Vendor Quote	$100.00	Load.	706	Load.	$ 70,600
Dozer Backfilling, Compacted	31 23 23.13 1600	$4.09	E.C.Y.	14110.88	E.C.Y.	$ 57,663
Vapor Barrier	Vendor Quote	$2.25	S.F.	31845	S.F.	$ 71,651
Dewatering System (OWS, Frac Tank, Carbon Filters, Pumps)	Vendor Quote		System	1	System	$ 100,000
Personal Protective Equipment (PPE)		$2,000.00	Each.	1	Each.	$ 2,000
Endpoint Sampling	Vendor Quote		Each.		Each.	$ 20,000
Laboratory Analysis	Vendor Quote		Each.		Each.	$ 40,000
Environmental Consulting (reporting, oversight, permits)			Each.	1	Each.	$ 400,000
Alternative 2 - Subtotal						$ 4,389,861
NYS Sales Tax @ 8.875%						$ 52,915
Division 1 - Requirements				15.00%		$ 666,416
Contractor Overhead				10.00%		$ 510,919
Contractor Profit				7.00%		$ 393,408
Insurance				5.00%		$ 300,676
Alternative 2 - Total						$ 6,314,195
Alternative 2 - Total + 20% Contingency						$ 7,577,034