DRAFT REMEDIAL ACTION WORK PLAN

for

GOWANUS CANAL NORTHSIDE
Brooklyn, New York
Block 424, Lot 1 and Block 431, Lot 12
NYSDEC BCP Site No. C224080

Prepared For:

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LANGAN

December 22, 2021
Langan Project No. 170295301

CERTIFICATION

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

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

NYS Professional Engineer #089491	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.

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Acronym	Definition
ACM	Asbestos-containing material
AOC	Area of concern
ASP	Analytical Services Protocol
AST	Aboveground storage tank
BCA	Brownfield Cleanup Agreement
BCP	Brownfield Cleanup Program
bgs	Below grade surface
BMP	Best management practice
BOA	Brownfield Opportunity Area
C&D	Construction and demolition
CAMP	Community Air Monitoring Plan
CFR	Code of Federal Regulations
CHASP	Construction Health and Safety Plan
Cis-1,2-DCE	Cis-1,2-dichloroethene
COC	Contaminants of concern
CP	Commissioner Policy
CQAP	Construction Quality Assurance Plan
CSM	Conceptual site model
CVOC	Chlorinated volatile organic compound
DCP	Department of City Planning
DER-10	Technical Guidance for Site Investigation and Remediation
DNAPL	Dense non-aqueous phase liquid
DOB	Department of Buildings
DUSR	Data Usability Summary Report
EC	Engineering control
EDD	Electronic data deliverable
EE	Environmental easement
El	Elevation
ELAP	Environmental Laboratory Approval Program
ESA	Environmental Site Assessment
eV	Electron volt
FEMA	Federal Emergency Management Agency
FER	Final Engineering Report
FIRM	Flood Insurance Rate Map
FWIRA	Fish and Wildlife Resources Impact Analysis
GPR	Ground-penetrating radar
HASP	Health and Safety Plan

Acronym	Definition
HDPE	High-density polyethylene
IC	Institutional control
IRM	Interim Remedial Measures
IRMWP	Interim Remedial Measures Work Plan
LNAPL	Light non-aqueous phase liquid
mg/kg	Milligram per kilogram
MGP	Manufactured gas plant
MOSF	Major Oil Storage Facility
ng/L	Nanograms per liter
NPL	National Priorities List
NYC	New York City
NYCDEP	New York City Department of Environmental Protection
NYCDOT	New York City Department of Transportation
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
NYSDOL	New York State Department of Labor
OSHA	Occupational Safety and Health Administration
OSI	Off-site investigation
OSIWP	Off-site Investigation Work Plan
PBS	Petroleum bulk storage
PCB	Polychlorinated biphenyl
PCE	Tetrachloroethene
PE	Professional Engineer
PFAS	Per- and polyfluoroalkyl substances
PFOA	Perfluorooctanoic acid
PFOS	Perfluorooctanesulfonic acid
PID	Photoionization detector
PM10	Particulates less than 10 microns in diameter
PPE	Personal protective equipment
PPM	Parts per million
PRP	Potentially Responsible Party
QAO	Quality Assurance Officer
QAPP	Quality Assurance Project Plan
QA/QC	Quality Assurance/Quality Control
QEP	Qualified Environmental Professional
RAO	Remedial action bbjective
RAWP	Remedial Action Work Plan
RCA	Recycled concrete aggregate

Acronym	Definition
RCNY	Rules of the City of New York
RE	Remedial Engineer
REC	Recognized environmental condition
RI	Remedial Investigation
RIR	Remedial Investigation Report
RURR	Restricted Use Restricted-Residential
SCG	Standards, Criteria, and Guidance
SCL	Soil Cleanup Level
SCO	Soil Cleanup Objective
SDS	Safety Data Sheets
SGV	Standards and Guidance Values
SMD	Sub-membrane depressurization
SMMP	Soil/Materials Management Plan
SMP	Site Management Plan
SOE	Support of excavation
SOP	Standard operating procedure
SPDES	State Pollutant Discharge Elimination System
SPW	Shore public walkway
SVI	Soil vapor intrusion
SVOC	Semivolatile organic compound
SWPPP	Stormwater Pollution Prevention Plan
TAL	Target Analyte List
TCL	Target Compound List
TCE	Trichloroethene
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
UST	Underground storage tank
UU	Unrestricted Use
VOC	Volatile organic compound
WGI	Warren George, Inc.
6 NYCRR	Title 6 of the New York Codes, Rules, and Regulations

EXECUTIVE SUMMARY

Langan Engineering, Environmental, Surveying, Landscape Architecture and Geology, D.P.C. (Langan) prepared this Remedial Action Work Plan (RAWP) on behalf of Gowanus Canal LLC and GowCan Owner, LLC (the Participant) for the Gowanus Canal Northside property, which is identified on the Brooklyn Borough Tax Map as Block 424, Lot 1 and Block 431, Lot 12 in Brooklyn, New York (the site). The Participant entered into the New York State Department of Environmental Conservation (NYSDEC) Brownfield Cleanup Program (BCP) to investigate and remediate the site in accordance with a Brownfield Cleanup Agreement (BCA) executed on April 16, 2015 and amended on July 7, 2021. The site was assigned BCP Site No. C224080. Upon completion of the remedial action described herein and the subsequent construction, the site will be improved with two multi-story residential buildings with ground-floor commercial uses and a continuous shore public walkway (SPW) along the Gowanus Canal.

This RAWP summarizes the nature and extent of contamination as determined during the Remedial Investigation (RI) conducted over four mobilizations between July 2017 and July 2021, identifies and evaluates remedial action alternatives, and recommends a Track 4 remedy.

The remedy described in this document is consistent with the procedures defined in the NYSDEC Division of Environmental Remediation (DER) Program Policy DER-10: Technical Guidance for Site Investigation and Remediation (DER-10) and complies with applicable standards, criteria and guidance. The remedy described in this document also complies with applicable federal, state and local laws, regulations, and requirements. The revised Draft RI Report (RIR) was submitted to the NYSDEC on September 8, 2021 and is in review.

Site Description/Physical Setting/Site History

The site is located in the Gowanus neighborhood of Brooklyn, New York, and is identified on the Borough of Brooklyn Tax Map as Block 424, Lot 1 and Block 431, Lot 12. Prior to November 2021, Lot 1 of Block 424 consisted of two lots (former Lots 1 and 20) and Lot 12 of Block 431 consisted of two lots (former Lots 12 and 17); the November 2021 lot mergers are part of the proposed redevelopment. The site encompasses an area of approximately 98,800 square feet (2.27 acres) and is transected by Sackett Street. The site is bound by Degraw Street to the north; the Gowanus Canal to the east; Union Street and multi-story commercial buildings to the south; and Bond Street and multi-story commercial buildings to the west.

The site buildings are undergoing demolition. Building demolition is required to implement the remedial action described herein. Prior to being vacated, the site operated as a wholesale fuel oil distribution facility with multiple maintenance garages.

The site and surrounding area are located in an urban setting historically characterized by industrial and commercial development. The site was previously occupied by the Bayside Fuel Oil Depot Corporation

and is listed as a closed Major Oil Storage Facility (MOSF). The following historical facilities occupied the northern portion of the site (Block 424):

- Coal storage (1886 to 1915 and 1938)
- "Commonwealth Fuel Co." (1922 to 1928)
- Automotive repair shop (1938 to 1969) with gasoline storage (1950 to 2015)
- Wood box manufacturer (1950)
- New York Telephone Co (1977)
- Truck Rental (1979 to 2015)

The following historical facilities were located on the southern portion of the site (Block 431):

- Coal storage (1886 to 1915)
- Box factory (1886)
- "Commonwealth Fuel Co." (1922 to 1928)
- "Magnet Fuel Corp" (1928)
- Garage with fuel storage (1950 to 2015)
- Truck repair shop (1969 to 2015)
- Fuel storage and automobile repair facility (1950 to 2015)

Summary of the Remedial Investigation

The RI was implemented over four mobilizations (July to August 2017, October 2018, October 2020, and June to July 2021) to investigate and characterize the nature and extent of environmental impacts at and emanating from the site and to provide sufficient information to evaluate remedial alternatives. Findings and conclusions are as follows:

1. Stratigraphy: The subsurface profile generally consists of fill directly overlying interbedded intermittent peat, sand, and clay horizons associated with marsh and flood deposits. Fill is located throughout the site and generally extends to depths between about 6 and 11 feet below grade surface (bgs). Fill extends to about 1 foot below the former bunkered aboveground storage tank (AST) on the southeastern portion of the site (former Lot 17). The fill primarily consists of fine- to medium-grained sand, with varying amounts of silt, gravel, and anthropogenic and pyrogenic material including coal, brick, concrete, wood, metal, and slag. The fill layer is generally underlain by fine- to medium-grained sand with varying amounts of silt and gravel. Intermittent clay units with thicknesses varying between about 6 inches and 22 feet were observed in all soil borings from as shallow as 1 foot bgs through the maximum drilled depth of 60 feet bgs, with the

exception of one boring on the northwestern portion of former Lot 1. Peat was encountered in three on-site borings on former Lot 17. Bedrock was not encountered.

2. Hydrogeology: Groundwater was encountered between 8.27 and 1.37 feet bgs. Groundwater elevation data indicate that shallow groundwater in the southern and northeastern portions of the site generally flows to the east towards the Gowanus Canal. Shallow groundwater in the northwestern portion of the site on former Lot 1 is inferred to flow towards the northwest. Deep groundwater is inferred to flow towards the southwest.

3. Petroleum-Impacted Soil, Groundwater, and Soil Vapor:

   Soil: Field indications of petroleum impacts, including photoionization detector (PID) readings up to 9,150 parts per million (ppm), were identified in soil samples collected throughout the site. The impacts were generally observed on former Lot 17 near the former location of the bunkered AST and on the northern and northwestern portions of former Lot 1 near the former 14 underground storage tanks (UST) and two gasoline USTs. Petroleum-related VOCs were detected at concentrations above the Part 375 Restricted Use Restricted-Residential (RURR) Soil Cleanup Objectives (SCO) in samples collected from the northern, western, and eastern portions of former Lot 1. Most impacts were observed at depths shallower than 10 feet bgs, with the exception of a soil sample collected between 23 and 24 feet bgs from the western portion of former Lot 1.

   Groundwater Impacts: Petroleum-related VOCs and semivolatile organic compounds (SVOC) were detected above the NYSDEC Standard Guidance Values (SGV)[1] in samples collected from 8 of 25 monitoring wells on the western, northern, and eastern portions of former Lot 1, the southeastern portion of former Lot 20, the southern portion of former Lot 12, and the central and southeastern portions of former Lot 17. Light non-aqueous phase liquid (LNAPL) was also identified in monitoring well MW08 in the northwestern portion of former Lot 17. The highest VOC concentrations were detected in the western and northern portions of former Lot 1. The highest VOC concentrations on the southern portion of the site were detected on former Lot 17. One deep well on former Lot 20 contained the gasoline additive MTBE. The petroleum-related SVOC naphthalene was detected in multiple shallow wells. Off-site groundwater analytical results at monitoring well MW28 indicate that petroleum-impacts in shallow groundwater are not migrating north from former Lot 1.

[1] NYSDEC SGVs promulgated in the NYSDEC 6 NYCRR Part 703.5 and the NYSDEC Technical and Operational Guidance Series (TOGS) 1.1.1 Ambient Water Quality Standards and Guidance Values for Class GA Water

Soil Vapor Impacts: Petroleum-related VOCs were detected at concentrations more than three orders of magnitude above those detected elsewhere at the site on the northern portion of former Lot 1. Ethanol, a gasoline additive, was also detected at concentrations more than two orders of magnitude above those detected elsewhere at the site in samples collected from former Lots 1, 12, and 17.

4. Coal Tar-Impacted Soil and Groundwater: Coal tar-related impacts, including soil exhibiting smearing, odors, staining, and/or PID readings up to 15,000 ppm, were identified along the eastern perimeter of the site near the Gowanus Canal at depths between 15 and 54 feet bgs. Coal tar contamination was most extensive on the southeastern portion of former Lot 17. Several coal tar-related VOCs and SVOCs were detected in corresponding soil and deep groundwater samples at concentrations above the Part 375 RURR SCOs and SGVs, respectively. Dense non-aqueous phase liquid (DNAPL) was not observed. The occurrence of coal tar-related impacts along the western perimeter of the Gowanus Canal is consistent with the United States Environmental Protection Agency (USEPA) Record of Decision for the Gowanus Superfund Site, which documented the presence of "bank-stored tar" along the Canal at similar elevations to those identified at the site. The source of the coal tar is likely the Former Fulton Street MGP facility, which was located upland and east of the Canal.

5. Arsenic- and Lead-Contaminated Soil: Arsenic and lead were detected in samples collected between 0 feet and 8 feet bgs on the western, northwestern, and southern portions of former Lot 1 and in the central portion of former Lot 17. Dissolved-phase arsenic was also detected in one well (MW02) at a concentration of 25.29 micrograms per liter (µg/L), which marginally exceeds the SGV of 25 µg/L.

6. Fill: Fill is present throughout the site and generally varies in thickness between about 6 and 11 feet. Samples of fill contained SVOC, metals, and pesticides.

7. Regional Groundwater Quality: Groundwater across the site contained several SVOCs, one pesticide (dieldrin), and several metals at concentrations above the SGVs. With the exception of arsenic (discussed above), the dissolved-phase metals above the SGVs were limited to iron, magnesium, manganese, sodium, and antimony. Magnesium, manganese, and sodium are commonly associated with regional brackish conditions attributable to the Gowanus Canal) and/or seasonal application of road salt. Concentrations of the metals were typically higher in wells near the Gowanus Canal.

8. Emerging Contaminant Analysis: Emerging contaminant sample analytical results from monitoring wells MW05 and MW09 indicated perfluorooctanoic acid (PFOA) concentrations between 37 nanograms per liter (ng/L) and 56 ng/L and PFOS concentrations between 3 ng/L and 17 ng/L; 1,4-

dioxane was not detected. PFOA and perfluorooctanesulfonic acid (PFOS) concentrations detected in the off-site groundwater samples exceeded the concentrations detected in the on-site groundwater samples.

9. Tetrachloroethene (PCE)-, Trichloroethene (TCE)-, and Acetone-Impacted Soil Vapor: Soil vapor collected throughout former Lots 1, 17, and 20 contained TCE, and acetone at concentrations one to two orders of magnitude above those detected elsewhere at the site. The presence of TCE and the PCE breakdown product cis-1,2-dichloroethene (cis-1,2-DCE) in the off-site monitoring well located on the Sackett Street sidewalk south of former Lot 1 at concentrations above the SGVs may indicate an off-site source for the chlorinated compounds. Acetone was detected in shallow soil samples throughout the site at concentrations above the Part 375 RURR SCO.

Qualitative Human Health Exposure Assessment

Complete on-site and off-site exposure pathways appear to be present, in the absence of institutional controls (IC) and engineering controls (EC), under current, construction and remediation, and future conditions. The complete exposure pathways indicate that there is a risk of exposure to humans from site contaminants via exposure to soil, groundwater, and soil vapor if ICs/ECs are not implemented.

Complete exposure pathways have the following five elements: 1) a contaminant source; 2) a contaminant release and transport mechanism; 3) a point of exposure; 4) a route of exposure; and 5) a receptor population. A discussion of the five elements comprising a complete pathway as they pertain to the site is provided below.

Current Conditions

Contaminant sources include the following: 1) soil with varying concentrations of SVOCs, pesticides, and metals; 2) petroleum-impacted soil, groundwater and soil vapor; 3) localized arsenic- and lead-impacted shallow soil; 4) coal tar-impacted soil and groundwater at depths greater than 20 feet bgs; and 5) PCE-, TCE-, and acetone-impacted soil vapor.

Contaminant release and transport mechanisms include exposed contaminated soil transported as dust (dermal, ingestion, inhalation), contaminated groundwater flow (dermal contact), and volatilization of contaminants from the soil and groundwater matrices to the soil vapor phase (inhalation). Groundwater is not used as a potable water source in Brooklyn.

Potential routes of exposure include ingestion and dermal absorption of contaminated soil, inhalation of organic vapors arising from contaminated soil, and inhalation of dust arising from contaminated soil. Potential receptor populations include the construction workers performing demolition work, and, to a lesser extent, the public adjacent to the site.

All five elements exist; therefore, the potential for completed exposure pathways is present. The risk is avoided by applying health and safety measures, such as monitoring the air for organic vapors and dust

during ground-intrusive activities, using vapor and dust suppression measures, maintaining site security, and wearing the personal protective equipment (PPE). Such measures prevent completion of these potential migration pathways.

Construction/Remediation Activities

During future development and remediation activities, the contaminant sources are similar to current conditions. Potential points of exposure include disturbed and exposed contaminated soil during excavation, contaminated dust and organic vapors arising from the excavation, and contaminated groundwater that could be encountered during excavation and dewatering operations. Potential routes of exposure include ingestion and dermal absorption of contaminated soil and groundwater, inhalation of organic vapors arising from contaminated soil and groundwater, and inhalation of dust arising from contaminated soil. Potential receptor populations include construction and remediation workers and, to a lesser extent, the public adjacent to the site.

All five elements exist; therefore, the potential for completed exposure pathways is present. The risk can be avoided by applying health and safety measures, such as monitoring the air for organic vapors and dust, using vapor and dust suppression measures, maintaining site security, and wearing PPE. In accordance with a Health and Safety Plan (HASP)/ Construction Health and Safety Plan (CHASP), a RAWP, and a Community Air Monitoring Plan (CAMP), measures such as conducting an air monitoring program, donning PPE, and applying vapor and dust suppression measures to prevent off-site migration of contaminants during construction will be implemented. Such measures will prevent completion of these potential migration pathways.

Proposed Future Conditions

Under the proposed future condition, some residual contaminants may remain on site, depending on the remedy, and will, to a lesser extent, include those listed under current conditions. It is anticipated that any remedy will include the removal and remediation of previously unidentified USTs and petroleum-impacted soil and groundwater. The risk of soil vapor intrusion (SVI) from petroleum-related contaminants of concern and exposure to petroleum-impacted soil and groundwater will therefore be mitigated under future conditions. Any proposed future use will include capping of the site with building slabs, asphalt/concrete pavement and/or two feet of clean fill in landscaped areas, effectively eliminating exposure risk to future building occupants, including building tenants, residential property employees, visitors and maintenance workers. Under future use scenarios, groundwater will be restricted for consumption under a deed restriction. The possible routes of exposure can be avoided or mitigated through restrictions on site and groundwater use, maintenance of a site capping system, a continuous waterproofing/vapor barrier membrane, maintenance/operation of soil vapor mitigation systems and implementation of a Site Management Plan (SMP).

Human Health Exposure Assessment Conclusions

1. In the absence of ICs/ECs, there is a moderate risk of exposure during the current and future construction/remediation activities. The primary exposure pathways are:

    a. Dermal contact, ingestion and/or inhalation of contaminated soil, groundwater and/or soil vapor by construction workers.

    b. Dermal contact, ingestion and inhalation of soil (dust) by the nearby community.

    These can be avoided by implementing all ground-intrusive work under the CHASP, performing community air monitoring, and following dust suppression and site security measures.

2. The existence of a complete exposure pathway for site contaminants to human receptors during proposed future conditions is unlikely. The site will be remediated and ICs/ECs will be in place to mitigate any exposure risk related to residual contamination that may remain on site. Further, groundwater is not used as a potable water source in Brooklyn.

3. It is not likely that a complete exposure pathway exists for the migration of site contaminants in groundwater to off-site human receptors for current, construction/remediation phase, or future conditions. Monitoring and control measures will be used during investigation and construction/remediation to prevent completion of this pathway, including implementation of a Health and Safety Plan (HASP)/CHASP and CAMP. Under future conditions, the site will be remediated and ICs/ECs, if required, will be implemented to prevent completion of the pathway; however, due to the presence of residual off-site contamination unrelated to the site, the potential for impacted off-site soil vapor will remain after the site is redeveloped.

Summary of the Remedy

It is anticipated that the site will be remediated to meet Track 4 restricted-residential standards. The Alternative II Track 4 remedy will include the following:

- Development and implementation of a CHASP and CAMP for the protection of on-site workers and the community during remediation activities
- Demolition and removal of subsurface obstructions (e.g., remnant foundation elements) as needed to facilitate remedial excavation and installation of ECs (including site-wide cover and sub-membrane depressurization [SMD] systems) - Review and certification of hazardous building materials and construction and demolition (C&D) debris transport and disposal methodologies is not a requirement of the Remediation Engineer (RE). The RE is responsible for documenting that C&D debris is not comingled with contaminated site soil and fill.
- Excavation and off-site disposal of contaminated soil to allow for installation of ECs

- Remediation of petroleum impacts to soil through source removal and groundwater through in-situ application of remediation products to stimulate dissolved-phase hydrocarbon biodegradation
- Installation of support of excavation (SOE) as needed to facilitate the remedial excavation
- Dewatering as needed to allow for excavation below the groundwater table, and treatment and discharge of dewatering fluids in accordance with applicable regulations
- Screening of excavated soil for indications of contamination, by visual, olfactory, and instrumental methods
- Handling, transport, and off-site disposal of excavated soil in accordance with federal, state, and local rules and regulations
- Decommissioning and removal of any encountered USTs
- Collection and analysis of documentation soil samples from remedial excavations
- Import and placement of fill (e.g., virgin crushed stone, recycled concrete aggregate [RCA], soil) meeting the lower of Part 375 RURR and Protection of Groundwater (PGW) SCOs to backfill remedial excavations and facilitate EC installation
- Installation of the below-grade components of an SMD system (including a continuous waterproofing/vapor barrier membrane) for potential commissioning and active operation of the system during site management, if warranted by a post-remediation SVI evaluation
- Installation of a site-wide composite cover system consisting of concrete building foundation slabs, exterior hardscapes (i.e., stone pavers, wooden boardwalk/platform, and rubber play surfaces), and landscaped areas with 2 feet of fill meeting the lower of Part 375 RURR and PGW SCOs to prevent future exposure to remaining contaminated soil
- Installation of two DNAPL recovery wells (one per block) for potential recovery of DNAPL (if observed) during site management
- Installation of three groundwater monitoring wells and collection of post-remediation groundwater samples
- Establishment of use restrictions (i.e., ICs) including prohibitions on the use of groundwater from the site and prohibitions on sensitive site uses, such as farming or vegetable gardening in remaining site soil, to prevent future exposure to remaining contamination
- Recording of an environmental easement (EE) referencing ECs and ICs to prevent future exposure to remaining contamination

- Publication of an SMP for long-term management of remaining contamination as required by the EE, including plans for: 1) IC/EC implementation, 2) monitoring, 3) operation and maintenance, and 4) reporting

Remedial activities will be performed in accordance with this NYSDEC-approved RAWP.

1.0 INTRODUCTION

Langan Engineering, Environmental, Surveying, Landscape Architecture and Geology, D.P.C. (Langan) prepared this Remedial Action Work Plan (RAWP) on behalf of Gowanus Canal LLC and GowCan Owner, LLC (the Participant) for the Gowanus Canal Northside property, which is identified on the Brooklyn Borough Tax Map as Block 424, Lot 1 and Block 431, Lot 12 in Brooklyn, New York (the site). The Participant entered into the New York State Department of Environmental Conservation (NYSDEC) Brownfield Cleanup Program (BCP) to investigate and remediate the site in accordance with a Brownfield Cleanup Agreement (BCA) executed on April 16, 2015 and amended on July 7, 2021. The site was assigned BCP Site No. C224080. Upon completion of the remedial action described herein and the subsequent construction, the site will be improved with two multi-story residential buildings with ground-floor commercial uses and a continuous shore public walkway (SPW) along the Gowanus Canal.

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1.1 Site Location and Description

The site is located in the Gowanus neighborhood of Brooklyn, New York, and is identified on the Borough of Brooklyn Tax Map as Block 424, Lot 1 and Block 431, Lot 12. Prior to November 2021, Lot 1 of Block 424 consisted of two lots (former Lots 1 and 20) and Lot 12 of Block 431 consisted of two lots (former Lots 12 and 17); the November 2021 lot mergers are part of the proposed redevelopment. The site encompasses an area of approximately 98,800 square feet (2.27 acres) and is transected by Sackett Street. The site is bound by Degraw Street to the north; the Gowanus Canal to the east; Union Street and multi-story commercial buildings to the south; and Bond Street and multi-story commercial buildings to the west. A site location map is provided as Figure 1.

According to the NYC Planning Commission Zoning Map 16c, the site is located in a M2-1 manufacturing zoning district. M2 districts typically range from light to heavy industrial uses and are typically located in older industrial neighborhoods and along waterfronts. Prior to being vacated, the site operated as a wholesale fuel oil distribution facility with multiple maintenance garages. Additional detail on historical site use is provided in Section 1.4. The vacant site buildings are being demolished to implement this

remedial action. A site plan is provided as Figure 2, and an April 26, 2021 land title survey prepared by Control Point Associates, Inc. PC is included as Appendix A.

1.2 Redevelopment Plan

The proposed remedial action is intended to make the site protective of human health and the environment consistent with the contemplated end use. The proposed redevelopment plan and end use are described here to provide the basis for this assessment; however, the contemplated remedy may be implemented independent of the proposed redevelopment plan.

The proposed redevelopment project is in the permitting phase and is subject to change. The contemplated project includes construction of two buildings, with one on Block 424 and one on Block 431, with commercial and residential uses. The contemplated project also includes a continuous 40- to 60-foot-wide SPW along the Gowanus Canal. A development plan is provided as Figure 3. Development plans are included in Appendix B.

1.3 Description of Surrounding Property

The site is located in an urban area. Land use within a half-mile of the site is primarily characterized by industrial, residential, and commercial properties. Major infrastructure (storm drains, sewers, and underground utility lines) exists within the streets surrounding the site. Surrounding properties include single- and multi-story buildings occupied by industrial, commercial, and residential tenants. The nearest ecological receptor is the Gowanus Canal, which adjoins the site to the east and is a federal Superfund site (added to the National Priorities List [NPL] on March 4, 2010). Surrounding property usage is summarized in the following table:

Direction	Adjoining Properties			Surrounding Properties
	Block No.	Lot No.	Description	
North	417	1	Two-story industrial building (259 Bond Street)	Multiple-story manufacturing facilities, utility companies, and residential and commercial buildings.
		21	One-story industrial building (479 Degraw Street)	
East	Gowanus Canal			Multiple-story manufacturing facilities, utility companies, and residential and commercial buildings.
South	431	7	One-story industrial building (293 Bond Street)	Multiple-story manufacturing facilities, utility companies, and
		43	One-story event space (501 Union Street)	

Direction	Adjoining Properties			Surrounding Properties
	Block No.	Lot No.	Description	
	438	7	One-story restaurant (450 Union Street)	residential and commercial buildings.
West	423	41	Two-story residential building (477 Sackett Street)	Multiple-story manufacturing facilities, utility companies, and residential and commercial buildings.
		35	Two-story industrial building (274 Bond Street)	

Sensitive receptors, as defined in DER-10, located within a half-mile of the site are listed in the following table:

Number	Name (Approximate Distance from Site)	Address
1	Thomas Greene Playground (approximately 0.14 miles east)	Nevins Street Brooklyn, NY 11217
2	New Dawn Charter High School (approximately 0.15 miles northwest)	242 Hoyt Street Brooklyn, NY 11217
3	P.S. 32 Samuel Mills Sprole School (approximately 0.17 miles west)	317 Hoyt Street Brooklyn, NY 11231
4	Rivendell School (approximately 0.21 miles southeast)	277 3rd Avenue Brooklyn, NY 11215
5	Preschool of America, Inc. (approximately 0.21 miles northwest)	378 Baltic Street Brooklyn, NY 11201
6	P.S. 372 – The Children's School (approximately 0.26 miles southeast)	512 Carroll Street Brooklyn, NY 11215
7	Cobble Hill School for American Studies (approximately 0.28 miles northwest)	347 Baltic Street Brooklyn, NY 11201
8	Warren Street Center for Children and Families (approximately 0.29 miles northwest)	343 Warren Street Brooklyn, NY 11201
9	Bumble Bee Daycare (approximately 0.32 miles southeast)	258 4th Avenue Brooklyn, NY 11215
10	The Language and Laughter Studio (approximately 0.32 miles northeast)	139 Nevins Street Brooklyn, NY 11217
11	P.S. 058 The Carroll School (approximately 0.34 miles southwest)	330 Smith Street Brooklyn, NY 11231
12	Hannah Senesh Community Day School (approximately 0.35 miles southwest)	342 Smith Street Brooklyn, NY 11231
13	Open House Nursery School (approximately 0.35 miles northwest)	318 Warren Street Brooklyn, NY 11201

Number	Name (Approximate Distance from Site)	Address
14	Al-Madinah School (approximately 0.37 miles southeast)	383 3rd Avenue Brooklyn, NY 11215
15	P.S. 133 William A. Butler (approximately 0.38 miles east)	610 Baltic Street Brooklyn, NY 11217
16	P.S. 38 (approximately 0.39 miles northeast)	450 Pacific Street Brooklyn, NY 11217
17	School for International Studies (approximately 0.40 miles northwest)	284 Baltic Street Brooklyn, NY 11201
18	Digital Arts and Cinema Technology High School (approximately 0.40 miles northwest)	284 Baltic Street Brooklyn, NY 11201
19	P.S. 261 (approximately 0.43 miles north)	314 Pacific Street Brooklyn, NY 11201
20	Acorn High School for Social Justice (approximately 0.43 miles northeast)	500 Pacific St Brooklyn, NY 11217
21	Strong Place for Hope Inc. Daycare (approximately 0.44 miles northeast)	460 Atlantic Avenue Brooklyn, NY 11217
22	Sunflower Child Care (approximately 0.46 miles southeast)	238 5th Avenue Brooklyn, NY 11215
23	Brooklyn Hospital Center: Lubin Spencer (approximately 0.46 miles northeast)	447 Atlantic Avenue Brooklyn, NY 11217
24	Brooklyn High School of the Arts (approximately 0.47 miles northeast)	345 Dean Street Brooklyn, NY 11217
25	The Math and Science Exploratory School (approximately 0.47 miles northeast)	345 Dean Street Brooklyn, NY 11217
26	Eladia's Kids Preschool (approximately 0.49 miles east)	147 5th Avenue Brooklyn, NY 11217

1.4 Site History

1.4.1 Historical Site Use

The site and surrounding area are located in an urban setting historically characterized by industrial and commercial development. The site was previously occupied by the Bayside Fuel Oil Depot Corporation and is listed as a closed Major Oil Storage Facility (MOSF). The following historical facilities occupied the northern portion of the site (Block 424):

- Coal storage (1886 to 1915 and 1938)
- "Commonwealth Fuel Co." (1922 to 1928)
- Automotive repair shop (1938 to 1969) with gasoline storage (1950 to 2015)

- Wood box manufacturer (1950)
- New York Telephone Co (1977)
- Truck rental (1979 to 2015)

The following historical facilities were located on the southern portion of the site (Block 431):

- Coal storage (1886 to 1915)
- Box factory (1886)
- "Commonwealth Fuel Co." (1922 to 1928)
- "Magnet Fuel Corp" (1928)
- Garage with fuel storage (1950 to 2015)
- Truck repair shop (1969 to 2015)
- Fuel storage and automobile repair facility (1950 to 2015)

1.4.2 Previous Environmental Reports and Investigations

Previous environmental reports are summarized below:

- June 4, 2014 *Phase I Environmental Site Assessment (ESA)*
- June 30, 2015 *Interim Remedial Measures Work Plan (IRMWP)*
- June 27, 2017 *Construction Completion Report (CCR)*
- August 13, 2017 *Emerging Contaminants Sampling Work Plan (ECSWP)*
- March 20, 2020 *IRMWP No. 2*
- April 13, 2020 *Off-Site Investigation Work Plan (OSIWP)*
- May 24, 2021 *IRMWP No. 2 Addendum*

The previous environmental reports listed above were prepared by Langan and are included as Appendix A of the Draft RIR, which is included as Appendix C.

June 4, 2014 Phase I ESA

In 2014, Langan completed a Phase I ESA to identify recognized environmental concerns (REC) associated with the site. The report summarized the following previous environmental investigations and regulatory correspondence:

2002 Phase I and Phase II ESAs by Galli Engineering, P.C. – Galli collected five soil and groundwater samples during the Phase II ESA. VOCs and SVOCs were identified at concentrations above the NYSDEC Technical and Administrative Guidance Memorandum (TAGM) Soil Cleanup Objectives (SCO), which were applicable

at the time, at locations down-gradient of a former UST field in the north-central portion of former Lot 1 along Degraw Street. VOCs were also detected in groundwater samples collected from former Lot 1 near the Gowanus Canal, in the central portion of former Lot 20, and in the northern portion of former Lot 17.

May 2005 – Based on the Phase II ESA results, Bayside Fuel Oil Depot - Bond Street Terminal was entered into the BCP.

August 2007 – Bayside Fuel Oil Depot – Bond Street Terminal was removed from the BCP. Bayside Fuel Oil Depot - Bond Street Terminal continued remedial activities on former Lot 17 under the NYSDEC MOSF and Spills Programs.

July 2009 Site Assessment Report by AKRF, Inc. – A total of 12 borings were advanced to 15 feet bgs and three temporary groundwater monitoring wells were installed. AKRF collected samples from each boring, with the exception of locations exhibiting significant contamination. Six groundwater samples were collected from three temporary and three historical permanent wells. Analytical results indicated that VOCs and SVOCs were present in groundwater at concentrations exceeding the NYSDEC Division of Water Technical and Operational Guidance Series (TOGS) 1.1.1 Ambient Water Quality Standards and Guidance Values (SGVs) for Class GA (drinking water). SVOC concentrations in soil also exceeded the TAGM SCOs. NYSDEC Spill No. 09-02825 was reported for the MOSF on former Lot 17.

2010 Remedial Action Plan (RAP) Implementation, by AKRF, Inc. – A RAP was implemented to further evaluate and address the spill condition. Implementation of the RAP included installation of two additional permanent monitoring wells and quarterly gauging of all permanent monitoring wells for light non-aqueous phase liquid (LNAPL) for two years. In March 2011, less than 0.01 feet of LNAPL was observed in a monitoring well along the northern perimeter of the MOSF, and an oil-absorbent sock was installed to remove the LNAPL. LNAPL was not detected after the initial observation, and the oil-absorbent sock was removed in September 2011. NYSDEC closed Spill No. 09-02825 after the two-year monitoring period.

2011 Gowanus Canal RIR, by HDR, H2MHILL, and GRB Environmental Services - The RIR was prepared for the Gowanus Canal Superfund Site on behalf of the USEPA. Three monitoring well couplets (a shallow and deep monitoring well at each location) were installed on or near the site as part of the RI. Two couplets were installed on site, near the Canal, and one off-site well was installed in the Sackett Street sidewalk near the southwestern corner of former Lot 1. The RIR concluded that shallow and deep groundwater from the monitoring wells along the Canal was expected to discharge into the Canal. Groundwater analytical results from the northern deep monitoring well indicated that groundwater posed a potential risk of contaminating the Canal with SVOCs.

2013 - USEPA listed Bayside Fuel Oil Depot Corp. as a Potentially Responsible Party (PRP) for source contamination to the Gowanus Canal, as part of the Gowanus Canal Superfund Site.

The Phase I ESA identified the following RECs:

- REC 1 – Current and Historical Use of the Site

  The site contained two vehicle service garages on former Lots 1 and 12. Parts cleaning areas were observed in both garages. Staining, odor, and an oil-absorbing compound were observed on former Lots 1, 12, and 17.

  Historical use of the site, described above in Section 1.4.1, was also part of the REC description.

- REC 2 – Petroleum Bulk Storage

  Former Lot 1 – NYSDEC Petroleum Bulk Storage (PBS) Facility No. 2-017574

  - Ten 550-gallon diesel USTs were closed and removed in December 1998;
  - Four 550-gallon kerosene USTs were closed and removed in December 1998; and
  - Three in-service, 275-gallon lube oil aboveground storage tanks (AST) "in contact with soil" were installed on August 1, 1985.

  Former Lot 12 – NYSDEC PBS Facility No. 2-017590

  - One 4,000-gallon gasoline UST was closed and removed in December 2009;
  - Two 275-gallon lube oil ASTs "in contact with soil" were closed and removed in June 1985; and
  - Two in-service, 275-gallon waste/used oil ASTs "not in contact with soil" were installed in January 1985.

  Former Lot 17 – NYSDEC MOSF Facility No. 2-1220

  - Six USTs ranging in size from 1,000 to 500,000 gallons were installed in December 1947 and administratively closed. A closure date was not provided.
  - Two in-service, 275-gallon waste/used oil ASTs "not in contact with soil" were installed in January 1985.

- REC 3 – Gowanus Canal Superfund Site - Potentially Responsible Party Listing

  Bayside Fuel Oil Corp. was named as a PRP for the Gowanus Canal Superfund Site. Three monitoring wells were installed at the site as part of the Gowanus Canal RI. Based on the Upland Investigation Summary and December 2011 Feasibility Study prepared by CH2MHILL on behalf of USEPA, groundwater impacted with VOCs, SVOCs, and metals was likely discharging from the site into the Canal.

- REC 4 – Current and Historical Use, Historical Petroleum Bulk Storage, and Spill Listings at Surrounding Properties

  Current and Historical Use

  Current and historical use of adjoining and surrounding (potentially up-gradient) properties included blacksmiths (1886 to 1969), coal yards (1886 to 1950), an electrical manufacturer (1950 to 2007), an oil burner warehouse (1969 to 2007), a plastic product manufacturer (1969 to 1987), an unspecified manufacturer (1988 to 2007), a brass foundry (1938 to 2007), and a machine shop (1950 to 2007).

  Historical Petroleum Bulk Storage

  A closed-in-place, 2,500-gallon No. 2 fuel oil UST (Facility ID No. 2-604303) was listed at a northern-adjoining property (259 Bond Street).

  Current Spill Listings

  NYSDEC Spill No. 06-03334 was reported in June 2006 after contamination was encountered in an excavation and chlorinated and petroleum-related VOCs were detected in soil, groundwater, and indoor air at a northern-adjoining property (Former O.Z. Electrical at 198 Douglass Street). NYSDEC Spill No. 06-03334 was reported as closed on March 30, 2021, after finalization of the Phase I ESA.

- REC 5 – Historic Fill

  Subsurface strata at the site primarily consist of historic fill underlain by sand, silt, and clay. The historic fill consists of silt, sand gravel, wood, ash, and coal slag and extends to depths between 4 and 14 feet bgs.

June 30, 2015 IRMWP

Langan prepared an IRMWP in 2015 to remove potential sources of petroleum and prevent additional environmental impacts to site media (soil, groundwater, and soil vapor). The scope of the interim remedial measure (IRM) was detailed in a CCR, as described below.

June 27, 2017 CCR

Langan prepared a 2017 CCR that documented implementation of the NYSDEC-approved IRMWP between February 23, 2016 and February 28, 2017. Langan documented Brookside Environmental, Inc.'s IRM implementation, which included:

- Removal of five bunkered fuel oil ASTs in former Lot 17, with a cumulative former capacity of 1.5 million gallons, including:
  - Asbestos abatement of fuel oil piping;

  - Waste characterization sampling, excavation, and off-site disposal of about 4,500 tons of soil;
  - Demolition and off-site disposal of bunkered AST concrete retaining walls;
  - Dismantling, cleaning, and off-site disposal of bunkered AST walls, ceilings, floors, bracing, product pumps, heating coils, piping, and loading rack as scrap metal;
  - Collection and disposal of residual fuel oil product recovered from piping;
  - Advancement of eight investigative test pits beneath the concrete base slab; and
  - Backfill of the former bunkered AST area with about 1 foot of ¾-inch virgin limestone gravel.
- Completion of a geophysical survey, including the identification and mark-out of suspected USTs;
- Advancement of 11 test pits to investigate the presence of suspected USTs, and backfilling of each test pit with excavated fill, imported virgin stone, or recycled concrete aggregate (RCA);
- Decommissioning, removal, and disposal of four USTs, including:
  - One 1,000-gallon gasoline UST and one 150-gallon gasoline UST (former Lot 1);
  - One 550-gallon gasoline UST (former Lot 20);
  - One 1,080-gallon abandoned-in-place No. 2 fuel oil UST (former Lot 17);
  - Waste characterization sampling and disposal of petroleum-impacted soil;
  - Collection and laboratory analysis of 12 documentation soil samples and one documentation groundwater sample within the UST graves; and
  - Backfilling of each UST grave with imported virgin limestone gravel, imported RCA, and/or excavated fill.
- Decommissioning, removal, and disposal of seven ASTs on former Lot 1:
  - Two 275-gallon lube oil ASTs;
  - One 275-gallon waste oil AST;
  - Two 275-gallon No. 2 fuel oil ASTs;
  - One 100-gallon calibration tank; and
  - One 550-gallon waste oil AST.
- Stockpiling, cleaning, and disposal of miscellaneous containers including drums, barrels, buckets, and cans of petroleum and chemical products; and

- Completion of a site-wide post-IRM land survey.

Langan collected 12 documentation soil samples and one documentation groundwater sample from UST graves following excavation. Soil samples were not collected from excavation bases due to concrete obstructions and/or groundwater saturation. Sidewall soil samples were analyzed for NYSDEC CP-51-list VOCs and SVOCs. The groundwater sample was analyzed for VOCs, SVOCs, PCBs, pesticides, metals (total and dissolved), and total cyanide.

A total of six SVOCs (benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, and indeno(1,2,3-cd)pyrene) exceeded the CP-51 Soil Cleanup Levels (SCL) for Gasoline or Fuel Oil Contaminated Soil in three soil samples collected from the eastern and southern sidewalls of the combined tank grave in the northern portion of former Lot 1, at depths between 6 and 7.5 feet bgs.

The groundwater sample collected from the UST tank grave on former Lot 20 contained six VOCs (1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, benzene, ethylbenzene, toluene, and total xylenes) and six SVOCs (benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, and indeno(1,2,3-cd)pyrene) at concentrations above the SGVs.

August 13, 2017 ECSWP

Langan developed an ECSWP that included the collection of two groundwater samples from existing monitoring wells for NYSDEC-listed per and polyfluoroalkyl substances (PFAS) and 1,4-dioxane analysis.

March 20, 2020 IRMWP No. 2

Langan prepared IRMWP No. 2 to support shoreline stabilization and reduce migration of coal tar-impacted soil and groundwater along the site's Gowanus Canal frontage through the following activities:

- Partial demolition of the existing concrete seawall, steel sheet piles, timber bulkhead, and associated structures as needed to install a sheet pile cut-off wall;
- Installation of a sealed-seam, sheet pile cut-off wall outboard of the existing bulkhead to stabilize the shoreline, enable site redevelopment, and reduce contaminant migration;
- Excavation, handling, transportation, and off-site disposal of soil generated during construction of the cut-off wall and upland components (i.e., sheet pile deadman, tie rods, walers, and stormwater pretreatment units [PTUs]);
- Implementation of a Community Air Monitoring Plan (CAMP) for dust, odors, and VOCs during ground-intrusive activities;
- Dewatering and treatment or off-site disposal of dewatering fluids, as necessary to facilitate excavation for cut-off wall construction;

- Collection and analysis of base of excavation and sidewall documentation soil samples from the tie rod and waler excavation area; and
- Completion of a post-IRM land survey of cut-off wall, excavation, and backfilling extents.

April 13, 2020 OSIWP

Per NYSDEC request, Langan developed an OSIWP to investigate the potential off-site extents of petroleum impacts northwest of the site, and determine whether detections of PFOA and PFOS were related to historical site use. The OSIWP included the advancement of two off-site soil borings on the Bond and Degraw Street sidewalks, conversion of the soil borings into permanent groundwater monitoring wells, and collection of two groundwater samples from the newly installed wells for VOC, SVOC, PFOA, and PFOS analysis.

May 24, 2021 IRMWP No. 2 Addendum

The scope of work included additional investigation and asbestos abatement/demolition of the site buildings to facilitate further investigation/remediation. The investigation scope in this addendum was developed in response to the April 9, 2021 NYSDEC Draft RIR comment letter. The letter documented the NYSDEC's request to further investigate the petroleum-related contamination identified in soil and groundwater on the western portion of former Lot 1, beneath the vacant buildings at 267 Bond Street. The objective of this addendum was to determine whether there are on-site shallow petroleum impacts that must be addressed by the forthcoming remedial program. The investigation scope included eight on-site soil borings in the western portion of former Lot 1 along Bond Street and one off-site soil boring and groundwater monitoring well on the western Bond Street sidewalk.

2.0 DESCRIPTION OF REMEDIAL INVESTIGATION FINDINGS

The RI was implemented over four mobilizations (July to August 2017, October 2018, October 2020, and June to July 2021) to investigate and characterize the nature and extent of environmental impacts at and emanating from the site and to provide sufficient information to evaluate remedial alternatives. Langan conducted the RI in accordance with the May 1, 2017 Remedial Investigation Work Plan (RIWP), the August 13, 2018 Emerging Contaminants Sampling Work Plan (ECSWP), the April 13, 2020 Off-Site Investigation Work Plan (OSIWP), the May 24, 2021 Interim Remedial Measures Work Plan (IRMWP) No. 2 Addendum, Title 6 of the New York Codes, Rules, and Regulations (NYCRR) NYSDEC Part 375, DER-10 (May 2010), and the New York State Department of Health (NYSDOH) Guidance for Evaluating Soil Vapor Intrusion in the State of New York (October 2006 and subsequent updates). The revised Draft RIR was submitted to the NYSDEC on September 8, 2021 and is included as Appendix C. RIR approval is pending.

2.1 Summary Remedial Investigation Performed

The RI included the following activities:

<u>Geophysical Survey</u>

- Completion of a geophysical survey to identify subsurface anomalies consistent with underground storage tanks (UST) and to clear sample locations to avoid subsurface utilities and structures

<u>Soil Investigation</u>

- Advancement of 29 on-site shallow soil borings to a maximum depth of 24 feet below grade surface (bgs); five on-site deep soil borings to a maximum depth of 60 feet bgs; and three off-site shallow soil borings to a maximum depth of 16 feet bgs
- Collection of up to three soil samples from each shallow soil boring and up to four samples from deep soil borings, for a total of 81 soil samples (plus quality assurance/quality control [QA/QC] samples), for laboratory analysis

<u>Groundwater Investigation</u>

- Installation and development of eight on-site shallow monitoring wells; four on-site shallow/deep monitoring well couplets; one on-site deep monitoring well; and three off-site shallow monitoring wells
- Collection of one groundwater sample from each new monitoring well and three pre-existing United States Environmental Protection Agency (USEPA)-installed monitoring well couplets, for a total of 27 groundwater samples (plus QA/QC samples), for laboratory analysis
- Surveying and synoptic gauging of monitoring wells to evaluate groundwater flow direction

Soil Vapor Investigation

- Installation of 13 soil vapor points at a depth of about 2 feet above the observed groundwater table
- Collection of one soil vapor sample from each point and collection of two ambient air samples, for a total of 15 samples, for laboratory analysis

2.1.1 Geophysical Survey

Prior to intrusive activities, the New York One Call Center was contacted for Code 753 utility mark-outs. A geophysical survey was conducted by X-Ray Utility Locating Service of Smithtown, New York, on July 31, 2017. The survey included use of a range of geophysical instruments, including electromagnetic and utility line locator instruments, and ground-penetrating radar (GPR) to identify potential USTs and locate buried utilities and subsurface structures in the vicinity of each boring location. Borings were relocated as necessary to avoid subsurface utilities and other subsurface impediments.

2.1.2 Soil Investigation

The soil investigation scope included:

- 26 borings (SB01 through SB26) advanced by AARCO Environmental Services Corp. between July 31 and August 4, 2017;
- Two off-site borings (SB27 and SB28) advanced by AARCO on October 7, 2020;
- Three borings (SB30, SB35, and SB37) advanced by Warren George, Inc. (WGI) between June 17 and 23, 2021;
- Five borings (SB31 through SB34 and SB36) advanced by AARCO between July 6 and 7, 2021; and
- One off-site boring (SB29) advanced by AARCO on July 7, 2021.

Langan documented advancement of the borings, screened recovered soil for environmental impacts, and collected soil samples for laboratory analysis. Soil was screened continuously to the boring termination depth for total organic vapor (TOV) concentration using a photoionization detector (PID), and for visual and olfactory indications of environmental impacts (e.g., staining and odor).

Samples were collected from 1) the two-foot interval directly below the unpaved grade surface or the concrete or asphalt pavement; 2) the capillary fringe about two feet above the groundwater interface; 3) the interval exhibiting the greatest degree of impacts based on field screening (i.e., visual observations, odors, and/or PID readings above background); and 4) the interval containing coal tar-impacted soil (where encountered in deep soil borings).

Soil samples were collected into laboratory-supplied containers that were sealed, labeled, and placed in a cooler containing ice (to maintain a temperature of approximately 4 degrees Celsius) for delivery to

Alpha Analytical, Inc. (Alpha), a NYSDOH Environmental Laboratory Approval Program (ELAP)-certified analytical laboratory in Westborough, Massachusetts. Soil samples collected from within the fill layer or at the groundwater interface were analyzed for 6 NYCRR Part 375 compound list and Target Compound List (TCL) volatile organic compounds (VOC), TCL semivolatile organic compounds (SVOC), polychlorinated biphenyls (PCB), pesticides, herbicides, Target Analyte List (TAL) metals, and total cyanide. Soil samples collected from below the groundwater table were analyzed for TCL VOCs, TCL SVOCs, and TAL metals. A portion of the soil samples collected to investigate and delineate petroleum impacts were analyzed for NYSDEC Commissioner Policy (CP)-51 Soil Cleanup Guidance-list VOCs and SVOCs only.

2.1.3 Groundwater Investigation

A total of 13 on-site soil borings (SB01 through SB12 and SB26) were converted into groundwater monitoring wells (MW01 through MW12S/D and MW26D). Four of the well locations correspond to shallow/deep well couplets (MW04S/D, MW06S/D, MW11S/D, and MW12S/D), and monitoring well MW26D is a single deep monitoring well. Shallow monitoring wells were installed to evaluate groundwater quality above the meadow mat. Deep monitoring wells were installed to evaluate groundwater quality below the meadow mat and to investigate potential dense non-aqueous phase liquid (DNAPL) impacts associated with the former Fulton Street Manufactured Gas Plant (MGP) and the Gowanus Canal. The three off-site soil borings (SB27 through SB29) were also converted into shallow groundwater monitoring wells (MW27 through MW29).

Groundwater samples were collected a minimum of one week after well development to allow for hydraulic stabilization. One groundwater sample was collected from each newly-installed on-site monitoring well and from each of the three pre-existing EPA monitoring well couplets (i.e., six total groundwater samples were collected from the three EPA well couplets). Monitoring well MW08 was not sampled due to the presence of LNAPL. Prior to sampling, the monitoring wells were gauged for static water levels and purged until physical and chemical parameters (e.g., temperature, dissolved oxygen, oxygen reduction potential, and turbidity) stabilized to within ranges specified in USEPA's Low Stress Purging and Sampling Procedure for the Collection of Groundwater Samples From Monitoring Wells, Dated July 30, 1996 and Revised January 19, 2010.

Groundwater samples were collected directly from the pump discharge line into laboratory-supplied containers that were sealed, labeled, and placed in a cooler containing ice for delivery to Alpha. Shallow groundwater samples were analyzed for TCL VOCs, TCL SVOCs, PCBs, pesticides, TAL metals (total and dissolved), and total cyanide. Deep groundwater samples were analyzed for TCL VOCs and TCL SVOCs. Two on-site monitoring wells, MW05 and MW09, were also analyzed for emerging contaminants. Off-site monitoring wells MW27 and MW28 were only analyzed for perfluorooctanoic acid (PFOA), perfluorooctanesulfonic acid (PFOS), and CP-51-list VOCs and SVOCs. Off-site monitoring well MW29 was only analyzed for CP-51-list VOCs and SVOCs.

2.1.4 Soil Vapor Investigation

A soil vapor investigation consisting of 13 soil vapor investigation points (SV01 through SV13) was completed. Two ambient air samples and one duplicate soil vapor sample were collected for quality assurance/quality control (QA/QC) purposes. Soil vapor sampling was conducted in accordance with the October 2006 NYSDOH Guidance for Evaluating Soil Vapor Intrusion in the State of New York. Each soil vapor sample point was installed to a depth of about 2 feet above the groundwater interface. The soil vapor sample point depths ranged between 0.5 and 9 feet bgs.

As a QA/QC measure, an inert tracer gas (helium) was introduced into an above-grade sampling chamber to ensure that the sampling points were properly sealed above the target sampling depth, thereby preventing subsurface infiltration of ambient air. Prior to sampling, three well volumes were purged from the point using a multi-gas monitor at a rate of less than 0.2 liters per minute. The multi-gas monitor was used to screen the soil vapor for the presence of VOCs. Following purging, each soil vapor point was sampled using laboratory-provided, 2.7- or 6-liter air canisters equipped with 2-hour sample interval flow controllers. Soil vapor and ambient air samples were analyzed by Alpha for VOCs by USEPA Method TO-15.

2.2 Significant Threat

A determination of whether the site poses a significant threat to human health and the environment will be made by NYSDEC and NYSDOH after final review of the RIR.

2.3 Geological Conditions

2.3.1 Regional and Site Geology

Based on the findings of previous investigations, subsurface strata consist primarily of fill underlain by sand, silt, and clay. Fill was observed throughout the site and predominately consists of loose, light brown, fine- to medium-grained sand, with varying amounts of silt, gravel, and anthropogenic and pyrogenic components such as coal, brick, concrete, wood, metal, and slag. The fill layer generally extends from grade surface to depths between about 6 and 11 feet bgs.

The fill layer is generally underlain by brown and light-brown to grey fine- to medium-grained sand with varying amounts of silt and gravel. Intermittent clay and silt units with thicknesses varying between about 6 inches and 19 feet were observed in most soil borings. Clay and silt deposits were identified between about 1 and 22 feet bgs, and from about 26 feet bgs to the maximum drilled depth of 60 feet bgs. Peat was encountered in one boring on former Lot 1 (15 to 16 feet bgs), and three borings on former Lot 17 (1 to 13 feet bgs).

The United States Geological Survey (USGS) “Bedrock and Engineering Geologic Maps of New York County and Parts Kings and Queens Counties, New York, and Parts of Bergen and Hudson Counties, New Jersey” (1990) indicates that bedrock underlying the site is part of the Hartland Formation. The Hartland

Formation is primarily composed of gray granulite with minor biotite and garnet. Based on a geotechnical investigation completed by Langan, bedrock depth is expected to be greater than 150 feet bgs.

2.3.2 Regional and Site Hydrogeology

Groundwater flow is typically topographically influenced, as shallow groundwater tends to originate in areas of topographic highs and flow toward areas of topographic lows, such as rivers, stream valleys, ponds, and wetlands. A broader, interconnected hydrogeological network often governs groundwater flow at depth or in the bedrock aquifer. Groundwater depth and flow direction are also subject to hydrogeologic and anthropogenic variables such as precipitation, evaporation, extent of vegetation cover, and coverage by impervious surfaces. Other factors influencing groundwater include depth to bedrock, the presence of artificial fill, and variability in local geology and groundwater sources or sinks.

The water level measured in the shallow monitoring wells during the RI was between 1.37 feet bgs (elevation [el] 4.87[2]) in MW08 and 8.27 feet bgs (el -1.87) in EPA-MW-3S. Groundwater elevation data indicate that shallow groundwater in the southern and northeastern portions of the site generally flows to the east towards the Gowanus Canal. Shallow groundwater in the northwestern portion of the site on former Lot 1 is inferred to flow towards the northwest.

The water level in the deep monitoring wells was between 2.69 feet bgs (el 2.35) in MW34D and 4.66 feet bgs (el 1.08) in MW12D. The groundwater elevations in monitoring wells MW04D, MW06D, and MW11D were not included in the flow direction estimation, because the mid-screen elevations of these wells did not align with the mean mid-screen elevations of the deep wells (i.e., 35 feet bgs). Deep groundwater at the site is inferred to flow towards the south-southwest.

Groundwater in Brooklyn is not used as a potable (drinking) water source. Potable water in the vicinity of the site is provided by the City of New York and derived from surface impoundments in the Croton, Catskill, and Delaware watersheds.

2.4 Contamination Conditions

2.4.1 Conceptual Model of Site Contamination

A conceptual site model (CSM) was developed based on the findings of the RI and previous reports to produce a simplified framework for understanding the distribution of impacted media, potential migration pathways, and potentially complete exposure pathways, as discussed below.

[2] Elevations herein are in feet and referenced to the North American Vertical Datum of 1988 (NAVD88).

2.4.1.1 Potential Sources of Contamination

Contaminant sources include the following: 1) soil with varying concentrations of SVOCs, pesticides, and metals; 2) petroleum-impacted soil, groundwater, and soil vapor; 3) localized arsenic- and lead-impacted shallow soil; 4) coal tar-impacted soil and groundwater at depths greater than 20 feet bgs; and 5) PCE-, TCE-, and acetone-impacted soil vapor.

2.4.1.2 Exposure Media

Impacted media include soil, groundwater, and soil vapor. Analytical data indicates that the fill across the site contains SVOCs, pesticides, and metals. Petroleum- and coal-tar related VOCs and SVOCs have been identified in soil (at depths of up to 54 feet bgs), groundwater, and soil vapor. Soil vapor has been impacted with petroleum-related VOCs and CVOCs.

2.4.1.3 Receptor Populations

The site is currently vacant and under construction. Currently and during development, potential human receptors will be limited to construction and remediation workers; authorized guests such as regulators, consultants, and representatives of the Participant visiting the site; and the public adjacent to the site. Under future conditions, potential receptors will include tenants, workers, and visitors to the mixed-used development.

2.4.2 Description of Areas of Concern

The following AOCs have been identified based on the results of the RI. AOC locations are shown on Figure 4.

2.4.2.1 AOC 1: Historic Petroleum Bulk Storage on Block 424

AOC 1 represents potential impacts associated with historical PBS on former Lots 1 and 20, including 17 former USTs:

- Fourteen historical 550-gallon diesel and kerosene USTs in the north-central portion of former Lot 1
- A 1,000-gallon gasoline UST and an adjacent 150-gallon gasoline UST previously located in the northwestern corner of former Lot 1 - Langan observed petroleum-impacted soil exhibiting odor and TOV concentrations up to about 33 parts per million (ppm) at a depth of about 3 feet bgs in the tank grave.
- One historical 550-gallon gasoline UST in the western portion of former Lot 20 - Langan observed petroleum-impacted soil exhibiting odor and TOV concentrations up to about 65.9 ppm at a depth of about 3 feet bgs in the tank grave.

Contaminants of concern (COC) include petroleum-related VOCs and SVOCs in soil and groundwater and petroleum-related VOCs in soil vapor.

2.4.2.2 AOC 2: Historic Petroleum Bulk Storage on Block 431, former Lot 17

AOC 2 represents potential impacts associated with historical PBS on Block 431, former Lot 17:

- Five bunkered petroleum ASTs with a capacity of 1.5 million gallons of fuel oil, diesel, and kerosene storage - TOV concentrations above background, staining, and odors were observed during excavation and disposal of soil surrounding and overlying the ASTs and beneath the former concrete base slab. LNAPL globules were also observed in two test pits excavated below the former concrete base slab on the southwest portion of former Lot 17.
- Abandoned-in-place 1,080-gallon No. 2 fuel oil UST located west of the two-story office building - TOV concentrations above background, staining, and odor were observed in soil within the tank grave at depths of between 3 and 6 feet bgs. Possible LNAPL globules were also observed on standing groundwater within the tank grave.

COCs include petroleum-related VOCs and SVOCs in soil and groundwater and petroleum-related VOCs in soil vapor.

2.4.2.3 AOC 3: Historic Petroleum Bulk Storage on Block 431, former Lot 12

AOC 3 represents historical use and PBS on Block 431, former Lot 12. Former Lot 12 contained an automobile repair facility and garage. The lot historically contained one 4,000-gallon UST, two 275-gallon ASTs, and two unregistered 275-gallon ASTs. Historical NYSDEC Spill No. 10-04835 pertained to petroleum product observed within a utility trench excavation located within or adjacent to former Lot 12.

COCs include petroleum-related VOCs and CVOCs, petroleum-related SVOCs, PCBs, and metals in soil and groundwater, and petroleum-related and CVOCs in soil vapor.

2.4.2.4 AOC 4: Historical Use of Block 424

AOC 4 represents historical use of Block 424 includes a coal yard (1886 to 1915 and 1938), a fuel company (1922 to 1928), an automobile repair shop (1938 to 1969), a facility with gasoline tanks (1950 to 2016), and a truck rental facility (1979 to 2015). Historical petroleum and chemical storage on Block 424 included seven ASTs and multiple chemical drums and storage containers. The ASTs and miscellaneous containers were cleaned, dismantled, and removed from the site during the 2016/2017 IRM.

2.4.2.5 AOC 5: Current and Historical Use, Historical Petroleum Bulk Storage, and Closed Spill Listing at Adjoining and Surrounding Properties

AOC 5 represents current and historical use of adjoining and surrounding properties, historical PBS at adjoining properties, and a spill listing at an adjoining property.

Up-gradient adjoining and surrounding properties along Degraw Street, Bond Street, and Union Street included blacksmiths (1886 to 1969), coal yards (1886 to 1950), two manufacturing facilities (1950 to

2007), an oil burner warehouse (1969 to 2007), a plastic product manufacturer (1969 to 1987), a brass foundry (1938 to 2007), a machine shop (1950 to 2007), and an existing vehicle repair shop.

A 2,500-gallon No. 2 fuel oil UST (Facility ID No. 2-604303) was listed at 259 Bond Street, which adjoins former Lot 1 to the north. Two unregistered gasoline USTs were located at 501 Union Street, which adjoins former Lot 17 to the west, from 1950 until 2007. Potential releases of petroleum from these USTs may have adversely impacted groundwater and/or soil vapor at the site.

NYSDEC Spill No. 06-03334 was reported in 2006 after petroleum-impacted soil was observed at a former electrical component manufacturing facility at 198 Douglass Street, which adjoins former Lot 1 to the north. Chlorinated and petroleum-related VOCs were identified in soil, groundwater, and indoor air at the former facility. NYSDEC Spill No. 06-03334 was reported as closed on March 30, 2021.

Potential releases of petroleum products, solvents, and/or other hazardous chemicals from historical operations, USTs and spill at off-site properties may have adversely impacted groundwater and/or soil vapor at the site.

2.4.2.6 AOC 6: Impacts from the Former Fulton Street Manufactured Gas Plant and the Gowanus Canal Superfund Site

AOC 6 represents coal tar impacts associated with the Gowanus Canal Superfund Site and the Former Fulton Street MGP, which have been observed deeper than 20 feet bgs at sites located along the Gowanus Canal.

2.4.3 Nature and Extent of Contamination

Soil contamination associated with the following classifications was identified at the site:

1. SVOC-, pesticide-, and/or metal-contaminated soil
2. Petroleum-contaminated soil
3. Coal tar-contaminated soil
4. Arsenic- and lead-contaminated soil

Groundwater contamination associated with the following classifications was identified at the site:

1. Petroleum-contaminated groundwater
2. Coal tar-contaminated groundwater
3. Arsenic-contaminated groundwater

Soil vapor contamination associated with the following classifications was identified at the site:

1. Petroleum-impacted soil vapor
2. CVOC-impacted soil vapor

2.4.3.1 Soil Contamination

Soil contamination, characterized by field observations and concentrations of contaminants exceeding the NYSDEC Part 375 Unrestricted Use (UU) and/or Restricted Use Restricted-Residential (RURR) SCOs, is attributed to 1) SVOC-, pesticide-, and/or metal-contaminated soil, 2) petroleum-contaminated soil, 3) coal tar-contaminated soil, and 4) arsenic- and lead-contaminated soil. Soil sample results are shown on Figures 5A and 5B.

SVOC-, Pesticide-, and/or Metal-Contaminated Soil

Fill is present throughout the site and generally varies in thickness between about 6 and 11 feet. fill was generally characterized as fine- to medium-grained sand, with varying amounts of silt, gravel, and anthropogenic and pyrogenic material including coal, brick, concrete, wood, metal, and slag. COCs associated with the fill include SVOCs, pesticides, and metals.

Petroleum-Contaminated Soil

Field indications of petroleum impacts including odor, staining, and/or PID readings above background were identified in soil samples collected throughout the site. The impacts were generally observed within the upper 10 feet of soil and were greatest on former Lot 17 near the former location of the bunkered ASTs and in the northern and northwestern portions of former Lot 1 near 16 former USTs. Laboratory analytical results indicate that concentrations of petroleum-related VOCs exceed the Part 375 UU and/or RURR SCOs in 10 samples collected from the northern, western, and eastern portions of former Lot 1. One sample collected from the southeastern portion of former Lot 12 also contained total xylenes at a concentration above the Part 375 UU SCO. SVOCs were detected at concentrations above the Part 375 RURR SCOs in the northern portion of former Lot 1, the central portion of former Lot 1, and the southwestern portion of former Lot 17.

Coal Tar-Contaminated Soil

Four borings advanced in the eastern portion of the site near the Gowanus Canal (SB06, SB11, SB12, and SB26) contained indications of a coal tar-like substance and soil exhibiting coal tar-like odor, staining, and/or PID readings above background at depths up to 54 feet bgs. Coal tar-related VOCs and SVOCs were detected at concentrations above the Part 375 RURR SCOs in SB06, SB12, and SB26. The occurrence of coal tar-related impacts along the western perimeter of the Gowanus Canal is consistent with the USEPA Record of Decision for the Gowanus Canal Superfund Site, which documents the presence of “bank-stored tar” along the Canal at elevations similar to those exhibiting coal tar impacts at the site. The source of the coal tar is likely the Former Fulton Street MGP facility, which was located east of the Canal.

Arsenic- and Lead-Contaminated Soil

Arsenic and lead were detected in samples collected between 0 feet and 8 feet bgs in the western, northwestern, and southern portions of former Lot 1 and in the central portion of former Lot 17.

2.5.3.2 Groundwater Contamination

Groundwater contamination, characterized by concentrations of contaminants exceeding the NYSDEC SGVs, is attributed to petroleum, coal tar, and arsenic contamination and regional groundwater quality. Groundwater sample results are shown on Figures 6A and 6B.

Petroleum-Contaminated Groundwater

Petroleum-related VOCs and SVOCs were detected above the SGVs in groundwater samples collected from 8 of 25 monitoring wells in the western, northern, and eastern portions of former Lot 1, the southeastern portion of former Lot 20, the southern portion of former Lot 12, and the central and southeastern portions of former Lot 17. LNAPL was also identified in monitoring well MW08 in the northwestern portion of former Lot 17.

Coal Tar-Contaminated Groundwater

Several coal tar-related VOCs and the coal tar-related SVOC naphthalene were detected at concentrations above the SGVs in deep monitoring well MW06D in the eastern portion of former Lot 1, and MW12D and MW26D in the southeastern portion of former Lot 17. The source of the coal tar is likely the Former Fulton Street MGP facility, which was located east of the Canal.

Arsenic-Contaminated Groundwater

Dissolved-phase arsenic was detected in well MW02 at a concentration of 25.29 micrograms per liter (µg/L), which marginally exceeds the SGV of 25 µg/L. The detection corresponds with an elevated arsenic concentration (58 milligrams per kilogram [mg/kg]) in a corresponding soil sample collected from 1 to 2 feet bgs.

Regional Groundwater Quality

Groundwater across the site contained several SVOCs, one pesticide (dieldrin), and several metals at concentrations above the SGVs. With the exception of arsenic (discussed above), the dissolved-phase metals above the SGVs were limited to iron, magnesium, manganese, sodium, and antimony. Magnesium, manganese, and sodium are commonly associated with regional brackish conditions attributable the Gowanus Canal and/or seasonal application of road salt. Concentrations of the metals were typically higher in wells near the Gowanus Canal.

2.5.3.3 Soil Vapor Contamination

Thirty-four VOCs, including petroleum-related and CVOCs, were detected in soil vapor samples throughout the site. VOCs were detected in soil vapor at concentrations up to 176,372 micrograms per cubic meter (µg/m³) in SV03. Samples collected throughout former Lots 1, 17, and 20 contained tetrachloroethene (PCE), trichloroethene (TCE), and acetone at concentrations one to two orders of magnitude above those detected elsewhere on site.

The off-site monitoring well located on the Sackett Street sidewalk south of former Lot 1 (EPA-MW4) contained TCE and the PCE breakdown product cis-1,2-dichloroethene (cis-1,2-DCE) at concentrations above the SGVs. Historical vehicle repair activities south and west of the site may therefore be the source of the CVOC detections in soil vapor. Acetone was detected in shallow soil samples throughout the site at concentrations above the Part 375 RURR SCO. Soil vapor sample results are shown on Figures 7A and 7B.

2.5 Environmental and Public Health Assessments

2.5.1 Qualitative Human Health Exposure Assessment

Based upon the CSM and the review of environmental data, complete on-site and off-site exposure pathways appear to be present, in the absence of institutional controls (IC) and engineering controls (EC), under current, construction and remediation, and future conditions. The complete exposure pathways indicate that there is a risk of exposure to humans from site contaminants via exposure to soil, groundwater, and soil vapor if ICs/ECs are not implemented.

Complete exposure pathways have the following five elements: 1) a contaminant source; 2) a contaminant release and transport mechanism; 3) a point of exposure; 4) a route of exposure; and 5) a receptor population. A discussion of the five elements comprising a complete pathway as they pertain to the site is provided below.

2.5.1.1 Current Conditions

Contaminant sources include the following: 1) soil with varying concentrations of SVOCs, pesticides, and metals; 2) petroleum-impacted soil, groundwater and soil vapor; 3) localized arsenic- and lead-impacted shallow soil; 4) coal tar-impacted soil and groundwater at depths greater than 20 feet bgs; and 5) PCE-, TCE-, and acetone-impacted soil vapor.

Contaminant release and transport mechanisms include exposed contaminated soil transported as dust (dermal, ingestion, inhalation), contaminated groundwater flow (dermal contact), and volatilization of contaminants from the soil and groundwater matrices to the soil vapor phase (inhalation). Groundwater is not used as a potable water source in Brooklyn.

Potential routes of exposure include ingestion and dermal absorption of contaminated soil, inhalation of organic vapors arising from contaminated soil, and inhalation of dust arising from contaminated soil. Potential receptor populations include the construction workers performing demolition work, and, to a lesser extent, the public adjacent to the site.

All five elements exist; therefore, the potential for completed exposure pathways is present. The risk is avoided by applying health and safety measures, such as monitoring the air for organic vapors and dust during ground-intrusive activities, using vapor and dust suppression measures, maintaining site security,

and wearing personal protective equipment (PPE). Such measures prevent completion of these potential migration pathways.

2.5.1.2 Construction/Remediation Activities

During future development and remediation activities, the contaminant sources are similar to current conditions. Potential points of exposure include disturbed and exposed contaminated soil during excavation, contaminated dust and organic vapors arising from the excavation, and contaminated groundwater that could be encountered during excavation and dewatering operations. Potential routes of exposure include ingestion and dermal absorption of contaminated soil and groundwater, inhalation of organic vapors arising from contaminated soil and groundwater, and inhalation of dust arising from contaminated soil. Potential receptor populations include construction and remediation workers and, to a lesser extent, the public adjacent to the site.

All five elements exist; therefore, the potential for completed exposure pathways is present. The risk can avoided by applying health and safety measures, such as monitoring the air for organic vapors and dust, using vapor and dust suppression measures, maintaining site security, and wearing PPE. In accordance with a Health and Safety Plan (HASP)/ Construction Health and Safety Plan (CHASP), a RAWP, and a CAMP, measures such as conducting an air monitoring program, donning PPE, and applying vapor and dust suppression measures to prevent off-site migration of contaminants during construction will be implemented. Such measures will prevent completion of these potential migration pathways.

2.5.1.3 Proposed Future Conditions

Under the proposed future condition, some residual contaminants may remain on site, depending on the remedy, and will, to a lesser extent, include those listed under current conditions. It is anticipated that any remedy will include the removal and remediation of previously unidentified USTs and petroleum-impacted soil and groundwater. The risk of soil vapor intrusion (SVI) from petroleum-related contaminants of concern and exposure to petroleum-impacted soil and groundwater will therefore be avoided under future conditions. Any proposed future use will include capping of the site with building slabs, asphalt/concrete pavement, and/or two feet of clean fill in landscaped areas, effectively eliminating exposure risk to future building occupants, including building tenants, residential property employees, visitors, and maintenance workers. Under future use scenarios, groundwater will be restricted for consumption under a deed restriction. The possible routes of exposure can be avoided or mitigated through restrictions on site and groundwater use, maintenance of a site capping system, a continuous waterproofing/vapor barrier membrane, maintenance/operation of soil vapor mitigation systems, and implementation of a Site Management Plan (SMP).

2.5.1.4 Human Health Exposure Assessment Conclusions

1. In the absence of ICs/ECs, there is a moderate risk of exposure during the current and future construction/remediation activities. The primary exposure pathways are:

a. Dermal contact, ingestion, and/or inhalation of contaminated soil, groundwater and/or soil vapor by construction workers.

b. Dermal contact, ingestion, and inhalation of soil (dust) by the nearby community.

These can be avoided by implementing all ground-intrusive work under the CHASP, performing community air monitoring, and following dust suppression and site security measures.

2. The existence of a complete exposure pathway for site contaminants to human receptors during proposed future conditions is unlikely. The site will be remediated, and ICs/ECs will be in place to mitigate any exposure risk related to residual contamination that may remain on site. Further, groundwater is not used as a potable water source in Brooklyn.

3. It is not likely that a complete exposure pathway exists for the migration of site contaminants in groundwater to off-site human receptors for current, construction/remediation phase, or future conditions. Monitoring and control measures will be used during investigation and construction/remediation to prevent completion of this pathway, including implementation of a HASP/CHASP and CAMP. Under future conditions, the site will be remediated and ICs/ECs, if required, will be implemented to prevent completion of the pathway; however, due to the presence of residual off-site contamination unrelated to the site, the potential for impacted off-site soil vapor will remain after the site is redeveloped.

2.5.2 Fish & Wildlife Remedial Impact Analysis

In addition to the human health exposure assessment, DER-10 requires an on-site and off-site Fish and Wildlife Resources Impact Analysis (FWRIA) if certain criteria are met. Based on the requirements stipulated in Section 3.10 and Appendix 3C of DER-10, a review of nearby fish and wildlife resources was conducted using aerial photos, site observations, and USGS topographic maps. The site is located in a long-urbanized, industrial area. The Gowanus Canal adjoins the site to the east, but is an NPL-listed site that possesses neither suitable habitat nor ecological significance. Based on these findings, there was no need to prepare an FWRIA for the site.

2.6 Interim Remedial Actions

Previous IRMs are documented in Section 1.4.2 and included:

1. The June 30, 2015 IRMWP was implemented in 2016 and 2017 to remove potential sources of petroleum and prevent additional environmental impacts to site media. The June 27, 2017 CCR documented the 2016 and 2017 IRM work.

2. The March 20, 2020 IRMWP No. 2 was implemented in 2021 to support shoreline stabilization and reduce migration of coal tar-impacted soil and groundwater along the site's Gowanus Canal frontage. A forthcoming CCR will document the 2021 IRM work.

3.0 DESCRIPTION OF REMEDIAL ACTION PLAN

This section presents an evaluation of three potential remedial alternatives. The proposed remedial alternatives are a Track 1 remedy (Alternative I), a Track 4 remedy (Alternative II), and No Further Action (NFA) (Alternative III). Alternatives I and II are expected to achieve the Remedial Action Objectives (RAO), while the NFA alternative is insufficient.

The recommended remedial alternative, based on an evaluation of the alternatives, is a Track 4 restricted-residential cleanup requiring an environmental easement (EE) and an SMP to address remaining contamination.

This section is organized as follows:

- Section 3.1 describes the remedial standards, criteria, guidance, and objectives
- Sections 3.2 and 3.3 provide technical descriptions of:
    - Alternative I, a Track 1 remedy
    - Alternative II, a Track 4 remedy
- Section 3.4 evaluates the remedial alternatives based on the BCP Remedy Selection Evaluation Criteria
- Section 3.5 discusses the recommended remedial alternative

3.1 Standards, Criteria, and Guidance and Remedial Action Objectives

In accordance with Environmental Conservation Law (ECL) § 27-1415 and DER-10, the objectives of the remedial action are to: 1) reduce the concentrations of contaminants of concern at the site to meet those levels that will protect public health and the environment, and 2) isolate the site from on-site migration of contaminated groundwater and soil vapor from potential off-site sources. In accordance with DER-10, the Participant has a responsibility to remediate contamination that has migrated or emanated from the site to off-site locations. Remedial alternatives will be developed for such a case that eliminate or mitigate on- and off-site environmental impacts or human exposures, to the extent practical. Where identifiable on-site sources contamination are found, the sources will be removed or treated to the extent practical.

Also, in accordance with DER-10, the RAOs for this site are defined as medium-specific objectives for the protection of public health and the environment and are developed based on contaminant-specific standards, criteria, and guidance (SCG), which include:

- NYSDEC DER-10 Technical Guidance for Site Investigation and Remediation (2010);
- NYSDEC DER-23 Citizen Participation Handbook for Remedial Programs (March 2010);
- NYSDEC DER-32 Brownfield Cleanup Program Applications and Agreements (June 2017);

- NYSDEC TOGS 1.1.1 – Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations (1998);
- NYSDEC TOGS 5.1.8 – New York State Stormwater Management Design Manual (2008);
- NYSDEC TOGS 5.1.10 – New York Standards and Specifications for Erosion and Sediment Controls (2005);
- NYSDEC CP-51 - Soil Cleanup Guidance (2010);
- NYSDEC CP-43 Groundwater Monitoring Well Decommissioning Policy (2009);
- NYSDOH – Guidance for Evaluating Soil Vapor Intrusions in the State of New York (2006) and subsequent updates;
- Title 10 of the Official Compilation of Codes, Rules and Regulations of the State of New York, Chapter 1, Part 5-1 – Drinking Water Supplies, Public Water Systems;
- 6 NYCRR Part 360 – General Provisions;
- 6 NYCRR Part 364 – Waste Transporter Permits;
- 6 NYCRR Part 370 – Hazardous Waste Management System;
- 6 NYCRR Part 375 – Environmental Remediation Programs;
- 6 NYCRR Part 376 – Land Disposal Restrictions;
- 6 NYCRR Part 700-706 – Surface Water and Groundwater Classification Standards;
- 6 NYCRR Part 750 – State Pollutant Discharge Elimination System (SPDES) Regulations;
- Code of Federal Regulations (CFR) Title 29 Part 1910.120 - Hazardous Waste Operations and Emergency Response Standard;
- CFR Title 29 Part 1926 - Safety and Health Regulations for Construction;
- NYSDEC Spill Response Guidance Manual; and
- NYSDEC Sampling, Analysis, and Assessment of Per- and Polyfluoroalkyl Substances Under NYSDEC's Part 375 Remedial Programs (June 2021).

Based on the results of previous subsurface investigations and the RI, the following RAOs have been identified:

RAOs	RAOs for Public Health Protection	RAOs for Environmental Protection
Soil	• Prevent ingestion/direct contact with contaminated soil • Prevent inhalation of, or exposure to, contaminants volatilizing from soil	• Prevent migration of contaminants that would result in groundwater contamination
Groundwater	• Prevent ingestion of groundwater with contaminant levels exceeding drinking water standards • Prevent contact with, or inhalation of, volatiles emanating from contaminated groundwater	• Restore groundwater aquifer to pre-disposal/pre-release conditions, to the extent practicable • Minimize the source of groundwater contamination
Soil Vapor	• Mitigate impacts to public health resulting from existing, or the potential for, soil vapor intrusion into buildings at the site	

3.2 Alternative I – Technical Description

Alternative I, a Track 1 remedy, includes the following:

- Development and implementation of a CHASP and CAMP for the protection of on-site workers and the community during remediation
- Demolition and removal of subsurface obstructions (e.g., remnant foundation elements) as needed to facilitate remedial excavation - Review and certification of hazardous building materials and construction and demolition (C&D) debris transport and disposal methodologies is not a requirement of the Remediation Engineer (RE). The RE is responsible for documenting that C&D debris is not comingled with contaminated site soil and fill.
- Excavation and off-site disposal of contaminated soil exceeding Part 375 UU SCOs
- Installation of support of excavation (SOE) components as needed to facilitate the remedial excavation
- Screening of excavated soil for indications of contamination by visual, olfactory, and instrumental methods

- Handling, transport, and off-site disposal of excavated soil in accordance with federal, state, and local rules and regulations
- Dewatering as needed to allow for excavation below the groundwater table, and treatment and discharge of dewatering fluids in accordance with applicable regulations
- Decommissioning and removal of any encountered USTs
- Collection and analysis of confirmation endpoint soil samples to verify that Part 375 UU SCOs are achieved
- Import and placement of fill (e.g., virgin crushed stone, recycled concrete aggregate [RCA], soil) meeting Part 375 UU SCOs to backfill remedial excavations
- Collection of post-remediation groundwater samples
- Completion of an SVI evaluation

The Alternative I remediation extent is shown on Figure 8, and the requirements for each of the Alternative I tasks are described below.

3.2.1 On-Site Worker, Public Health, and Environmental Protection

A site-specific CHASP will be implemented during remediation to protect on-site Langan workers from accidents and acute/chronic exposures to the identified contaminated media. The contractor implementing the remedy will be required to develop and enforce their own HASP, consistent with Occupational Safety and Health Administration (OSHA) requirements. Public health will be protected by implementing and enforcing dust, odor, and organic vapor control and monitoring procedures included in the CAMP. The CAMP will include continuous perimeter monitoring of dust and organic vapor using aerosol monitors and PIDs capable of recording data and calculating 15-minute averages. Field personnel will monitor perimeters for visible dust and odors. The environment will be protected by implementing and enforcing soil erosion prevention measures.

3.2.2 Contaminated Soil Removal

Contaminated soil containing VOCs, SVOCs, pesticides, PCBs, and metals at concentrations that exceed the UU SCOs was identified at the site from surface grade to 53 feet bgs. To achieve Track 1, soil exceeding the UU SCOs defined in 6 NYCRR Part 375-6.8, will be excavated and disposed of off-site.

The estimated remedial excavation depths range between about 15 and 55 feet bgs. The estimated volume of remedial excavation and off-site disposal is about 101,000 cubic yards. The estimate is based on the removal of fill/soil across the site to depths of soil samples without exceedances of any UU SCOs, two feet below the deepest sample collected, or two feet below observed impacts. SOE and dewatering will be necessary to facilitate the remedial excavation. Any off-site soil within the boundaries of the SOE will also be excavated and disposed of off-site.

C&D debris generated during the remedial excavation will be handled, transported and disposed of in accordance with federal, state, and city regulations (including 6 NYCRR Part 360 Series regulations). Review and certification of hazardous building materials and C&D debris transport and disposal methodologies is not a requirement of the RE. The RE is responsible for documenting that C&D debris is not comingled with contaminated site soil and fill.

3.2.3 UST Removal

Unknown USTs may be encountered during excavation. Any USTs and/or associated appurtenances will be decommissioned, disposed of off-site, and registered with the NYSDEC PBS unit. If encountered, petroleum-impacted soil will be excavated. Petroleum impacts at the groundwater table will be addressed through excavation and dewatering. Excavated petroleum-impacted soil will be stockpiled separately from non-petroleum-impacted soil, characterized, and disposed of off-site at a permitted disposal facility in accordance with applicable regulations. Given that the site-wide remedial excavation will extend beyond expected UST depths, confirmation endpoint samples will not be collected from UST excavations.

3.2.4 Excavation Dewatering and Treatment

Dewatering of groundwater will be required to accommodate excavation of soil exceeding UU SCOs and will also act as a method of groundwater remediation in conjunction with source removal. If discharging dewatering fluids to the sewer, the contractor will follow the Rules of the City of New York (RCNY) Title 15, Chapter 19, Use of the Public Sewers and the NYCDEP "Procedure for Obtaining Letter of Approval for Groundwater Discharge to Sanitary or Combined Sewer" to obtain a permit for temporary discharge of groundwater into the city sewer system (NYCDEP discharge permit). The dewatering system will include pretreatment (e.g., bag filters, carbon filtration, etc.) to reduce contaminant concentrations below NYCDEP effluent limitations prior to discharge to the sewer system. If the contractor will discharge more than 10,000 gallons per day, approval from the NYCDEP's Bureau of Water and Sewer Operations will also be required. If the contractor's dewatering system has a pumping capacity of greater than 45 gallons per minute, a Long Island Well permit would be obtained from NYSDEC. The dewatering and treatment system will be designed by a New York State-licensed Professional Engineer (PE). Discharge of water generated during remedial construction to surface waters (e.g., the Gowanus Canal) is prohibited without an SPDES permit.

3.2.5 Confirmation Endpoint Soil Sampling

Confirmation soil samples will be collected from the remedial excavation base at a frequency of one per 900 square feet and from excavation sidewalls at a frequency of one per 30 linear feet per NYSDEC DER-10. Sidewall samples will not be collected because the excavation will extend up to and beyond the site boundary and SOE measures (e.g., secant piles) will preclude access to soil sidewalls. An estimated 110 base confirmation soil samples, plus quality assurance and quality control (QA/QC) samples, will be

collected and analyzed for the full Part 375 list and emerging contaminants to document performance of the remedy.

3.2.6 Excavation Backfill

After the remedial excavation, the site will be backfilled to development grade. About 132,000 cubic yards (volume of excavation plus 30% extra to account for compaction) of fill will be required. Backfill will comply with 6 NYCRR Part 375-6.7(d) and NYSDEC DER-10 Section 5.4(e), Table 5.4(e), and Appendix 5.

Imported backfill will consist of fill meeting the lower of UU and Protection of Groundwater (PGW) SCOs, RCA, and/or virgin crushed stone from a mine or quarry. The fill will be segregated at a source/facility that is free of environmental contaminants. If sampling of the proposed fill is required, qualified environmental personnel will collect representative samples at a frequency consistent with DER-10. The samples will be analyzed for 6 NYCRR Part 375 VOCs, SVOCs, pesticides, herbicides, PCBs, metals, and PFAS by a NYSDOH ELAP-certified laboratory. Upon meeting these criteria, the fill will be transported to the site and segregated from impacted fil/soil, as necessary, on plastic sheeting until used as backfill. RCA imported to the site must be derived from recognizable and uncontaminated concrete and can only be used as backfill above the groundwater table. RCA is not acceptable for and will not be used as cover or drainage material. RCA must originate from a NYSDEC-permitted or registered C&D debris facility and contain less than 10% by weight passing a No. 10 sieve to be excluded from NYSDEC DER-10 sampling requirements. Virgin stone must originate from a NYSDEC-permitted mine or quarry and contain less than 10% by weight passing a No. 10 sieve to be excluded from NYSDEC DER-10 sampling requirements.

3.2.7 Post-Remediation Groundwater Sampling

Three 2-inch-diameter groundwater monitoring wells, screened across the groundwater table, will be installed and sampled to demonstrate that the groundwater RAOs are being met.

3.2.8 SVI Evaluation and Vapor Barrier Membrane

Achieving a Track 1 remedy will remove on-site sources of contamination. Potential exposure pathways for contaminated soil vapor (based on existing data) that may migrate onto the site from off-site sources are anticipated to be mitigated through building construction, which may include concrete foundation construction below the groundwater table and include installation of a continuous waterproofing/vapor barrier membrane between the concrete cellar slab and underlying saturated soil. The continuous membrane will extend from beneath the cellar slab, along the walls of the cellar, to surface grade. The continuous waterproofing/vapor barrier membrane will be resistant to petroleum-related contaminants and have a minimum thickness of 20 mils.

An SVI evaluation will be conducted after the aforementioned remedial elements are completed. The method of remediation and development construction (i.e., removal of site soil/fill, construction of concrete building foundations, and continuous waterproofing/vapor barrier membrane) are anticipated to mitigate the potential for SVI; however, they are not considered ECs. The SVI evaluation will include

documentation of the installation of the above-listed construction measures, and a post-remediation site walk to document site conditions. The objective of the SVI evaluation is to document that the development-specific construction elements are implemented.

3.3 Alternative II – Technical Description

Alternative II, a Track 4 restricted-residential remedy, includes the following:

- Development and implementation of a CHASP and CAMP for the protection of on-site workers and the community during remediation
- Demolition and removal of subsurface obstructions (e.g., remnant foundation elements) as needed to facilitate remedial excavation and installation of ECs (including site-wide cover and sub-membrane depressurization [SMD] systems) - Review and certification of hazardous building materials and C&D debris transport and disposal methodologies is not a requirement of the RE. The RE is responsible for documenting that C&D debris is not comingled with contaminated site soil and fill.
- Excavation and off-site disposal of contaminated soil to allow for installation of ECs;
- Remediation of petroleum impacts to soil through source removal and to groundwater through in-situ application of remediation products to stimulate dissolved-phase hydrocarbon biodegradation
- Installation of SOE as needed to facilitate the remedial excavation
- Dewatering as needed to allow for excavation below the groundwater table, and treatment and discharge of dewatering fluids in accordance with applicable regulations
- Screening of excavated soil for indications of contamination, by visual, olfactory, and instrumental methods
- Handling, transport, and off-site disposal of excavated soil in accordance with federal, state, and local rules and regulations
- Decommissioning and removal of any encountered USTs
- Collection and analysis of documentation soil samples from remedial excavations
- Import and placement of fill (e.g., virgin crushed stone, RCA, soil) meeting the lower of Part 375 RURR and PGW SCOs to backfill remedial excavations and facilitate EC installation
- Installation of the below-grade SMD system components (including a continuous waterproofing/vapor barrier membrane) for potential commissioning and active operation of the systems during site management, if warranted based on the results of a post-remediation SVI evaluation

- Installation of a site-wide composite cover system consisting of concrete building foundation slabs, exterior hardscapes (i.e., stone pavers, wooden boardwalk/platform, and rubber play surfaces), and landscaped areas with 2 feet of fill meeting the lower of Part 375 RURR and PGW SCOs to prevent future exposure to remaining contaminated soil
- Installation of two DNAPL recovery wells (one per block) for potential recovery of DNAPL (if observed) during site management
- Installation of three groundwater monitoring wells and collection of post-remediation groundwater samples
- Establishment of use restrictions (i.e., ICs) including prohibitions on the use of groundwater from the site and prohibitions on sensitive site uses, such as farming or vegetable gardening in remaining site soil, to prevent future exposure to remaining contamination
- Recording of an EE referencing ECs and ICs to prevent future exposure to remaining contamination
- Publication of an SMP for long-term management of remaining contamination as required by the EE, including plans for: 1) IC/EC implementation, 2) monitoring, 3) operation and maintenance, and 4) reporting

The Alternative II remediation extent is shown on Figure 9 and the requirements for each of the Alternative II tasks are described below.

3.3.1 On-Site Worker, Public Health and Environmental Protection

A site-specific CHASP will be implemented during remediation to protect on-site Langan workers from accidents and acute/chronic exposures to the identified contaminated media. The contractor implementing the remedy will be required to develop and enforce their own HASP, consistent with OSHA requirements. Public health will be protected by implementing and enforcing dust, odor, and organic vapor control and monitoring procedures included in the CAMP. The CAMP will include continuous perimeter monitoring of dust and organic vapor using DustTrak aerosol monitors and PIDs capable of recording data and calculating 15-minute averages. Field personnel will monitor perimeters for visible dust and odors. The environment will be protected by implementing and enforcing soil erosion prevention measures.

The CHASP is included in Appendix D; each contractor performing RAWP operations on the site will have and enforce a HASP that, at a minimum, meets the CHASP criteria. A generic guidance for CAMP implementation is included in Appendix E.

3.3.2 Contaminated Soil Removal

Excavation and off-site disposal of contaminated soil will be performed to remove source material, install ECs, and access the groundwater table to allow for in-situ groundwater treatment (see Section 3.3.8). Remedial excavation areas are summarized as follows:

- Area #1 is located in the northern portion of the site near Degraw Street and is associated with 14 former 550-gallon diesel and kerosene USTs and two associated pump islands. Excavation will extend to about 8 feet bgs, as practicable, to remove petroleum-impacted soil and treat groundwater in-situ.
- Area #2 is located in the western portion of the site along Bond Street and is associated with petroleum-impacted groundwater documented by groundwater monitoring well MW02. In-situ groundwater treatment will be accomplished by either 1) excavation to about 10 feet bgs, as practicable, followed by direct mixing with the excavator bucket, or 2) injection from grade at a series of temporary locations using direct-push drilling with retractable stainless steel injection tooling. Source material is not present in Area #2 based on previous investigations; therefore, if excavation to 10 feet bgs is performed then excavated soil may be reused as backfill in this area after application of the in-situ groundwater remediation product if the requirements of Section 5.4.6 are met.
- Area #3 is located in the central portion of the site near Sackett Street and is associated with petroleum impacts evidenced by the presence of LNAPL in groundwater monitoring well MW08 during the RI. Excavation will extend to about 2 feet bgs, as practicable, to remove LNAPL-saturated soil.
- Area #4 is located in the southern portion of the site and is associated with the former bunkered ASTs. Excavation will extend to about 3 feet bgs, as practicable, to remove petroleum-impacted soil and allow for in-situ groundwater treatment. Removal of gravel surface cover, demolition of the former bunkered AST base slab, and removal of historical timber foundation elements are required to facilitate excavation in this area.
- Site-wide excavation will extend up to 2 feet bgs, as needed, to facilitate the construction of the composite cover and the SMD systems. The building foundation slabs will comprise part of the composite cover system. Excavation for foundation construction will includes pile cap excavations to as deep as 5 feet bgs and partial cellar excavations to as deep as 18 feet bgs.
    - Remedial over-excavations will be performed, as practicable, during excavation for foundation construction if grossly contaminated soil, as defined by Part 375.1-2(u), is identified. Remedial over-excavations will extend, at a maximum, to the groundwater table.

The estimated volume of contaminated soil requiring removal and off-site disposal for a Track 4 remedy is about 4,000 cubic yards. C&D debris (i.e., remnant foundation elements) generated during excavation will be handled, transported and disposed of in accordance with federal, state, and city regulations (including 6 NYCRR Part 360 regulations). Review and certification of hazardous building materials and C&D debris transport and disposal methodologies is not a requirement of the RE. The RE is responsible for documenting that C&D debris is not comingled with contaminated site soil and fill.

3.3.3 UST Removal

Unknown USTs may be encountered during excavation. Any USTs and/or associated appurtenances will be decommissioned, disposed of off-site, and registered with the NYSDEC PBS unit. If encountered in the UST grave, petroleum-impacted soil in the unsaturated zone will be excavated as practicable. Petroleum-impacts at the groundwater table will be addressed through excavation (source removal) and/or in-situ treatment. Excavated petroleum-impacted soil will be stockpiled separately from non-petroleum-impacted soil, characterized, and disposed of off-site at a permitted disposal facility in accordance with applicable regulations. One documentation soil sample will be collected from the base of UST removal excavations (if any), plus up to four sidewall samples (if SOE does not preclude access to the excavation sidewalls).

3.2.4 Excavation Dewatering and Treatment

Dewatering of groundwater will be required to accommodate at least one of the remedial excavation areas (Area #1) and will also act as a method of groundwater remediation in conjunction with source removal. If discharging dewatering fluids to the sewer, the contractor will follow the RCNY Title 15, Chapter 19, Use of the Public Sewers and the NYCDEP "Procedure for Obtaining Letter of Approval for Groundwater Discharge to Sanitary or Combined Sewer" to obtain a NYCDEP discharge permit. The dewatering system will include pretreatment (e.g., bag filters, carbon filtration, etc.) to reduce contaminant concentrations below NYCDEP effluent limitations prior to discharge to the sewer system. If the contractor will discharge more than 10,000 gallons per day, approval from the NYCDEP's Bureau of Water and Sewer Operations will also be required. If the contractor's dewatering system has a pumping capacity of greater than 45 gallons per minute, a Long Island Well permit would be obtained from NYSDEC. The dewatering and treatment system will be designed by a New York State-licensed PE. Discharge of water generated during remedial construction to surface waters (e.g., the Gowanus Canal) is prohibited without an SPDES permit.

3.3.5 Documentation Soil Sampling

Documentation soil samples will be collected from the base of the remedial excavation areas where source material is being removed as described in Section 3.3.2, in accordance with NYSDEC DER-10. A total of 13 base-of-excavation and 15 sidewall documentation soil samples will be collected (plus QA/QC samples). Sidewall samples will not be collected where SOE and/or obstructions preclude access to soil sidewalls. Additional documentation samples may be collected if remedial excavations are larger than

anticipated. Documentation and QA/QC samples will be analyzed for the Part 375 list of VOCs, SVOCs, metals, and emerging contaminants, including PFAS. Analytical results of the soil samples collected during the RI will be used to document soil quality in areas outside of the four remedial excavations.

3.3.6 Excavation Backfill

Import of fill will be required to backfill remedial excavations. About 6,000 cubic yards (volume of excavation plus 30% extra to account for compaction) of fill is anticipated to restore the site to development grade. Backfill will comply with 6 NYCRR Part 375-6.7(d) and NYSDEC DER-10 Section 5.4(e), Table 5.4(e), and Appendix 5.

Imported fill will meet the lower of RURR and PGW SCOs, or consist of RCA, and/or virgin crushed stone from a mine or quarry. The fill will be segregated at a source/facility that is free of environmental contaminants. If sampling of the proposed fill is required, qualified environmental personnel will collect representative samples at a frequency consistent with DER-10. The samples will be analyzed for 6 NYCRR Part 375 VOCs, SVOCs, pesticides, herbicides, PCBs, metals, and PFAS by a NYSDOH ELAP-certified laboratory. Upon meeting these criteria, the fill will be transported to the site and segregated from impacted soil/fill, as necessary, on plastic sheeting until used as backfill. RCA imported to the site must be derived from recognizable and uncontaminated concrete and can only be used as backfill above the groundwater table. RCA is not acceptable for and will not be used as cover or drainage material. RCA must originate from a NYSDEC-permitted or registered C&D debris facility and contain less than 10% by weight passing a No. 10 sieve to be excluded from NYSDEC DER-10 sampling requirements. Virgin stone must originate from a NYSDEC-permitted mine or quarry and contain less than 10% by weight passing a No. 10 sieve to be excluded from NYSDEC DER-10 sampling requirements.

3.3.7 Composite Cover System

A site-wide composite cover system consisting of concrete building foundation slabs, landscaped areas with at least 2 feet of approved fill, and hardscape (i.e., stone pavers, wooden boardwalk/platform, and rubber play surfaces) will be installed. The landscaped areas and hardscape will be part of the continuous 40- to 60-foot-wide SPW along the Gowanus Canal. A site cover is required to allow for restricted-residential use of the site in areas where the upper 2 feet of exposed surface soil exceeds the applicable SCOs. Any proposed soil cover will consist of a minimum of 2 feet of fill (e.g., soil, stone, etc.) placed over a high-visibility demarcation layer. Soil covers, consisting of imported fill, will meet the lower of the RURR and PGW SCOs as set forth in Part 375-6.7(d). A composite cover system plan is shown on Figure 10.

3.3.8 In-Situ Groundwater Treatment

A remediation product, PetroFix™, will be applied in-situ to remediate petroleum-impacted groundwater at Areas #1, #2, and #4 (see Figure 9). PetroFix™ is manufactured by Regenesis®, a remediation product vendor based in San Clemente, California. The PetroFix™ mixture consists of water, micron-scale activated carbon (corn-syrup-like black fluid) and an anaerobic electron acceptor blend (sodium nitrate/ammonium

sulfate as white powder). After application, dissolved-phase hydrocarbons will sorb onto the activated carbon particles, while the fast- and slow-release electron acceptors stimulate prolonged biodegradation. About 7,575 gallons of the PetroFix™ mixture (including 14,800 pounds of PetroFix™ and 740 pounds of electron acceptor blend) will be applied. Potential application methods include 1) injections through a series of temporary locations using direct-push drilling with retractable stainless steel injection tooling, and/or 2) spray application to the excavation base and bucket-mixing with saturated soil as needed. Appendix F includes a PetroFix™ design document prepared by Regenesis®, specifications and application instructions, safety data sheets (SDS), and spray application example photographs.

Three new, 2-inch-diameter permanent groundwater monitoring wells, screened across the groundwater table, will be installed to monitor efficacy of the groundwater treatment. Two of the wells will be installed within Areas #1 and #3 (one well per area), and the third well will be installed on the Bond Street sidewalk west of Area #2. Proposed groundwater monitoring well locations are shown on Figure 9. Two post-application quarterly groundwater sampling events will be conducted to demonstrate that the groundwater RAOs are being met. Subsequent groundwater sampling events may be required and will be detailed in the SMP.

3.3.9 Installation of Soil Vapor Mitigation System

To mitigate SVI, SMD systems (including continuous waterproofing/vapor barrier membrane) will be installed beneath the new building slabs. The SMD systems will be installed below occupied building spaces in the lowest level. The SMD systems will not be installed below building areas that extend to the groundwater table, such as the partial cellars. The SMD systems will also not be installed below mechanically-ventilated parking garage spaces, such as the garage entry ramp in the north building facing Sackett Street, because the NYC Mechanical Code requires an air exchange rate sufficient to prevent accumulation of vapors.

The SMD systems were designed and developed in general accordance with the NYSDOH Guidance. The SMD systems will include a sub-membrane collection layer (8-inch layer of virgin ¾-inch stone) with horizontal perforated collection piping. The collection layer will underlie a continuous waterproofing/vapor barrier membrane that is integrally bonded to the concrete building foundation slab. The membrane will be resistant to petroleum-related contaminants and have a minimum thickness of 20 mils. SMD system drawings are included as Appendix G and waterproofing/vapor barrier membrane drawings are included as Appendix B.

Riser pipes will be installed to convey the collected vapor to the roof. The riser pipes will either be connected to active vacuum blowers or passive wind turbines, pending the results of a post-remediation SVI evaluation. The SVI evaluation will include collection of co-located sub-slab vapor and indoor air samples after concrete foundation slab installation is complete and the buildings are fully enclosed. The sample results will be evaluated using the NYSDOH Guidance to determine if active SVI mitigation is

warranted. Completion and commissioning of the SMD systems will occur during the site management phase of the project, but prior to building occupancy.

3.3.10 DNAPL Recovery Well Installation

Two recovery wells will be installed and used to recover DNAPL (if observed) during site management. Coal tar impacts were observed during the RI, though measurable DNAPL was not observed in RI monitoring wells during a subsequent well gauging event. The recovery wells will be installed where the greatest degree of coal tar impacts were observed in each block (i.e., near RI soil borings SB06 and SB26). Proposed recovery well locations are shown on Figure 9.

The recovery wells will be installed with 20-foot-long, 4-inch-diameter, wire-wrapped, 30-slot, stainless steel screens, and 15-foot-long stainless steel sumps. A hydrated bentonite plug will be installed below the bottom of the sump to limit the potential for vertical DNAPL migration. The well casing/riser, extending to grade surface, will be stainless steel and have a nominal inside diameter of 4 inches. The annular space around the wells will have a filter pack installed to at least 2 feet above the well screen. The filter pack will be clean, rounded silica sand with a minimum size of #3. The annular space above the filter pack will be sealed with a minimum 2-foot-thick layer of hydrated bentonite. The remaining annular space will be filled with neat cement grout to grade, and each recovery well will be completed with a flush-mounted steel manhole. Both recovery wells will be located outdoors, within the SPW. The north recovery well will be installed to el -40 (base of sump), and the south recovery well will be installed to el -60. Recovery well depths and screen lengths may be adjusted based on field observations during installation.

The SMP will include manual DNAPL recovery procedures, including transport and disposal requirements. The SMP will also include target goals for completion of the recovery and monitoring program, and procedures for discontinuance (subject to NYSDEC approval).

3.3.11 Engineering and Institutional Controls

An EE will be recorded referencing ICs and ECs that are part of the selected remedy, which will be binding upon all subsequent owners and occupants of the site. The ICs will restrict the site's use to restricted-residential, commercial, and industrial uses and require implementation of an SMP. The ECs will include a composite cover system and SMD systems. The SMP will identify long-term monitoring, maintenance, and certification requirements.

3.4 Evaluation of Remedial Alternatives

The following is an evaluation of the proposed remedy based on the NYSDEC BCP remedy evaluation criteria listed below. The first two criteria are considered "threshold" criteria and must be satisfied for an alternative to qualify as a selection. The remaining criteria are considered "balancing" criteria, which are

used to compare the advantages and disadvantages of each alternative. A remedial alternative must satisfy the threshold criteria before qualifying for further evaluation under the balancing criteria.

A. Protection of human health and the environment
B. Compliance with SCGs
C. Short-term effectiveness and impacts
D. Long-term effectiveness and permanence
E. Reduction of toxicity, mobility, or volume of contaminated fill/soil
F. Implementability
G. Cost effectiveness
H. Community Acceptance
I. Land use

3.4.1 Protection of Public Health and the Environment

Alternative I – The remedy will mitigate exposure pathways from on-site contaminated media by removing soil that exceeds Part 375 UU SCOs and dewatering and treatment of contaminated groundwater. This remedy will effectively achieve the RAOs for public health and environmental protection by eliminating the possibility for ingestion, inhalation, or dermal contact with contaminated media.

Alternative II – The remedy will mitigate exposure pathways to on-site contaminated media by removing all source material, preventing exposure to contaminated soil left in place with a composite cover system, in-situ treatment of contaminated groundwater, and SVI mitigation via installation of SMD systems (including a continuous waterproofing/vapor barrier membrane). The RAOs for public health and environmental protection will be met through the removal, treatment, and capping of contaminated soil, which will eliminate the possibility for ingestion, inhalation, or dermal contact, and treatment of groundwater contamination. SVI will be mitigated through the installation of SMD systems (including a continuous waterproofing/vapor barrier membrane) and concrete building foundation slabs. Impacted groundwater will be remediated via in-situ treatment. Groundwater in Brooklyn is not a source of drinking water and its use will be restricted on-site.

Alternative III – A NFA remedy is not protective of public health or the environment, because exposure pathways to on-site contaminated media will be complete during future use and no treatment of contaminated groundwater will occur.

Public health will be protected during remediation under remedial Alternatives I and II by implementing the CAMP during site work and enforcing dust, odor, and organic vapor control. The environment will be protected by implementing and enforcing soil erosion and sediment controls as needed.

3.4.2 Compliance with Standards, Criteria, and Guidance

Alternative I – The Track 1 remedy will comply with applicable SCGs due to the removal of soil that exceeds Part 375 UU SCOs, and dewatering and treatment of contaminated groundwater.

Alternative II – The Track 4 remedy comply with applicable SCGs by installing ECs to prevent contact with remaining soil contamination exceeding the RURR SCOs, removal of source material with the potential to impact groundwater and soil vapor, in-situ treatment of contaminated groundwater, and long-term SVI mitigation via installation of SMD systems with a continuous waterproofing/vapor barrier membrane.

Alternative III – A NFA remedy does not comply with applicable SCGs, because contaminated media will remain in place without ECs.

Remedial alternatives will also comply with SCGs that involve protection of the public health and environment during the remedial action by implementing and enforcing a site-specific CHASP and CAMP. OSHA requirements for on-site construction safety will be followed by the site contractors.

3.4.3 Short-Term Effectiveness and Impacts

The most significant short-term adverse impacts and risks to the community will be through the migration of contaminants carried in soil, vapor, and dust generated during construction. Additional short-term adverse impacts and risks to the community include the potential complications and risk involved with designing and constructing SOE and underpinning for the buildings and structures adjoining the site, and potential impositions on roadway and pedestrian traffic associated with construction.

The estimated volume of fill/soil requiring removal and off-site disposal is about 101,000 cubic yards for Alternative I, about 25 times more than Alternative II (about 4,000 cubic yards). Truck traffic will be significantly less under Alternative II, due to the significant decrease in export (and import) of fill/soil. The potential for short-term adverse impacts related to migration of contaminants carried in soil is higher for the Alternative I scenario. The Alternative III scenario does not have any short-term adverse impacts.

Truck traffic will be routed on the most direct course using major thoroughfares where possible, and flaggers will be used to protect pedestrians at site entrances and exits. The effects of these potential adverse impacts to the community, workers and the environment will be greater for Alternative I and can be avoided under Alternatives I and II by implementing control plans (including the CHASP, CAMP, and dust, odor and vapor control measures).

3.4.4 Long-Term Effectiveness and Impacts

Alternative I – The Track 1 remedy will remove sources of groundwater contamination and site soil that exceeds the UU SCOs, and dewater and treat impacted groundwater. In addition, groundwater in Brooklyn is not used for drinking water. Potential exposure pathways for impacted groundwater and soil vapor that may migrate onto the site from off-site sources will be eliminated through the construction of the concrete building foundation slabs and installation of a continuous waterproofing/vapor barrier

membrane. Future site use will be unrestricted; therefore, the long-term effectiveness of this remedy will eliminate risks and satisfy the objectives of this criterion.

Alternative II – The Track 4 remedy will remove source material, treat impacted groundwater, and mitigate potential SVI. A site-wide composite cover system consisting of concrete building foundation slabs, exterior hardscapes (i.e., stone pavers, wooden boardwalk/platform, and rubber play surfaces), and landscaped areas with 2 feet of fill meeting the lower of Part 375 RURR and PGW SCOs to prevent future exposure to remaining contaminated soil. Active SMD systems and a continuous waterproofing/vapor barrier membrane will mitigate SVI from any remaining on-site or off-site contaminant sources. An SMP and EE will restrict the use of groundwater on the site.

Alternative III – A NFA remedy is insufficient as a long-term remedial alternative, because it is not protective of public health or the environment.

3.4.5 Reduction of Toxicity, Mobility, or Volume of Contaminated Fill/Soil

Alternative I – The Track 1 remedy will permanently and entirely reduce the toxicity, mobility, and volume of contamination through excavation and off-site disposal of soil exceeding Part 375 UU SCOs, and dewatering and treatment of groundwater.

Alternative II – The Track 4 remedy will remove or treat on-site sources of groundwater contamination and remove contaminated site soil. Exposure to remaining contamination will be prevented by ECs, including a composite cover system and SMD systems. The Track 4 remedy will reduce the toxicity, mobility, and volume of soil and groundwater contamination to a lesser extent than the Track 1 remedy, because contaminated soil will be left in place.

Alternative III – A NFA remedy will not reduce toxicity, mobility, or volume of contaminated fill/soil.

3.4.6 Implementability

Implementation of the Track 1 and Track 4 remedies can be achieved with conventional construction methods and equipment, including the use of standard bucket excavators and SOE, and proven in-situ remediation technologies. The availability of local contractors, personnel and equipment suitable to working in a structurally challenging environment is high, due to the frequency of this type of remediation in the region. The Track 1 remedy includes deeper excavation over the entire site footprint, which will require a complex SOE system to prevent undermining of adjacent buildings and infrastructure. The Track 4 remedy includes source material removal that will also require an SOE system, but on a significantly smaller scale. Implementability of the Track 1 remedy is more challenging and time consuming than the Track 4 remedy. An NFA remedy will not require any effort to complete.

3.4.7 Cost Effectiveness

The estimated preliminary engineering and contractor remediation cost of each remedy track is:

- Alternative I – Track 1 remedy: approximately $56,400,000

- Alternative II – Track 4 remedy: approximately $5,500,000, plus ongoing operation and maintenance costs
- Alternative III – NFA remedy: no cost

Tables 1 and 2 detail the costs of the individual components needed to achieve Alternatives I and II.

Alternative I – As the site will be remediated to meet UU SCOs, there will be no long-term operation, maintenance, or monitoring costs associated with the proposed remedy. Post-remediation, short-term groundwater monitoring will be implemented under the Track 1 remedy until groundwater has been restored to pre-release or asymptotic conditions, to the extent practicable.

Alternative II – The Track 4 remedy has a lower cost than Track 1 because it requires less excavation, off-site disposal, backfill, and SOE. ECs and ICs will be implemented to monitor remaining contamination, which requires an SMP, an EE, and long-term costs associated with operation and maintenance of ECs and monitoring of ongoing groundwater remediation.

3.4.8 Community Acceptance

The Track 1 remedy may be less acceptable to the community because of the increased traffic, time, and effort associated with site remedial excavation. However, the potential exposure pathways to on-site contamination will be eliminated upon completion. The Track 4 remedy will be acceptable to the community, because the RAOs will be met through removal of contaminated soil/fill and ECs and ICs will be used to prevent exposure to remaining contamination. The NFA remedy will not be acceptable to the public, because exposure pathways to on-site contaminated media will be complete future use. Any selected remedy will be subject to a 45-day public comment period, and any substantive public comments will be addressed before the remedy is approved by NYSDEC.

3.4.9 Land Use

The current, intended, and reasonably anticipated future land use of the site and its surroundings are compatible with the alternatives. The future proposed development includes two mixed-use residential/commercial buildings. Review of previous environmental and public documents led to the following conclusions:

1. The current and proposed use of the site and its surroundings will be compatible with the selected remedy.
2. The proposed site use conforms to the recently approved Gowanus neighborhood Rezoning, which rezoned the site to M1-4/R7-2, as described in the September 10, 2021 Final Environmental Impact Statement (FEIS) for the Gowanus Neighborhood Plan prepared by the NYC Department of City Planning (DCP).
3. The proposed site use conforms to historical and/or recent development patterns in the area.

4. The site does not fall within the boundaries of an existing Brownfield Opportunity Area (BOA).
5. The site is located in an urban setting that is characterized by residential, commercial, and mixed-use developments. There are no areas zoned for agricultural use in the proximity of the site.
6. There are no federal or state land designations.
7. The population growth patterns and projections support the proposed land use.
8. The site is accessible to existing infrastructure.
9. The site is not in close proximity to important cultural resources, including federal or state historic or heritage sites or Native American religious sites.
10. The nearest ecological receptor is the Gowanus Canal, an NPL site located adjacent to the site.
11. Municipal water supply wells are not present in this area of NYC; therefore, groundwater from the site will not affect municipal water supply wells or recharge areas.
12. According to the Federal Emergency Management Agency (FEMA) September 5, 2007 Flood Insurance Rate Map (FIRM, Map Number 3604970211F) and the December 5, 2013 Preliminary FIRM (Map Number 3604970211G), the site is located within Zone AE, a special flood hazard area subject to inundation by the 1% annual chance flood.
13. The site geology is described in Section 2.3.1.
14. There are no known ICs currently in effect at the site.

3.5 Summary of the Selected Remedy

Alternatives I and II will be protective of human health and the environment and will meet the remedy selection criteria. Alternative III (No Further Action) will not. Implementation of Alternative I provides for removal of all on-site soil contamination exceeding UU SCOs and treatment of groundwater through dewatering; however, the additional excavation required to achieve a Track 1 cleanup will include significantly more risk than the Track 4 scenario because of a substantially complex SOE design for adjoining buildings, structures, and roadways. Track 4 is also preferred over Track 1 considering the increased truck traffic and prolong potential exposure to contaminated dust and vapor associated with the additional Track 1 excavation. The Track 1 scenario is also more than ten times the cost of the Track 4 remediation

Alternative II provides for excavation and removal of contaminated soil to allow for installation of ECs and removal of source material impacting soil, groundwater, and soil vapor. Groundwater contamination will be remediated via dewatering and treatment and an in-situ remediation method. Potential exposure pathways for soil, groundwater and soil vapor contaminants will be mitigated via in-situ treatment, construction of SMD systems, and construction of a composite cover system.

Unlike Alternative I, Alternative II can be practically implemented in a cost-effective manner while providing similar overall protection to human health and the environment. Therefore, Alternative II is the recommended remedial alternative for this site. Figure 9 depicts the Alternative II (Track 4) remedy.

4.0 REMEDIAL ACTION PROGRAM

4.1 Governing Documents

The primary documents governing the remedial action are summarized in this section. As referenced, copies of the full plans are provided in the appendices.

4.1.1 Remedial Design and Green Remediation Principles

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-10. The major green remediation components to be considered 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 that 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; and
- Integrating the remedy with the end use where possible and encouraging green and sustainable re-development.

4.1.2 Site-Specific CHASP

The Remedial Engineer (RE) oversaw the preparation of a site-specific CHASP, which is provided as Appendix D. The CHASP requires that all remedial work performed under this plan will be in full compliance with governmental requirements, including site and worker safety requirements mandated by Federal OSHA. The CHASP provides a mechanism for establishing on-site safe working conditions, safety organization, procedures, and PPE. The CHASP meets the requirements of 29 CFR 1910 and 29 CFR 1926 (which includes 29 CFR 1910.120 and 29 CFR 1926.65, respectively). The CHASP includes, but is not limited to, the following components:

- Organization and identification of key personnel

- Training requirements
- Medical surveillance requirements
- List of site hazards
- Excavation safety
- Drill rig safety
- Work zone descriptions and monitoring procedures
- Personal safety equipment and protective clothing requirements
- Decontamination requirements
- Standard operating procedures
- Contingency plan
- SDS

Remedial work performed under this plan will be in full compliance with governmental requirements, including site and worker safety requirements mandated by Federal OSHA. The Participant and associated parties preparing the remedial documents submitted to the State and those performing the construction work, are completely responsible for the preparation of a CHASP and for the performance of work in accordance with that plan and applicable laws.

The CHASP and requirements defined in this RAWP pertain to all remedial and invasive work performed at the site until the issuance of a Certificate of Completion. The Langan Site Safety Coordinator will be William Bohrer. If required, confined space entry will comply with all OSHA requirements to address the potential risk posed by combustible and toxic gasses. Langan personnel will not enter confined spaces.

4.1.3 Quality Assurance Project Plan (QAPP)

The RE oversaw preparation of a Quality Assurance Project Plan (QAPP) that describes the quality control components employed so that the proposed remedy accomplishes the remedial goals and RAOs and is completed in accordance with the design specifications. The QAPP is provided as Appendix H and includes:

- Responsibilities of key personnel and their organizations for the proposed remedy;
- Qualifications of the quality assurance officer;
- Sampling requirements including methodologies, quantity, volume, locations, frequency, and acceptance and rejection criteria; and

- Description of reporting requirements for quality assurance activities including weekly quality assurance review reports, periodic quality assurance and quality control audits, and other report and data submissions.

4.1.4 Construction Quality Assurance Plan (CQAP)

The RE oversaw the preparation of a Construction Quality Assurance Plan (CQAP) that describes the quality control components employed so that the proposed remedy accomplishes the remedial goals and RAOs and is completed in accordance with design specifications. Because the remedy is being accomplished through building construction, the contractor and construction manager will have the primary responsibility to provide construction quality. A list of engineering personnel involved in implementation of the CQAP and procedures that will be carried out by the remedial engineering team are identified below.

Remedial Engineer (RE):	Jason J. Hayes, PE, LEED AP
Project Manager:	Patrick Farnham, PE
Langan Health & Safety Officer:	Anthony Moffa Jr., CHMM
Site Safety Coordinator:	William Bohrer, PG
Qualified Environmental Professional (QEP):	Michael Burke, PG, CHMM
Field Team Leader:	Vinicius De Paula, EIT
Quality Assurance Officer (QAO):	Gerald Nicholls, PE, CHMM

Project personnel résumés are provided in Appendix I.

The RE will directly supervise field personnel that will be on-site during the remedial action to monitor particulates and organic vapor in accordance with the CAMP. Daily reports will be submitted to NYSDEC and NYSDOH and will include reporting of CAMP results that exceed the specified action levels (if any).

A QEP or the RE will directly supervise field personnel that will meet with the Construction Superintendent on a daily basis to discuss the plans for that day and schedule upcoming activities. The field personnel will document remedial activities in daily reports.

A QEP or the RE will directly supervise field personnel that will screen the excavation with a PID during intrusive activities. All readings will be noted in the record. Elevated readings will be reported to NYSDEC and NYSDOH in the daily reports. The field personnel will collect documentation soil samples in accordance with this RAWP.

A photo log will be kept to document construction activities by still photos. The photo log may also be used to record activities recorded in the daily report.

The project field notebook will be used to document all sampling activities and how they correspond to the RAWP. All observations and field and laboratory tests will be recorded in the project field notebook

or on separate logs. Recorded field observations may take the form of notes, charts, sketches, or photographs.

The Field Team Leader will maintain the current field book and original field paperwork during the performance of work. The Project Manager will maintain the field paperwork after completion and will maintain submittal document files.

4.1.5 Soil/Materials Management Plan (SMMP)

The RE oversaw preparation of an SMMP that includes detailed plans for managing contaminated soil, fill and liquids that are disturbed at the site, including excavation, handling, storage, transport and disposal. It also includes controls that will be applied to these efforts to facilitate effective, nuisance-free performance in compliance with applicable federal, state and local laws and regulations. The SMMP is provided as Section 5.4.

4.1.6 Stormwater Pollution Prevention Plan (SWPPP)

Erosion and sediment controls for the site will be designed and documented in a SWPPP in conformance with requirements presented in the New York State Standards and Specifications for Erosion and Sediment Control. Best Management Practices (BMP) will be employed to mitigate erosion and prevent the migration of sediment off-site throughout construction. Dewatering is required during construction of the partial cellars, and will be permitted under an NYCDEP discharge permit. Discharge of water generated during remedial construction to surface waters (e.g., the Gowanus Canal) is prohibited without an SPDES permit. Components of the SWPPP are further described in Section 5.4.10.

4.1.7 CAMP

A site-specific CAMP was developed in accordance with the NYSDOH Generic CAMP included as Appendix E. Community air monitoring will be conducted as outlined in Section 5.4.12.

4.1.8 Contractors Site Operations Plan (SOP)

The RE will review all plans and submittals for this remedial project (including those listed above and contractor and subcontractor document submittals) for compliance with this RAWP. The RE is responsible for documenting that contractor and subcontractor document submittals are in compliance with this RAWP. Remedial documents will be submitted to NYSDEC and NYSDOH in a timely manner and prior to the start of work.

4.1.9 Citizen Participation Plan

A certification of mailing will be sent by the Participant to the NYSDEC project manager following the distribution of all Fact Sheets and notices that includes: 1) certification that the Fact Sheets were mailed; 2) the date they were mailed; 3) a copy of the Fact Sheet; 4) a list of recipients (contact list); and 5) a statement that the repository was inspected on (specific date) and that it contained all of the applicable project documents.

No changes will be made to NYSDEC-approved Fact Sheets authorized for release by NYSDEC without written consent from the NYSDEC. No other information, such as brochures and flyers, will be included with the Fact Sheet mailing.

Document repositories have been established at the following locations, as proposed in the BCP Application, and will contain all applicable project documents:

Brooklyn Public Library – Carroll Gardens Branch
396 Clinton Street
Brooklyn, NY 11231
(718) 596-6972

NYSDEC – Division of Environmental Remediation
Attn: Jane O'Connell
47-40 21st Street
Long Island City, NY 11101
(718) 482-4900

4.2 General Remedial Construction Information

4.2.1 Project Organization

This section presents the anticipated project organization and associated roles, including key personnel, descriptions of duties and lines of authority in the management of the RAWP. Information regarding the organization/personnel and their associated responsibilities is provided below.

4.2.2 Remedial Engineer

The RE for this project will be Jason J. Hayes. The RE is a registered PE licensed by the State of New York. The RE will have primary direct responsibility for implementation of the remedial program for the Gowanus Canal Northside site BCP Site No. C224080). The RE will certify in the Final Engineering Report (FER) that the remedial activities were observed by qualified environmental professionals under his supervision and that the remediation requirements set forth in the RAWP and any other relevant provisions of ECL 27-1419 have been achieved in accordance with this RAWP. Other RE certification requirements are listed later in this RAWP.

The RE and their team will document the work of remediation contractors and subcontractors involved in all aspects of remedial construction, including soil excavation, stockpiling, characterization, removal and disposal, air monitoring, EC installation, emergency spill response services, import of backfill, and management of waste transport and disposal. Deviations from the procedures identified in the RAWP that are observed by Langan will be brought to the attention of the contractor, who will remedy the deviation(s). The RE will be responsible for all communication with NYSDEC and NYSDOH.

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

In the FER, the RE will provide the certifications listed in Section 9.1 of this RAWP.

4.2.3 Remedial Action Construction Schedule

The anticipated remedial action construction schedule is discussed below in Section 10.0 and provided in Appendix J. The NYSDEC will be promptly notified of proposed changes, delays, or deviations to the schedule.

4.2.4 Work Hours

The hours of operation of remedial construction will conform to the NYCDOB construction code requirements or according to specific variances issued by that agency. NYSDEC will be notified by the Participant of any variances issued by the NYCDOB. The NYSDEC reserves the right to deny alternate remedial construction hours.

4.2.5 Site Security

The site perimeter will be secured with gated and signed plywood fencing with restricted points of entry in accordance with NYCDOB and New York City Department of Transportation (NYCDOT) permits and requirements. The purpose of the fencing is to limit site access to authorized personnel, protect pedestrians from site activities, and maintain site security.

4.2.6 Traffic Control

Site traffic will be controlled through designated points of access along Sackett, Bond, Degraw, and Union Streets. Access points will be continuously monitored and if necessary, a flagging system will be used to protect workers, pedestrians, and authorized guests. Traffic will also adhere to applicable local, state, and federal laws.

4.2.7 Contingency Plan

The contingency plans described below have been developed to address unexpected discoveries of additional contaminated media and/or USTs.

4.2.7.1 Discovery of Unexpected Contaminated Soil

During remediation and construction activities, the soil will be continuously monitored by the RE's field representative(s) using a PID as well as visual and olfactory field screening to identify previously unknown contamination and soil that may not be suitable for the selected disposal facility(ies). Impacted fill/soil will be segregated and sampled for lab analysis in accordance with disposal facility requirements. Laboratory analysis will be for full scan parameters (VOCs, SVOCs, PCBs, pesticides, metals, and PFAS). Analyses will not be otherwise limited without NYSDEC approval. If the facility is not permitted to receive the sampled fill/soil, the fill/soil will be disposed of off-site at a permitted facility able to receive the fill/soil based on the characterization data. Identification of unknown or unexpected contaminated media identified by screening during invasive site work will be promptly communicated by phone to the NYSDEC

Project Manager. These findings will be detailed in daily reports and subsequent monthly BCP progress reports. Potential additional remedial measures will be coordinated with NYSDEC.

4.2.7.2 Discovery of Unexpected USTs

Previously unidentified USTs may be discovered during excavation. Any unexpected USTs encountered during remedial and/or construction activities will be decommissioned in accordance with 6 NYCRR Part 613 and NYSDEC DER-10 Section 5.5. Once the tank, its contents, and associated piping are removed, post-excavation soil samples will be collected per the requirements of NYSDEC DER-10 and this RAWP. If encountered, petroleum-impacted soil in the unsaturated zone will be excavated as practicable. Petroleum impacts at the groundwater table will be addressed through excavation and/or in-situ treatment. Excavated petroleum-impacted fill/soil will be stockpiled separately from non-petroleum-impacted fill/soil, characterized, and disposed of off-site at a permitted disposal facility in accordance with applicable regulations. UST closure documentation, including contractor affidavits, waste manifests, and tank disposal receipts, will be included as appendices to the FER. USTs will be registered and decommissioned with the NYSDEC PBS unit, as necessary.

If USTs are encountered during invasive site work, the findings will be promptly communicated to the NYSDEC's Project Manager and detailed in daily reports and subsequent monthly BCP progress reports.

4.2.8 Worker Training and Monitoring

Worker training and monitoring will be conducted in accordance with the CHASP, which is provided in Appendix D.

4.2.9 Agency Approvals

Permits or government approvals required for remedial construction will be obtained before the start of remedial construction. The planned end use for the site does not conform to current zoning for the property, but does conform to the proposed zoning outlined in the September 10, 2021 FEIS for the Gowanus Neighborhood Plan by NYC DCP. A Certificate of Completion will not be issued for the project unless conformance with the zoning designation is demonstrated.

4.2.10 NYSDEC BCP Signage

Signs are optional for BCP sites and should be discussed with the NYSDEC Project Manager. If a sign is to be displayed, it must follow NYSDEC specifications for design and content. The NYSDEC Project Manager can provide details on signage protocol.

4.2.11 Pre-Construction Meeting with NYSDEC

Prior to the onset of construction, a meeting will be held between the NYSDEC, RE, Participant, construction manager, and contractor to discuss project roles, responsibilities, and expectations associated with this RAWP. Notice will be provided to the NYSDEC seven days prior to site mobilization.

4.2.12 Emergency Contact Information

An emergency contact sheet with names and phone numbers is included in the CHASP, provided as Appendix D. That document will define the specific project contacts for use by NYSDEC and NYSDOH in the case of a day or night emergency.

4.2.13 Remedial Action Costs

The estimated preliminary engineering and contractor cost of the preferred remedy is about $5,500,000, plus ongoing operation and maintenance costs. An itemized and detailed summary of estimated costs for the preferred remedy is attached as Table 2.

4.3 Site Preparation

The RE will work with the Participant and their contractors so that site development activities will not interfere with, or otherwise impair or compromise, the remedial activities proposed in this RAWP.

4.3.1 Mobilization

Before commencing remedial construction, the contractor will mobilize to the site and prepare for remedial activities. Mobilization and site preparation activities may include the following:

- Identifying the location of all aboveground and underground utilities (e.g., power, gas, water, sewer, telephone), equipment, and structures (as necessary to implement the remediation);
- Mobilizing necessary remediation personnel, equipment, and materials to the site;
- Constructing one or more stabilized construction entrances consisting of virgin crushed stone or RCA at or near the site exit, which takes into consideration the site setting and site perimeter;
- Constructing a decontamination pad for trucks, equipment, and personnel that come into contact with impacted fill/soil during remedial activities;
- Installing erosion and sedimentation control measures, as necessary; and
- Installing temporary fencing or other temporary barriers to limit unauthorized access to areas where remediation activities will be conducted.

4.3.2 Erosion and Sedimentation Controls

Based on the size of the site and the planned excavation, select common erosion and sedimentation control practices (i.e. perimeter silt fencing, inlet protection, stabilized construction entrances, dust control via water sprinkling, etc.) will be necessary and will be implemented in accordance with the project-specific SWPPP. BMPs for soil erosion will be selected to minimize erosion and sedimentation off site from the start of the remediation to the completion of development.

4.3.3 Monitoring Well Decommissioning

Existing groundwater monitoring wells to be affected by implementation of this RAWP will be decommissioned in accordance with NYSDEC policy CP-43, unless the full length of the well is to be excavated during remediation and development. If required, well decommissioning will be performed by an experienced driller and logged by the driller and Langan personnel. Decommissioning documentation will be provided in the FER.

4.3.4 Stabilized Construction Entrance(s)

Stabilized entrance areas will be constructed to prevent decontaminated trucks from being re-contaminated by site soil before exiting. The areas will be covered with virgin crushed stone or RCA and graded so that runoff water will be directed onto the site. The contractor will protect and maintain the existing sidewalks and roadway at site entrance points.

4.3.5 Utility Marker and Easements Layout

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

The presence of utilities and easements on the site will be investigated by the RE, Participant, and their contractors. No impediments to the planned work under this RAWP are expected due to known utilities or easements on the site.

4.3.6 Sheeting and Shoring

Management of structural stability of on-site or off-site structures during on-site activities including excavation is the sole responsibility of the Participant and their contractors. The Participant and their contractors are solely responsible for safe execution of all invasive and other work performed under this RAWP. The Participant and their contractors must obtain any local, state or federal permits or approvals that may be required to perform work detailed in this RAWP.

4.3.7 Equipment and Material Staging

The contractor will notify the RE and the Participant, in writing with receipt confirmed, of pending site work mobilization at least 30 calendar days in advance. During mobilization, construction equipment will be delivered to the site, temporary facilities constructed, and temporary utilities installed as needed. The contractor will place and maintain temporary toilet facilities within the work areas for usage by all site personnel. The contractor will provide drinking water for all site personnel.

4.3.8 Decontamination Area

The contractor will construct decontamination pads at each site entrance/exit planned for construction vehicle usage. The location of decontamination pads may change periodically to accommodate the contractor's sequencing of work. When required, the pads will be constructed by the contractor to collect wastewater for off-site disposal or treatment and discharge, if generated during decontamination activities. The design will consider adequate space to decontaminate site equipment and vehicles, and sloping and liners to facilitate collection of wastewater. Any collected truck rinsate and decontamination wastewater shall be either discharged in accordance with an NYCDEP discharge permit or tested and transported to an off-site disposal facility that is permitted to accept this waste, in accordance with applicable local, state, and federal regulations. The contractor will maintain the decontamination pad(s) throughout the duration of site work. Prior to demobilization, the contractor will deconstruct the pads and dispose of materials as required.

If the contractor uses high pressure washing methods, the contractor shall provide splash protection around the vehicle decontamination facility to prevent splatter and mist migrating off-site during the vehicle decontamination process. Splash protection shall be temporary and stable and capable of being dismantled in the event of high winds.

4.3.9 Site Fencing

The site perimeter will be secured with gated and signed plywood fencing. The purpose of the fencing is to limit site access to authorized personnel, protect pedestrians from site activities and maintain site security.

4.3.10 Demobilization

The contractor will be responsible for demobilizing all labor, equipment, and materials not designated for off-site disposal. The RE will be responsible to document that the contractor performs follow-up coordination and maintenance for the following activities:

- Restoration of areas that may have been disturbed to accommodate support areas (e.g., staging areas, decontamination areas, storage areas, temporary water management area[s], and access area);
- Removal of temporary access areas (whether on-site or off-site) and restoration of disturbed access areas to pre-remediation conditions;
- Removal of sediment and erosion control measures and disposal of materials in accordance with acceptable rules and regulations;
- Equipment decontamination; and
- General refuse disposal.

4.4 Reporting

Daily and monthly BCP progress reports and an FER will be required to document the remedial action. The RE responsible for certifying the reports will be an individual licensed to practice engineering in the State of New York; Jason Hayes, P.E., of Langan, will have this responsibility. Should Mr. Hayes become unable to fulfill this responsibility, another suitably qualified New York State PE will take his place. Daily and monthly reports will be included as appendices to the FER. In addition to the periodic reports and the FER, copies of all relevant contractor documents will be submitted to the NYSDEC.

4.4.1 Daily Reports

Daily reports will be submitted to NYSDEC and NYSDOH Project Managers by the end of each day following the reporting period (or at a frequency acceptable to them) and will include:

- An update of progress made during the reporting day;
- Locations of work and quantities of fill/soil imported to and exported from the site;
- References to alpha-numeric map for site activities;
- A summary of any and all complaints with relevant details (names, phone numbers);
- A summary of CAMP findings, including corrective actions for instances where action levels were exceeded;
- An explanation of notable site conditions;
- A description of anticipated site activities; and
- The NYSDEC-assigned project number.

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

Daily reports will include a description of daily activities keyed to an alpha-numeric map for the site that identifies work areas. These reports will include a summary of air sampling results, odor and dust problems and corrective actions, and all complaints received from the public.

4.4.2 Monthly Reports

Monthly reports will be submitted to NYSDEC and NYSDOH Project Managers by the tenth of the month following the reporting period. The monthly reports will include the following information, as well as any additional information required by the Brownfield Cleanup Agreement (BCA):

- Activities relative to the site during the previous reporting period and those anticipated for the next reporting period, including a quantitative presentation of work performed (i.e. tons of fill/soil exported and imported, etc.);
- Description of approved activity modifications, including changes of work scope and/or schedule;
- Sampling results received following internal data review and validation, as applicable; and
- An update of the remedial schedule including the percentage of project completion, unresolved delays encountered or anticipated that may affect the future schedule, and efforts made to mitigate such delays.

4.4.3 Other Reporting

Photographs will be taken of all remedial activities and submitted to NYSDEC in digital format. Photographs will illustrate all remedial program elements and will be of acceptable quality. Representative photos of the site before any remedial actions and of each contaminant source, source area and site structures before, during and after remediation will be provided. Photographs will be included in the daily reports as needed, and a comprehensive collection of photos will be included in the FER.

Site records for remedial work will be documented and maintained on-site during the project and be available for inspection by NYSDEC and NYSDOH staff.

4.4.4 Complaint Management Plan

The management plan for documenting complaints is detailed below.

Item	Description
Approach	Complaints regarding remediation or construction activities/operations will be minimized and mitigation measures will be implemented to reduce the incidence of complaints.
Objective	To manage environmental complaints from the community regarding construction or remediation.
Implementation Strategy/Mitigation Measures	All complaints will be documented on a complaint register. The register will be maintained as an ongoing record. Each entry will include the following information: • Time, date and nature of complaint; • Type of communication (telephone, letter, email, personal, etc.); • Name, contact address, and contact number; and • Response and investigation undertaken as a result of the complaint and action taken with the signature of the responsible person. Each complaint will be investigated as soon as practicable in relation to the requirements.

Item	Description
Monitoring	A representative from the Participant or the RE will follow up on the complaint within two weeks of receipt to ensure it has been resolved.
Reporting	Upon receipt, the NYSDEC will be notified. Complaints and resolutions will be documented in the daily reports.
Corrective Action	Should an incident or failure to comply occur in relation to the management of environmental complaints, one or more of the following corrective actions will be undertaken as appropriate: • Conduct additional training of staff to handle environmental complaints; • Investigate why the environmental complaint was not addressed within the specified time frame; and • Investigate the complaint and action follow-up according to the investigation results.

4.4.5 Deviations from the RAWP

Necessary deviations from the RAWP will be coordinated with the NYSDEC in advance. Notification will be provided to the NYSDEC by telephone/email for conditions requiring immediate action (e.g., conditions judged to be a danger to the surrounding community). Based on the significance of the deviation, an addendum to this RAWP may be necessary and will include:

- Reasons for deviating from the approved RAWP;
- Approval process to be followed for changes/editions to the RAWP; and
- Effect of the deviation(s) on the overall remedy.

5.0 REMEDIAL ACTION: SOURCE MATERIAL REMOVAL AND IN-SITU GROUNDWATER TREATMENT

5.1 Soil Cleanup Objectives

The SCOs for the site will be RURR SCOs. Excavation and off-site disposal of contaminated soil will be performed to remove source material and install ECs. The reasonably anticipated use of the site is restricted residential. Remaining soil contamination above the RURR SCOs will be capped with a site-wide composite site cover system consisting of concrete building foundation slabs, landscaped areas with at least 2 feet of approved fill, and hardscape areas (i.e., stone pavers, wooden boardwalk/platform, and rubber play surfaces). Imported fill will meet the SCOs for the proposed site use as set forth in Part 375-6.7(d).

Soil and materials management on- and off-site will be conducted in accordance with the SMMP included below as Section 5.4. UST closures will conform to the criteria defined in 6 NYCRR Part 613, NYSDEC CP-51, and other applicable NYSDEC UST closure requirements including DER 10 Chapter 5.5.

5.2 Remedial Performance Evaluation

5.2.1 Documentation Soil Samples

Documentation soil samples will be collected from the base of the remedial excavation areas where source material is being removed as described in Section 3.3.2, in accordance with NYSDEC DER-10. A total of 13 base-of-excavation and 15 sidewall documentation soil samples will be collected (plus QA/QC samples). Sidewall samples will not be collected where SOE and/or obstructions preclude access to soil sidewalls. Additional documentation samples may be collected if remedial excavations are larger than anticipated. Documentation and QA/QC samples will be analyzed for the Part 375 list of VOCs, SVOCs, metals, and emerging contaminants, including PFAS. Analytical results of the soil samples collected during the RI will be used to document soil quality in areas outside of the remedial excavations.

Documentation samples will be transported under standard chain-of-custody protocol to an NYSDOH ELAP-approved laboratory. Laboratory analyses will be conducted in accordance with EPA SW-846 methods and NYSDEC Analytical Services Protocol (ASP) Category B deliverable format. QA/QC procedures required by the NYSDEC ASP and SW-846 methods will be followed, including instrument calibration, standard compound spikes, surrogate compound spikes, and analysis of quality control samples. The laboratory will provide sample bottles, which are pre-cleaned and preserved. Where there are differences in the SW-846 and NYSDEC ASP requirements, the NYSDEC ASP shall take precedence.

A data usability summary report (DUSR) will be included in the FER. Quality control procedures for the sampling are included in the QAPP (Appendix H). Documentation soil sample results will be provided in NYSDEC electronic data deliverable (EDD) format for EQuIS™. Guidance on sampling frequency is presented in Section 5.4 of DER-10. Prior to completion of validation, preliminary sample results will be appended to the monthly progress reports.

The proposed documentation soil sample locations are presented in Figure 11. The FER will provide a tabular and map summary of all documentation sample results.

5.2.2 Groundwater Remediation Performance Monitoring

Post-remediation quarterly groundwater sampling events will be conducted to determine whether the groundwater RAOs have been met. The sampling events will include collection of one groundwater sample from each of the three newly installed monitoring wells, plus QA/QC samples. Samples will be submitted to an NYSDOH ELAP-accredited laboratory for Part 375-listed VOC analysis. Subsequent groundwater sampling events may be required if the groundwater RAOs are not met within two quarters, and will be detailed in the SMP. Groundwater sample results will be used in consultation with NYSDEC to determine when to discontinue groundwater sampling and when the groundwater remedy is considered complete. Criteria for completion of groundwater remediation are further discussed in Section 8.0.

If groundwater quarterly groundwater sampling continues to be required during construction of the buildings, the wells will be integrated into the building design to remain accessible for future sampling.

5.3 Estimated Fill/Soil Removal Quantities

The estimated volume of fill/soil requiring removal and off-site disposal is about 4,000 cubic yards. Soil excavation will be performed for source removal and to facilitate the construction of the composite cover system and the SMD systems.

5.4 SMMP

This section presents the approach to management, disposal and reuse of soil and fill excavated from the site. This plan is based on the current knowledge of site conditions, and will be augmented with the additional data collected during remediation. Field personnel, under the direction of the RE or QEP, will monitor and document the handling and transport of contaminated fill/soil removed from the site for disposal as a regulated solid waste. Field personnel, under the direction of the RE or QEP, will assist the remedial contractor in identifying impacted fill/soil during excavation, determining fill/soil suitable for direct load-out versus temporary on-site stockpiling, selection of samples for waste characterization, and determining the proper off-site disposal facility. Separate stockpile areas will be constructed as needed to stage various excavated fill/soil types with the intent to more efficiently manage and characterize the fill/soil and to avoid comingling of impacted fill/soil with non-impacted fill/soil.

5.4.1 Soil Screening Methods

Visual, olfactory, and PID soil screening and assessment will be performed by field personnel under the direction of the RE during all remedial and development excavations into known or potentially contaminated fill/soil. Soil screening will be performed regardless of when the invasive work is done and will include all excavation and invasive work performed during the remedy and during development

phase, such as excavations for foundations and utility work, prior to issuance of the Certificate of Completion.

Primary contaminant sources (including but not limited to, source material and former USTs) identified during the RI, waste characterization, and remedial action will be surveyed by a surveyor licensed to practice in the State of New York. This information will be provided on maps in the FER.

Field screening will be performed by field personnel under the direct supervision of the RE or QEP. Resumes will be provided for all personnel responsible for field screening (i.e., those representing the RE) of invasive work for known or unknown contaminant sources during remediation and development work.

5.4.2 Stockpile Methods

Soil stockpile areas will be constructed as necessary for staging of site soil, pending loading and/or waste characterization testing. Separate stockpile areas will be constructed to avoid comingling fill/soil of differing waste types. All stockpile areas will meet the following minimum requirements:

- The excavated soil will be placed onto a minimum thickness of 8-mil low-permeability plastic sheeting or tarps of sufficient strength to prevent puncture during use; separate stockpiles will be created where soil types are different (e.g., petroleum-impacted soil stockpiled in a contaminated soil area). The use of multiple layers of thinner liners is permissible.
- Equipment and procedures will be used to place and remove the soil that will minimize the potential to jeopardize the integrity of the liner.
- Stockpiles will be covered at the designated times (see below) with minimum 6-mil plastic sheeting or tarps, which will be securely anchored to the ground. Stockpiles will be routinely inspected and broken covers will be promptly replaced.
- Stockpile capacity is about 1,000 cubic yards. Stockpiles at capacity will be covered until ready for loading.
- Active stockpiles (e.g., stockpiles that have not reached their capacity) will be covered at the end of each workday.
- Each stockpile area will be encircled with silt fences and hay bales, as needed, to contain and filter particulates from rainwater that has drained off the soil, and to mitigate the potential for surface water run-off to leave the site.
- Stockpiles will be inspected at a minimum once each day and after every storm event. Results of inspections will be recorded in a logbook and maintained at the site and available for inspection by the NYSDEC.
- Coal tar-impacted soil may be generated during installation of the building foundation pile elements. Direct-loading of coal tar-impacted soil is not practicable, therefore, the soil will be

temporarily stockpiled on-site. Coal-tar impacted soil stockpiles will remain covered at all times unless soil is being added to the stockpile or being prepared for disposal. Periodic VOC monitoring will be conducted in the vicinity of coal tar-impacted soil stockpiles. Efforts will be made to prioritize direct-loading and minimize the duration of stockpiling.

5.4.3 Characterization, Excavation and Load Out

Excavated soil will be characterized for off-site disposal in a manner suitable to the receiving facility and in conformance with applicable permits. Sampling and analytical methods, sampling frequency, analytical results, and QA/QC will be reported in the FER. All data available for fill/soil to be disposed of at a given facility must be submitted to the disposal facility for review and approval before shipment and receipt.

The Participant and their contractors are solely responsible for safe execution of invasive work, the structural integrity of excavations, structures that may be affected by excavations, and other work performed under this RAWP. Field personnel under the direct supervision of the RE or QEP will oversee all invasive work and the excavation and loading of excavated soil. Development-related grading cuts and fills will not be performed without NYSDEC approval of the RAWP, and the RE will provide that site development activities will not interfere with, or otherwise impair or compromise, remedial activities proposed in this RAWP.

The RE will be responsible for monitoring egress points for truck and equipment transport from the site and ensuring that the contractor is notified of their obligation to immediately clean the sidewalks and or streets of soil or fill derived from the site during site remediation and development. Non-compliance will be reported to the NYSDEC. Locations where vehicles enter or exit the site shall be inspected daily for evidence of off-site sediment tracking. Cleaning of the adjacent streets will be performed as needed to maintain a clean condition with respect to site-derived materials. Loaded vehicles leaving the site will be lined, securely covered, manifested, and placarded in accordance with federal, state, and local (NYCDOT) requirements, and all other applicable transportation requirements. Trucks hauling fill/soil will not be lined unless the material exhibits free liquids or is grossly-impacted. On-site mechanical processing of fill and contaminated soil is prohibited unless otherwise approved by the NYSDEC.

Primary contaminant sources (including but not limited to source material and former USTs) identified during implementation of the remedy will be surveyed by a surveyor licensed to practice in the State of New York. The survey information will be shown on maps to be reported in the FER.

5.4.4 Transport Off-Site

Transport of materials will be performed by licensed haulers in accordance with appropriate local, state, and federal regulations, including 6 NYCRR Part 364. Haulers will be licensed and permitted and trucks properly placarded. Trucks will enter and exit the site using dedicated ingress/egress points. Trucks loaded with fill/soil will exit the vicinity of the site using only approved truck routes. Trucks will be prohibited from stopping and idling in the neighborhood outside the site. To the extent possible, queuing

of trucks will be performed on site in order to minimize off-site disturbance. Off-site queuing will be minimized.

Proposed inbound and outbound truck routes to the site are shown on Figure 12. These routes take into account:

- Limiting transport through residential areas and past sensitive sites
- Use of city-mapped truck routes
- Minimization of off-site queuing of trucks entering the facility, to the extent possible
- Limiting total distance to major highways
- Promoting safety in access to highways
- Overall safety in transport

A truck wash/cleaning area will be operated on site. The RE will be responsible for documenting that outbound trucks are washed and cleaned at the truck wash before leaving the site until the remedial construction is complete. Locations where vehicles enter or exit the site will be inspected daily for evidence of off-site sediment tracking.

If loads contain wet fill/soil capable of producing free liquid, truck liners will be used. The RE will be responsible for documenting that egress points for truck and equipment transport from the site are clean of soil or fill derived from the site during remediation and development. Cleaning of the adjacent streets will be performed as needed to maintain a clean condition with respect to site-derived materials.

5.4.5 Disposal Off-Site

Excavated soil and fill removed from the site will be handled, transported and disposed of in accordance with local, state (including 6 NYCRR Parts 360), and federal regulations. If disposal of fill/soil is proposed for unregulated disposal (i.e., clean soil removed for development purposes), a formal request with an associated plan will be made to the NYSDEC's Project Manager. Unregulated off-site management of fill/soil from this site is prohibited without formal NYSDEC approval.

Excavated non-hazardous contaminated soil and hazardous waste (if encountered) must be disposed of at a facility licensed to accept the material. Non-hazardous fill can be sent to a C&D debris handling and recovery facility only with written approval from the NYSDEC. Hazardous waste is prohibited from being sent to a C&D debris handling and recovery facility (6 NYCRR Part 361-5). Hazardous waste derived from the site will be managed, transported and disposed of in compliance with applicable local, state, and federal regulations.

Non-hazardous fill and contaminated soil taken off-site will be handled, at minimum, as a Municipal Solid Waste per 6 NYCRR Part 360.2. Fill and contaminated soil from the site are prohibited from being disposed at Part 360.15 Registration Facilities (also known as Soil Recycling Facilities). Soil that is contaminated but

non-hazardous and is being removed from the site is considered by the NYSDEC Division of Materials Management (DMM) to be C&D debris with contamination not typical of virgin soil. This soil may be sent to a permitted Part 360 landfill. They may be sent to a permitted C&D debris processing facility without permit modifications only upon prior notification of NYSDEC Region 2 DMM. This material is prohibited from being sent or redirected to a Part 360.15 Registration Facility. In this case, as dictated by DMM, special procedures will include, at a minimum, a letter to the C&D debris facility that provides a detailed explanation that the material is derived from a DER remediation site, that the fill/soil is contaminated and that it must not be redirected to on-site or off-site Soil Recycling Facilities. The letter will provide the project identity and the name and phone number of the RE. The letter will include as an attachment a summary of all analytical data for the fill/soil being transported.

The following documentation will be obtained and reported by the RE for each off-site disposal location used in this project to fully demonstrate and document that the disposal of material derived from the site conforms to applicable laws:

1. A letter from the RE or Participant to the receiving facility describing the material to be disposed and requesting formal written acceptance of the material. This letter will state that material to be disposed of is contaminated material generated at an environmental remediation site in New York State. The letter will provide the project identity and the name and phone number of the RE. The letter will include as an attachment a summary of all analytical data for the material being transported (including site characterization data); and
2. A letter from each receiving facility stating it is in receipt of the correspondence (above) and is approved to accept the material. These documents will be included in the FER.

The FER will include an account of the destination of all contaminated soil, fill and liquids removed from the site during the remedy, including excavated fill/soil, hazardous waste (if any), non-regulated soil, and fluids. Documentation associated with disposal must also include records (i.e., manifests and scale tickets) and approvals for receipt by the facilities. This information will also be presented in the FER.

5.4.6 Reuse On-Site

Excavated soil may be reused on the site under the proposed remedy. Soil may only be reused if the requirements in this section and NYCRR Part 360 are met. Source material, grossly-contaminated soil, or soil exhibiting staining or odor will not be reused on-site. Excavated soil may be used as backfill, without additional sampling, for the excavation from which the soil was removed, or in areas of similar physical characteristics at the site. Soil proposed for reuse in areas differing in physical characteristics will be sampled in accordance with NYSDEC DER-10.

Soil removed during the implementation of the remedy or removed for grading or other purposes will not be reused within a cover soil layer, within landscaping berms, or as backfill for subsurface utility lines. Organic matter (wood, roots, stumps, etc.) or other solid waste derived from clearing and grubbing of the

site is prohibited for reuse on-site. Material deemed unfit for reuse will be transported off-site for disposal.

5.4.7 Fluids Management

Based on the depth to groundwater observed during the RI, localized dewatering of groundwater will likely be required to install foundation elements. If discharging dewatering fluids to the sewer, the contractor will obtain an NYCDEP discharge permit. The dewatering system may include pretreatment (e.g., bag filters, carbon filtration, etc.) to reduce contaminant concentrations below NYCDEP effluent limitations prior to discharge to the New York City Sewer system, as required by the permit. If the contractor will discharge more than 10,000 gallons per day, they will also have to obtain approval from the NYCDEP's Bureau of Water and Sewer Operations, Chief of Permitting and Compliance. If the contractor's dewatering system has a pumping capacity of greater than 45 gallons per minute, a Long Island Well permit would be obtained from NYSDEC. The dewatering and treatment system will be designed, operated and maintained by the Contractor's New York State-licensed PE. As an alternative to discharging to the sewer, dewatered groundwater may be containerized and disposed of at an approved facility.

Dewatered fluids will not be recharged back to the land surface or subsurface, and will be managed off-site. Discharge of water generated during remedial construction to surface waters (e.g., the Gowanus Canal) is prohibited without a SPDES permit.

5.4.8 Demarcation

After the completion of soil removal and any other invasive remedial activities and prior to backfilling with reused site fill or imported clean fill, a land survey will be performed by a New York State licensed surveyor. The survey will define the top elevation of residual contaminated soils. A physical demarcation layer, consisting of orange snow fencing material, geotextile material or equivalent material will be placed on this surface to provide a visual reference, where the surface is capped clean soil (e.g., landscaped area). The demarcation layer is not required if the residual soil is capped with impervious surface cover (e.g., concrete, asphalt). This demarcation layer will constitute the top of the 'Residuals Management Zone', the zone that requires adherence to special conditions for disturbance of contaminated residual soils defined in the SMP. The survey will measure the grade covered by the demarcation layer before the placement of cover soils, pavement and sub-soils, structures, or other materials. This survey and the demarcation layer placed on this grade surface will constitute the physical and written record of the upper surface of the 'Residuals Management Zone' in the FER and SMP.

5.4.9 Backfill from Off-Site Sources

Backfill proposed for import will be approved by the RE and will be in compliance with provisions in this RAWP prior to receipt at the site. Imported soil for backfill must meet the requirements of 6 NYCRR Part 375-6.7(d) and NYSDEC DER-10 Section 5.4(e), Table 5.4(e)10, and Appendix 5. Backfill from industrial

sites, spill sites, other environmental remediation sites or other potentially contaminated sites will not be imported to the site. Solid waste will not be imported to the site.

The FER will include the following certification by the RE: "I certify that all import of soil from off-site, including source evaluation, approval, and sampling, has been performed in a manner that is consistent with the methodology defined in the RAWP".

Backfill will consist of clean fill (as described in the following paragraph) or other acceptable fill such as RCA or virgin stone from a quarry. If RCA is imported to the site, it will be from a NYSDEC-registered or -permitted facility in compliance with 6 NYCRR Part 360 registration and permitting requirements for the period of acquisition of RCA. Import of RCA will be imported as per a site-specific Beneficial Use Determination (BUD), if required by NYSDEC. RCA imported from compliant facilities will not require chemical testing, unless required by the NYSDEC under the terms for operation of the facility. RCA imported to the site must be derived from recognizable and uncontaminated concrete. RCA is not acceptable for and will not be used as cover or drainage material. RCA must originate from a NYSDEC-permitted or registered C&D debris facility and contain less than 10% by weight passing a No. 10 sieve to be excluded from NYSDEC DER-10 sampling requirements. Virgin stone must originate from a mine or quarry and contain less than 10% by weight passing a No. 10 sieve to be excluded from NYSDEC DER-10 sampling requirements. Sampling may be required by NYSDEC under the terms for operation of the facility.

Imported soil (i.e., clean fill) will meet the lower of RURR and PGW SCOs. Non-compliant soil will not be imported to the site. Clean fill will be segregated at a source/facility that is free of environmental contaminants. Qualified environmental personnel will collect representative samples at a frequency consistent with NYSDEC CP-51. The samples will be analyzed for Part 375 VOCs (USEPA Method 8260), SVOCs (USEPA Method 8270), pesticides/PCBs (USEPA Method 8082/8081), metals (USEPA Method 6010), and PFAS (USEPA Method 537 or 537.1) by a NYSDOH ELAP-certified laboratory. Upon meeting these criteria, the clean fill will be transported to the site and segregated from impacted material, as necessary, on plastic until used as backfill.

Facilities will be identified in the FER. A PE or QEP will review the 6 NYCRR Part 360 registrations and/or permits for the facilities for the period of acquisition of RCA. Imported RCA and virgin gravel, rock, or stone from mines or quarries must have no more than 10% by weight passing through a No. 10 sieve and will not require additional testing unless required by NYSDEC under its terms for operation of the facility. Additional exemptions from testing requirements may be approved by the NYSDEC Project Manager based on their review of requests by the PE/QEP. Prior to material import, the RE will review documentation from each import facility, including the facility name, address, permit/registration, and site history, if necessary, in accordance with DER-10. Proposed import material will be approved by both the RE and the NYSDEC. Upon arrival, import material will be screened for visual, olfactory, and instrumental evidence of contamination.

5.4.10 SWPPP

The SWPPP will include detailed requirements for the following erosion and sediment control measures:

- Stabilized deconstruction entrances
- Dust control
- Temporary soil stockpile management
- Silt fencing
- Inlet protection
- Turbidity curtain

Silt fencing or hay bales will be installed around the perimeter of the remedial construction area, as required. Barriers and hay bale checks will be installed and inspected once a week and after every storm event; necessary repairs shall be made immediately. Results of inspections will be recorded in a logbook maintained at the site and available for inspection by the NYSDEC. Accumulated sediments will be removed as required to keep the barrier and hay bale check functional. Undercutting or erosion of the silt fence toe anchor shall be repaired immediately with appropriate backfill. Manufacturer's recommendations will be followed for replacing any silt fence damaged due to weathering. Where discharge locations or points are accessible, they shall be inspected to ascertain whether erosion control measures are effective in preventing significant impacts to receiving waters.

The RE will document that the remediation contractor performs stormwater pollution prevention measures in accordance with the project-specific SWPPP.

5.4.11 Contingency Plan

If USTs or other previously unidentified contaminant sources are found, sampling will be performed on free product, if encountered, and surrounding subsurface materials (e.g., sediment, soil, stone, etc.). Laboratory analysis will be for full scan parameters (TAL metals, TCL VOCs and SVOCs, TCL pesticides and PCBs, and PFAS). These analyses will not be limited without prior approval by NYSDEC.

Identification of unknown or unexpected contaminated media identified by screening during invasive site work will be promptly communicated to NYSDEC's Project Manager. These findings will be also detailed in daily and subsequent monthly BCP progress report.

5.4.12 Community Air Monitoring Plan

Community air monitoring will be conducted in compliance with the NYSDOH Generic CAMP outlined below and included in Appendix E.

The CAMP includes real-time monitoring for VOCs and particulates at the downwind perimeter of ground-intrusive activities. Ground intrusive activities include, but are not limited to, soil/waste excavation and

handling and advancement of trenches and test pits. Periodic monitoring for VOCs is required during non-intrusive activities such as the collection of groundwater samples from existing monitoring wells. "Periodic" monitoring during sample collection might reasonably consist of collecting a reading upon arrival at a sample location, monitoring while opening a well cap or overturning soil, monitoring during well bailing/purging, and collecting a reading before leaving a sample location.

CAMP monitoring for VOC levels will be conducted with PIDs, and monitoring for dust/particulates will be conducted with particulate sensors equipped with filters to detect particulate matter less than 10 microns in diameter (PM10). Monitoring for particulates and odor will be conducted during all ground intrusive activities by the RE's field inspector. The work zone is defined as the general area in which machinery is operating in support of remediation activities. A portable PID will be used to monitor the work zone and for periodic monitoring of VOCs during activities such as soil and groundwater sampling. The site perimeter will be visually monitored for fugitive dust emissions.

The following actions will be taken based on measured VOC levels:

- If total VOC levels exceed 5 parts per million (ppm) above background for the 15-minute average at the perimeter, work activities will be temporarily halted and monitoring continued. If levels readily decrease (per instantaneous readings) below 5 ppm above background, work activities will resume with continued monitoring.
- If total VOC levels at the downwind perimeter of the work zone persist at levels in excess of 5 ppm above background but less than 25 ppm, work activities will be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps work activities will resume provided that the total organic vapor level 200 feet downwind of the work zone or half the distance to the nearest potential receptor or residential/commercial structure, whichever is less – but in no case less than 20 feet, is below 5 ppm above background for the 15-minute average.
- If the total VOC level is above 25 ppm at the perimeter of the work zone, activities will be shut down.

The following actions will be taken based on visual dust observations:

- If the downwind particulate level is 100 micrograms per cubic meter (µg/m³) greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work zone, then dust suppression must be employed. Work may continue with dust suppression techniques provided that downwind PM10 levels do not exceed 150 µg/m³ above the background level and provided that no visible dust is migrating from the work zone.
- If, after implementation of dust suppression techniques, downwind PM10 levels are greater than 150 µg/m³ above the background level, work must be stopped and a re-evaluation of activities initiated. Work can resume provided that dust suppression measures and other controls are

successful in reducing the downwind PM10 concentration to within 150 µg/m³ of the upwind level and in preventing visible dust migration.

Concentrations above actions levels observed in the CAMP will be reported to the NYSDEC and NYSDOH Project Managers and included in the daily report. In addition, a map showing the location of the downwind and upwind CAMP stations will be included in the daily report.

5.4.13 Odor, Dust and Nuisance Control Plan

Dust, odor, and nuisance control will be accomplished by the contractor as described in this section. Invasive development work will be conducted in accordance with dust and odor suppression methodology defined in the RAWP.

5.4.13.1 Odor Control Plan

This odor control plan is capable of controlling emissions of nuisance odors off-site. Specific odor control methods to be used on a routine basis will include application of foam suppressants or tarps over the odorous or VOC source areas. If nuisance odors are identified, work will be halted and the source of odors will be identified and corrected. Work will not resume until nuisance odors are abated. The NYSDEC and NYSDOH will be notified of all odor events and of all other complaints about the project. Documentation of odor and vapor controls, including notifying the contractor and owner of potential halt of work conditions, will be the responsibility of the RE, who is responsible for certifying the FER. Application of odor controls is the responsibility of the contractor.

All necessary means will be employed to prevent on- and off-site nuisances. If odors develop and cannot be otherwise controlled, means to eliminate nuisance conditions may include: (a) shrouding open excavations with tarps and other covers; (b) use of odor-suppressing foam; (c) use of chemical odorants in spray or misting systems; and, (d) use of staff to monitor odors in the surrounding neighborhood.

5.4.13.2 Dust Control Plan

A dust suppression plan that addresses dust management during invasive on-site work, will include, at a minimum, the items listed below:

- Dust suppression will be achieved through the use of dedicated on-site water spraying for road wetting. The water source will be equipped with a water cannon, as required, capable of spraying water directly onto off-road areas including excavations and stockpiles.
- Clearing and grubbing of larger sites will be done in stages to limit the area of exposed, unvegetated soil vulnerable to dust production.
- Gravel will be used on roadways to provide a clean and dust-free road surface.
- On-site roads will be limited in total area to minimize the area required for water spraying.

5.4.13.3 Other Nuisances

A plan for rodent control will be developed and employed by the contractor prior to and during site clearing and site grubbing, and during all remedial work.

A plan will be developed and employed by the contractor for all remedial work and will conform, at a minimum, to NYCDEP noise control standards.

6.0 RESIDUAL CONTAMINATION TO REMAIN ON SITE

ECs and ICs are required to protect human health and the environment because contaminated soil, groundwater, and soil vapor will remain beneath the site after remediation. These ECs and ICs are described hereafter. Long-term management of ECs/ICs and of remaining contamination will be executed pursuant to a site-specific SMP that will be developed and submitted to the NYSDEC for approval prior to submission of the FER.

ECs will be implemented to protect public health and the environment by appropriately managing remaining contamination. The Controlled Property (the site) will have two primary EC systems: 1) a composite cover system and 2) SMD systems (including continuous waterproofing/vapor barrier membrane).

7.0 ENGINEERING AND INSTITUTIONAL CONTROLS

The site will require ICs/ECs to achieve a Track 4 remedy. A site-wide composite cover system consisting of concrete building foundation slabs, landscaped areas with at least 2 feet of approved fill, and hardscape areas (i.e., stone pavers, wooden boardwalk/platform, and rubber play surfaces) will be installed to prevent exposure to remaining contaminated soil. SMD systems (including continuous waterproofing/vapor barrier membrane) will be installed to mitigate SVI. The proposed ECs and ICs are detailed in the following sections.

7.1 Engineering Controls

7.1.1 Composite Cover System

Exposure to remaining contaminated soil will be prevented by a site-wide engineered composite cover system. The composite cover system will consist of concrete building foundation slabs, landscaped areas with at least 2 feet of approved fill, and hardscape areas (i.e., stone pavers, wooden boardwalk/platform, and rubber play surfaces). Any proposed soil cover will consist of a minimum of 2 feet of soil meeting the lower of the RURR and PGW SCOs placed over a demarcation layer (see Section 5.4.8). A composite cover system plan is shown on Figure 10. In addition, development plans for the proposed redevelopment depicting the composite cover system are included as Appendix B.

An Excavation Work Plan will be included in the SMP and will outline the procedures to be followed in the event that the composite cover system and underlying remaining contamination are disturbed after the remedial action is complete. Maintenance of this composite cover system will be described in the SMP.

7.1.2 SVI Mitigation System

SMD systems (including continuous waterproofing/vapor barrier membrane) will be installed below the footprint of the buildings to mitigate potential SVI from any remaining on-site or off-site contaminant sources. The SMD systems were designed in general accordance with the NYSDOH Guidance, and will be installed as follows:

- Two SMD systems beneath the north building (Block 424)
- Three SMD systems beneath the south building (Block 431)

The system consists of a sub-slab collection layer and vapor conveyance piping overlain by a continuous waterproofing/vapor barrier membrane that is integrally bonded to the concrete building foundation. Permanent vapor monitoring points will be used to monitor differential pressure beneath the building slab and serve as potential sub-slab vapor sampling points. Riser pipes will be installed to convey the collected vapor to the roof. The riser pipes will either be connected to active vacuum blowers or passive wind turbines, pending the results of an SVI evaluation.

The SVI evaluation will include collection of co-located sub-slab vapor and indoor air samples after concrete foundation slab installation is complete and the building are fully enclosed. The sample results will be evaluated using the NYSDOH Guidance to determine if active SVI mitigation is warranted. Completion and commissioning of the SMD systems will occur during the site management phase of the project, but prior to building occupancy.

Record drawings and specifications of the SMD systems will be presented in the FER and SMP. The SMP will include the necessary drawings and specifications to complete the SMD systems installation and provisions for system operation and indoor air monitoring. The SMP will also describe procedures to be followed if the SMD systems are disturbed after its installation is complete. Maintenance of the SMD systems will be described in the SMP. The SMD system drawings are included as Appendix G and waterproofing/vapor barrier membrane drawings are included as Appendix B.

7.2 Institutional Controls

After the remedy is complete, the site will have contamination remaining in place. ICs for the remaining contamination have been incorporated into the remedy to render the overall site remedy protective of public health and the environment. Two elements have been designed for continual and proper management of remaining contamination in perpetuity: an EE and an SMP. These elements are described in this section.

A site-specific EE will be recorded with New York City Register's Office for Kings County to provide an enforceable means for the continual and proper management of remaining contamination and protection of public health and the environment in perpetuity or until released in writing by the NYSDEC. It requires that the grantor of the EE and the grantor's successors adhere to all ECs/ICs placed on the site by this NYSDEC-approved remedy. ICs provide restrictions on site usage and mandate operation, maintenance, monitoring, and reporting measures for all ECs and ICs. The IC will mandate an SMP be implemented at the site. The SMP will describe methods and procedures for compliance with all ECs and ICs that are required by the EE. Once the SMP has been approved by the NYSDEC, compliance with the SMP is required by the grantor of the EE and grantor's successors and assigns.

7.2.1 Environmental Easement

An EE, as defined in Article 71 Title 36 of the Environmental Conservation Law, is required when remaining contamination is left on-site after the remedial action is complete. As part of this remedy, an EE approved by the NYSDEC will be filed and recorded with the New York City Register's Office for Kings County, proof of which will be provided to the NYSDEC. The EE will be submitted as part of the FER.

The EE renders the site a Controlled Property. The EE must be recorded with the New York City Register's Office for Kings County before the Certificate of Completion can be issued by the NYSDEC. A series of ICs are required under this remedy to implement, maintain, and monitor the ECs, prevent future exposure to remaining contamination by controlling disturbances of soil beneath the composite cover system, and

restrict the use of the site to restricted-residential, commercial or industrial uses only. These ICs are requirements or restrictions placed on the site that are listed in, and required by, the EE. ICs can, generally, be subdivided between controls that support ECs, and those that place general restrictions on site usage or other requirements. ICs in both of these groups are closely integrated with the SMP, which provides all of the methods and procedures to be followed to comply with this remedy.

The ICs that support ECs are:

- Compliance with the EE by the grantor and the grantor's successors and adherence to all elements of the SMP is required;
- ECs must be operated and maintained as specified in the SMP;
- ECs on the Controlled Property must be inspected and certified at a frequency and in a manner defined in the SMP;
- Groundwater and other environmental or public health monitoring must be performed as defined in the SMP;
- Data and information pertinent to site management must be reported at the frequency and in a manner defined in the SMP; and
- On-site environmental monitoring devices, including but not limited to groundwater monitoring wells, must be protected and replaced as necessary for proper functioning in the manner specified in the SMP.

ECs may not be discontinued without an amendment or extinguishment of the EE. The EE may be extinguished only by release by the Commissioner of NYSDEC, or the Commissioner's designee, and filed with the office of the recording officer for the county or counties where the Controlled Property is situated in the manner prescribed by Article 9 of the Real Property Law.

Adherence to these ICs for the site is mandated by the EE and will be implemented under the SMP (discussed in the next section). The site restrictions that may apply to the site are:

- Vegetable gardens and farming in remaining site soil on the Controlled Property are prohibited;
- Use of groundwater underlying the Controlled Property is prohibited without treatment rendering it safe for intended purpose;
- All future activities on the Controlled Property that will disturb remaining contaminated fill/soil are prohibited unless they are conducted in accordance with the soil management provisions in the SMP;
- The Controlled Property may be used for restricted-residential, commercial, and industrial uses only, provided the long-term ECs and ICs included in the SMP are employed; and

- The Controlled Property may not be used for a higher level of use without an amendment or extinguishment of this EE.

Grantor agrees to submit to the NYSDEC a written statement that certifies, under penalty of perjury, that: 1) controls employed at the Controlled Property are unchanged from the previous certification or that any changes to the controls were approved by the NYSDEC; and, 2) nothing has occurred that impairs the ability of the controls to protect public health and environment or that constitute a violation or failure to comply with the SMP. The NYSDEC retains the right to access the Controlled Property at any time in order to evaluate the continued maintenance of any and all controls. This certification shall be submitted annually, or at a specified frequency allowed by the NYSDEC.

7.2.2 Site Management Plan

Site management is the last phase of remediation and begins with the approval of the FER and issuance of the Certificate of Completion for the remedy. The SMP is submitted as part of the FER, but will be written in a manner that allows its removal and use as a complete and independent document. Site management continues in perpetuity or until released in writing by the NYSDEC. The property owner is responsible to ensure that all site management responsibilities defined in the EE and the SMP are performed.

The SMP is intended to provide a detailed description of the procedures required to manage remaining contamination at the site following completion of the remedy in accordance with the BCA with the NYSDEC. This includes: 1) development, implementation, and management of all ECs and ICs; 2) development and implementation of monitoring systems and a Monitoring Plan; 3) development of a plan to operate and maintain any treatment, collection, containment, or recovery systems (including, where appropriate, preparation of an Operations and Maintenance Manual); 4) submittal of Site Management Reports, performance of inspections and certification of results, and demonstration of proper communication of site information to the NYSDEC; and 5) defining criteria for termination of ECs.

To address these needs, the SMP will include four plans: 1) an Engineering and Institutional Control Plan for implementation and management of EC/ICs; 2) a Monitoring Plan for implementation of Site Monitoring; 3) an Operation and Maintenance Plan for implementation of operation and maintenance of the ECs; and 4) a Site Management Reporting Plan for submittal of data, information, recommendations, and certifications to NYSDEC. The SMP will be prepared in accordance with the requirements in NYSDEC DER-10 and the guidelines provided by the NYSDEC.

Site management activities, reporting, and EC/IC certification will be scheduled on a certification period basis. The certification period will be annual and will be due for submission to the NYSDEC by March 1 of the year following the reporting period.

No exclusions for handling of remaining contaminated soil will be provided in the SMP. All handling of remaining contaminated fill/soil will be subject to provisions contained in the SMP.

8.0 CRITERIA FOR COMPLETION OF REMEDIATION/TERMINATION OF REMEDIAL SYSTEMS

8.1 Groundwater Monitoring

The decision to discontinue groundwater sampling after implementation of the groundwater remedy will be made in consultation with NYSDEC and will consider the whether remaining VOC concentrations have:

- Decreased to levels below applicable NYSDEC standards, as practicable; and/or
- Become asymptotic over an extended period of time.

Proposed groundwater monitoring well locations are shown on Figure 9 but are subject to change based as the building design progresses.

8.2 Coal Tar Recovery

The coal tar recovery wells will be gauged quarterly to measure the presence of recoverable DNAPL. The decision to discontinue gauging events will be made in consultation with NYSDEC and will consider the whether recoverable DNAPL is identified during consecutive gauging events. Proposed recovery well locations are shown on Figure 9 but are subject to change as the building design progresses.

8.3 Composite Cover System

The composite cover system is a permanent control and the quality and integrity of this system will be inspected at defined, regular intervals in perpetuity. A composite cover system plan is shown on Figure 10. The frequency of inspections will be defined in the SMP.

8.4 SVI Mitigation System

The SVI evaluation will include collection of co-located sub-slab vapor and indoor air samples after concrete foundation slab installation is complete and the buildings are fully enclosed. The sample results will be evaluated using the NYSDOH Guidance to determine if active SVI mitigation is warranted. Completion and commissioning of the SMD systems will occur during the site management phase of the project, but prior to building occupancy.

The SMD systems will not be decommissioned or deactivated without written approval by NYSDEC and NYSDOH. A proposal to deactivate an SMD system may be submitted by the property owner based on confirmatory data that justifies such request. If an SMD system is deactivated, the system will continue to operate as a passive system. Systems will remain in place and operational until permission to discontinue use is granted in writing by NYSDEC and NYSDOH.

9.0 FINAL ENGINEERING REPORT

An FER, prepared in accordance with DER-10, will be submitted to NYSDEC after implementation of the remedial action defined in this RAWP. The FER documents that the remedial work required under this RAWP has been completed and performed in compliance with this plan. The FER will provide a comprehensive account of the locations and characteristics of all soil/fill removed from the site including the surveyed map(s) of all sources. The FER will include the following documentation:

1. Written and photographic documentation (via daily field reports) of the completed remedy
2. A description of any deviations from the RAWP
3. An account of fill/soil exported from the site, including waste types and volumes, waste characterization documentation, facility-signed manifests and scale tickets, facility approvals and other waste disposal documentation
4. An account of backfill imported to the site
5. A tabular summary of documentation soil samples results and other sampling and laboratory analysis completed as part of the remedial action
6. Record drawings for ECs and commissioning test results (as necessary)

Before approval of an FER and issuance of a Certificate of Completion, all project reports must be submitted in digital form on electronic media (PDF).

9.1 Certifications

The following certification will appear in front of the Executive Summary of the FER. The certification will be signed by the RE, Jason J. Hayes, who is a Professional Engineer registered in New York State. This certification will be appropriately signed and stamped. The certification will include the following statements:

I, _____, am currently a registered professional engineer licensed by the State of New York. I had primary direct responsibility for implementation of the remedial program for the Gowanus Canal Northside site (NYSDEC BCP Site No. C224080).

I certify that the site description presented in this FER is identical to the site descriptions presented in the EE, the SMP, and the BCA for the Gowanus Canal Northside site and related amendments.

I certify that the RAWP dated [month day year] and Stipulations [if any] in a letter dated [month day year] and approved by the NYSDEC were implemented and that all requirements in those documents have been substantively complied with.

I certify that the remedial activities were observed by engineers, geologists and scientists under my supervision and that the remediation requirements set forth in the RAWP and any other relevant provisions of ECL 27-1419 have been achieved.

I certify that all use restrictions, ICs, ECs, and all operation and maintenance requirements applicable to the site are contained in an EE created and recorded pursuant ECL 71-3605 and that all affected local governments, as defined in ECL 71-3603, have been notified that such easement has been recorded. A SMP has been submitted by the Participant for the continual and proper operation, maintenance, and monitoring of all ECs employed at the site, including the proper maintenance of all remaining monitoring wells, and that such plan has been approved by the NYSDEC.

I certify that the export of all contaminated soil, fill and liquid from the property was performed in accordance with the RAWP, and were taken to facilities licensed to accept this material in full compliance with all Federal, State and local laws.

I certify that all import of soils from off-site was performed in accordance with the RAWP.

I certify that all invasive work during the remediation and all invasive development work were conducted in accordance with dust and odor suppression methodology and soil screening methodology defined in the RAWP.

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.

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

10.0 SCHEDULE

Implementation of the remedy is anticipated to begin in May 2022 and be completed during the first quarter of 2024. After completion of remedial activities, an SMP and FER will be submitted to the NYSDEC as detailed in Section 9.0. A remedial action construction schedule is included in Appendix J.