FINAL ENGINEERING REPORT
for
Former Shell Service Station and Parking Garage
300 West 122nd Street
New York, NY 10027

NYSDEC BCP No. C231067

Prepared for:
Bespoke Harlem West LLC
884 Eastern Parkway
Brooklyn, New York 11213

Prepared by:
Langan Engineering, Environmental, Surveying,
Landscape Architecture and Geology, D.P.C.
21 Penn Plaza
360 West 31st Street, 8th Floor
New York, New York 10001

December 18, 2019
170500202

CERTIFICATIONS

I, Jason J. Hayes, am currently a registered professional engineer licensed by the State of New York, I had primary direct responsibility for implementation of the remedial program activities, and I certify that the Remedial Action Work Plan (RAWP) was implemented and that all construction activities were completed in substantial conformance with the Department-approved RAWP.

I certify that the data submitted to the Department with this Final Engineering Report demonstrates that the remediation requirements set forth in the RAWP and in all applicable statutes and regulations have been achieved in accordance with the time frames, if any, established in the RAWP.

I certify that all use restrictions, Institutional Controls, Engineering Controls, and/or any operation and maintenance requirements applicable to the Site are contained in an environmental easement 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.

I certify that a Site Management Plan has been submitted for the continual and proper operation, maintenance, and monitoring of all Engineering Controls employed at the Site, including the proper maintenance of all remaining monitoring wells, and that such plan has been approved by the Department.

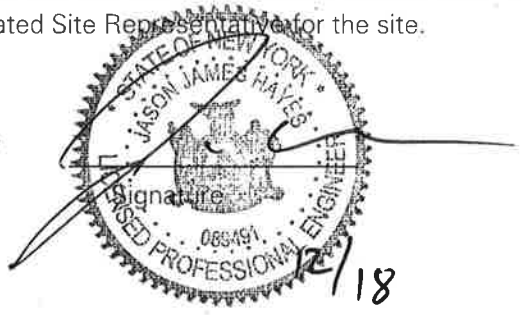
I certify that all documents generated in support of this report have been submitted in accordance with the DER's electronic submission protocols and have been accepted by the Department.

I certify that all data generated in support of this report have been submitted in accordance with the Department's electronic data deliverable and have been accepted by the Department.

I certify that all information and statements in this certification form are true. I understand that a false statement made herein is punishable as a Class "A" misdemeanor, pursuant to Section 210.45 of the Penal Law. I, Jason Hayes, of Langan Engineering, Environmental, Surveying, Landscape Architecture, and Geology D.P.C. (Langan), am certifying as Owner's Designated Site Representative for the site.

089491-1
NYS Professional Engineer #

12-18-2019
Date



Signature

12/18

TABLE OF CONTENTS

TABLES

FIGURES

APPENDICES

LIST OF ACRONYMS

AARCO	AARCO Environmental Services Corp.
Alpha	Alpha Analytical, Inc. of Westborough, Massachusetts
ASP	Analytical Services Protocol
Bayshore	Bayshore Soil Management, LLC
BCA	Brownfield Cleanup Agreement
BCP	Brownfield Cleanup Program
bgs	Below Grade Surface
BMP	Best Management Practices
BWSO	Bureau of Water & Sewer Operations
BWT	Bureau of Wastewater Treatment
C&D	Construction and Demolition
CAMP	Community Air Monitoring Plan
CHASP	Construction Health and Safety Plan
Clean Water	Clean Water of New York
COC	Contaminant of Concern
CP	Commissioner's Policy
CPP	Citizen Participation Plan
CQAP	Construction Quality Assurance Plan
CVOC	Chlorinated Volatile Organic Compound
DD	Decision Document
DER-10	Technical Guidance for Site Investigation and Remediation
DO	Dissolved Oxygen
DUSR	Data Usability Summary Report
EBC	Environmental Business Consultants
EC	Engineering Control
EDD	Electronic Data Deliverables
EIMS	Environmental Information Management System
el.	Elevation
ELAP	Environmental Laboratory Approval Program
EPA	United States Environmental Protection Agency
EPH	Extractable Petroleum Hydrocarbons
eV	Electron Volt
FDNY	Fire Department of the City of New York
FER	Final Engineering Report
GC/CM	General Contractor/Construction Manager
HDPE	High Density Polyethylene Tubing
IC	Institutional Control
IPT	Island Pump and Tank
IRM	Interim Remedial Measure

Moncon	Moncon, Inc.
MSDS	Material Safety Data Sheet
NAVD88	North American Vertical Datum of 1988
NYC	New York City
NYCDEP	New York City Department of Environmental Protection
NYCDOB	New York City Department of Buildings
NYCTA	New York City Transit Authority
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
NYSDOT	New York State Department of Transportation
OER	NYC Office of Environmental Remediation
ORC	Oxygen Release Compound Advanced® Pellets
OSHA	Occupational Safety and Health Administration
PBS	Petroleum Bulk Storage
PCB	Polychlorinated Biphenyls
PCE	Tetrachloroethylene
PID	Photoionization Detector
PM10	Particulate Matter Smaller than 10 Micrometers in Diameter
PPE	Personal Protective Equipment
ppm	Parts per Million
QA/QC	Quality Assurance/Quality Control
QAPP	Quality Assurance Protect Plan
QEP	Qualified Environmental Professional
RAO	Remedial Action Objective
RAWP	Remedial Action Work Plan
RC	Remediation Contractors
RCA	Recycled Concrete Aggregate
RCRA	Resource Conservation and Recovery Act
RDI	Remedial Design Investigation
RE	Remedial Engineer
RI	Remedial Investigation
Rise	Rise Development
RIWP	Remedial Investigation Work Plan
RU	Residential Use
RRU	Restricted-Residential Use
SCO	Soil Cleanup Objective
AWQSs	Technical and Operational Guidance Series Ambient Water Quality Standards and Guidance Values
The site	300 West 122nd Street
SMD	Submembrane Depressurization

SMMP	Soil/Materials Management Plan
SMP	Site Management Plan
SOE	Support of Excavation
SVOC	Semivolatile Organic Compound
SWPPP	Stormwater Pollution Prevention Plan
TAL	Target Analyte List
TCL	Target Compound List
TCLP	Toxicity Characteristic Leaching Procedure
UST	Underground Storage Tank
UU	Unrestricted Use
VOC	Volatile Organic Compound
The Volunteer	Bespoke Harlem West, LLC
$\mu g/m^3$	Micrograms per Cubic Meter
29 CFR 1910	Code of Federal Regulations Title 29 Part 1910
6 NYCRR	Title 6 of the New York Codes, Rules and Regulations
375-1.8	Part 375, Subpart 375-1, Section 375-1.8

1.0 BACKGROUND AND SITE DESCRIPTION

Ladera, LLC entered into a Brownfield Cleanup Agreement (BCA) with the New York State Department of Environmental Conservation (NYSDEC) on March 17, 2011, to investigate and remediate a 0.46-acre (20,417-square-foot) property located at 300 West 122nd Street in New York, New York (the site). In December 2017, the site and BCA were transferred from Ladera, LLC to West 122 Associates LLC. Bespoke Harlem West, LLC (the Volunteer) was then added to the BCA on January 26, 2018. New York State Brownfield Cleanup Program (BCP) Site No. C231067 was assigned to the site by the NYSDEC. The property was remediated to Track 2 Residential Use(RU) in accordance with the following documents, collectively referred to as "Remedial Documents":

- May 2011 NYSDEC-approved Interim Remedial Measure Work Plan
- November 2013 NYSDEC-approved Interim Remedial Measure Completion Report
- February 2014 NYSDEC-approved Remedial Action Work Plan (RAWP)
- February 2014 NYSDEC Decision Document
- February 2018 (Revised March 2018) Remedial Design Work Plan
- February 2019 Alternative Groundwater Treatment Plan
- April 2019 NYSDEC-approved Alternative Groundwater Treatment Plan Amendment

The site will be used for residential and commercial purposes. The Remedial Documents are included in Appendix A.

The site is located in the West Harlem neighborhood of New York, New York and is identified as Block 1948, Lot 35 on the Borough of Manhattan Tax Map. The site is bounded by West 122nd Street to the north, St. Nicholas Avenue to the east, a five-story mixed-use building (301 West 121st Street) and West 121st Street to the south, and a five-story residential building (302 West 122nd Street) and a four-story residential building (307 West 121st Street) to the west. A New York City Transit Authority (NYCTA) subway tunnel adjoins the site to the east below St. Nicholas Avenue. A site location map is included as Figure 1 and a site plan is included as Figure 2. The boundaries of the site are fully described in the metes and bounds description that is part of the Environmental Easement included in Appendix B.

Before remediation, the site was improved with a one-story building that operated as an auto garage and a multi-story parking garage with a full cellar. Site buildings were demolished in 2015. Site remediation occurred between May 7, 2018 and October 3, 2019. Superstructure

construction is currently ongoing and when construction is complete, the site will be improved with a 13-story residential building with first-floor and cellar commercial space, with the full cellar extending about 16 feet below grade surface (bgs). The finished cellar slab elevation ranges from about elevation (el.) 3 to 18.5 feet NAVD88.[1] The St. Nicolas Avenue sidewalk elevation is about el. 29.

This Final Engineering Report (FER) summarizes the remedial actions implemented at the site in accordance with the Remedial Documents. An electronic copy of this FER with all supporting documentation is included electronically as Appendix C.

2.0 SUMMARY OF SITE REMEDY

2.1 Remedial Action Objectives

Environmental Business Consultants (EBC) completed a Remedial Investigation (RI) between September 4 and 10, 2013 in accordance with the scope of work detailed in the June 2011 Remedial Investigation Work Plan (RIWP), which was approved by the NYSDEC on April 19, 2013. The RI was completed to characterize the nature and extent of site contamination in soil, groundwater and soil vapor and assess risk to human health and the environment. Contaminants of concern identified during the RI included volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs) and metals. Based on the results of the RI, the following Remedial Action Objectives (RAOs) were identified for this site.

2.1.1 Groundwater RAOs

RAOs for Public Health Protection

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

RAOs for Environmental Protection

- Restore the groundwater aquifer, to the extent practicable, to pre-disposal/pre-release conditions.
- Remove the on-site source of groundwater contamination.

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

2.1.2 Soil RAOs

RAOs for Public Health Protection

- Prevent ingestion/direct contact with contaminated soil.
- Prevent inhalation exposure to contaminants volatilizing from soil.

RAOs for Environmental Protection

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

2.1.3 Soil Vapor RAOs

RAOs for Public Health Protection

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

2.2 Description of the Remedy

The site was remediated to a Track 2 RU standard in accordance with the Remedial Documents. The factors considered during the selection of the remedy are those listed in the NYSDEC Technical Guidance for Site Investigation and Remediation (DER-10) and Title 6 of the New York Codes, Rules and Regulations (6 NYCRR) Part 375, Subpart 375-1, Section 375-1.8 (375-1.8). Per the Decision Document, the following were the remedy components:

1) Implementation of a remedial design program to further evaluate site conditions to better inform the remedial action for the site.
2) Demolition of on-site structures to allow for excavation and off-site disposal of contaminated soils and remedial excavation to depths of 15 feet to approximately 26 feet bgs, or el. 14 to 3 feet and off-site disposal of soil/fill material, including non-hazardous soil/historic fill and non-hazardous petroleum-contaminated soil, to meet RU SCOs.
3) Contaminated groundwater extraction via localized dewatering to remove the residual mass of petroleum-related VOCs in groundwater, which included discharge of treated groundwater to the combined sewer system and discharge of contaminated groundwater to a permitted facility. Application of oxygen releasing compound pellets below the groundwater table at the base of the remedial excavation as a post-groundwater extraction polishing measure to accelerate the rate of any naturally-occurring aerobic biodegradation of residual petroleum-related VOCs in groundwater

4) Implementation of an institutional control in the form of an environmental easement for the controlled property that requires the remedial party or site owner to implement, maintain, and monitor the engineering controls, prevent future exposure to residual contaminants of concern by controlling disturbances of the subsurface, and limit the use and development of the site to residential, restricted residential, commercial, and industrial uses only.

5) Implementation of a Site Management Plan (SMP) that includes long term management of the institutional and engineering controls and residual contamination.

3.0 INTERIM REMEDIAL MEASURES

An Interim Remedial Measure (IRM) was performed at the site in accordance with the May 2011 NYSDEC-approved IRM Work Plan prepared by EBC between June 7 and July 1, 2011 by Island Pump and Tank (IPT) under the supervision of Sovereign Consulting, Inc. The IRM consisted of the removal of three 4,000-gallon USTs and twelve 550-gallon gasoline USTs from the northern part of the site. Following the UST removals, EBC collected 25 post-excavation soil samples, including 11 sidewall and 14 bottom locations from the tank excavation. Several SVOCs were detected in soil samples that exceeded 6 NYCRR Part 375 Restricted Residential (RURR) and/or Unrestricted Use (UU) Soil Cleanup Objectives (SCOs) and were likely related to historic fill material.

A total of 114.24 tons of soil was excavated for the tank excavation and was disposed of as non-hazardous waste at Soil Safe, Inc. (Soil Safe) located in Logan, New Jersey. Concrete tank encasements were disposed of at a concrete recycling facility. Tank excavation areas were backfilled using recycled concrete aggregate (RCA) provided by 110 Sand and Gravel in Bethpage, New York. The tanks were permanently closed in accordance with 6 NYCRR Part 612.2 and 613.9. The information and certifications made in the NYSDEC-approved IRM Completion Report, prepared by AMC Engineering, PLLC dated November 2013 were relied upon to prepare this report and certify that the remediation requirements for the site have been met. The approved IRM Completion Report is included as Appendix A.

4.0 DESCRIPTION OF REMEDIAL ACTIONS PERFORMED

Remedial activities were completed at the site in accordance with the NYSDEC-approved RAWP and DD for the 300 West 122nd Street site. Deviations from the Remedial Documents are discussed in Section 4.13.

4.1 Governing Documents

4.1.1 Site Specific Construction Health and Safety Plan

Remedial work performed under this remedial action was in compliance with governmental requirements, including site and worker safety requirements mandated by the Occupational Safety and Health Administration (OSHA). The site-specific Construction Health and Safety Plan (CHASP) provided a mechanism for establishing on-site safe working conditions, safety organization procedures, and personal protective equipment (PPE) requirements, and was complied with for remedial invasive work performed at the site. The site-specific CHASP met the requirements of the Code of Federal Regulations Title 29 Part 1910 (29 CFR 1910) and 29 CFR 1926 (which includes 29 CFR 1910.120 and 29 CFR 1926.65). The site-specific CHASP included, but was not limited to, the following components:

- Organization and identification of key personnel
- Training requirements
- Medical surveillance requirements
- List of site hazards
- Excavation safety
- Work zone descriptions
- PPE requirements
- Decontamination requirements
- Standard operating procedures
- CAMP
- Material Safety Data Sheets (MSDSs)

4.1.2 Quality Assurance Project Plan

The Quality Assurance Project Plan (QAPP) was included as Attachment A of the Remedial Design Work Plan. . The QAPP described the specific policies, objectives, organization,

functional activities and quality assurance/quality control (QA/QC) activities designed to achieve the project data quality objectives.

4.1.3 Construction Quality Assurance Plan

The Construction Quality Assurance Plan (CQAP) included as Section 4.1.3 of the RAWP managed performance of the remedial action tasks through designed and documented QA/QC methodologies applied in the field and in the lab. The CQAP provided a detailed description of the observation and testing activities used to monitor construction quality and confirm that remedial construction conformed to the remedial action objectives and specifications. The Volunteer acted as their own General Contractor/Construction Manager (GC/CM) through an affiliate organization, Happy Living Development, to implement the remedial activities. The GC/CM and their selected contractors were responsible for construction quality as the remedy was completed. A list of engineering personnel involved in implementation of the CQAP and a description of the procedures carried out by the remedial engineering team are provided below.

The following project personnel were involved with the RAWP implementation:

Remedial Engineer (RE):	Jason Hayes, P.E., LEED^{AP}
Project Manager:	Greg Wyka, PG, LEED^{AP}
Langan Health & Safety Officer:	Tony Moffa, CHMM
Site Safety Coordinator:	William Bohrer, PG
Qualified Environmental Professional (QEP):	Michael Burke, PG, CHMM
Field Team Leader:	Julia Leung, P.E.
Field Staff Members:	Daniel Eida, Ashley Stappenbeck, and Patrick Stovall
Quality Assurance Officer:	Emily Strake, CEP

The Remedial Engineer (RE) directly supervised field staff that were on-site during the remedial action, including during UST excavation and removal, field screening of excavations, soil/fill material excavation and removal, and Community Air Monitoring Plan (CAMP) implementation. The RE directly supervised field staff that met with the GC/CM (affiliated with the Volunteer) daily to discuss the plans for that day and schedule upcoming activities. The RE reviewed site development activities to verify they did not interfere with, or otherwise impair or compromise, the remedial action. The field staff kept a project field book and a photo log documenting

remedial activities. Daily reports summarizing remedial activities were submitted to NYSDEC and the New York State Department of Health (NYSDOH) and included CAMP results.

4.1.4 Soil/Materials Management Plan

The Soil/Materials Management Plan (SMMP) included in the RAWP (Section 4.1.4) provided detailed plans for managing soil/materials disturbed during remedy implementation remedy, including excavation, handling, storage, transportation and disposal. It also included the controls that were applied to provide for effective, nuisance-limited performance of invasive remedial actions in compliance with applicable federal, state and local laws and regulations.

4.1.5 Erosion and Sediment Control Plan

A Stormwater Pollution Prevention Plan was not necessary because the project disturbed less than one acre and stormwater was either disposed of off-site or was discharged to a combined sewer. Since earthwork was completed below the adjacent sidewalk grade, full-time erosion and sedimentation measures were not required. Best Management Practices (BMP) for soil erosion were selected and implemented, as needed, to minimize erosion and sedimentation off-site. Barriers and hay bales were installed around the site perimeter and stormwater catch basins, as necessary. Barriers and hay bale checks were inspected and repaired and accumulated sediments were removed, as necessary.

4.1.6 Community Air Monitoring Plan

Community air monitoring was conducted in compliance with the NYSDOH Generic CAMP included as Attachment E of the RAWP. The CAMP was developed to protect off-site receptors, including occupants of residences and businesses, from potential airborne contaminant releases during ground intrusive work. Monitoring for dust and VOCs was conducted during ground intrusive activities by field staff under direct supervision of the RE. The CAMP included real-time monitoring for VOCs and particulate matter smaller than ten micrometers in diameter (PM10) at the upwind and downwind perimeter of the site when ground intrusive activities were underway. During periods of Langan supervision, continuous monitoring was implemented during the waste characterization investigation, remedial design investigation, UST excavation and removal, soil/fill excavation and load-out, and earthwork associated with foundation construction. Langan air monitoring for particulates and VOCs began at the site on May 7, 2018 and continued until ground intrusive activities were completed on October 1, 2019.

Monitoring for VOC levels was conducted with a MiniRAE® 3000 photoionization detector (PID) equipped with a 10.6 electron volt (eV) lamp and monitoring for PM10 was conducted with a TSI DustTrak™ II Model 8530. A portable PID was used to monitor the work zone. Field staff visually

monitored ambient air conditions at the site perimeter to check for visible dust emissions and odors; if observed, mitigation measures were implemented. Preventative measures for dust generation implemented by the contractor included wetting surficial soil and surrounding work areas and covering surficial soil with tarps. Odor-controlling RusFoam®OC foam and BioSolve® were used to suppress petroleum odors during the removal of the petroleum-impacted soil in the eastern-central portion of the site.

Action levels used for the protection of the community and visitors were set forth in the CAMP. The particulate action level was set at 150 micrograms of dust per cubic meter of air (µg/m^3) above background for a 15-minute average, and the VOC action level was set at 25 parts per million (ppm) for instantaneous readings and above background or 5 ppm above background for a 15-minute average. DustTraks and PIDs were monitored each day during implementation of the RAWP. Fifteen-minute running averages were calculated from the data recorded and were compared to the action levels specified in the CAMP.

Instances when concentrations of VOCs and PM10 exceeded action levels were included and explained in daily reports and are discussed in Section 4.2.5. Daily CAMP field data summary sheets and air monitoring data are provided as Appendix D.

4.1.7 Contractors Site Operations Plans

The RE reviewed all plans and submittals prepared by the contractor for this remedial project and confirmed that they were in compliance with the Remedial Documents. All required plans and submittals were submitted to NYSDEC and NYSDOH in a timely manner and prior to the start of work. Construction Specifications are included in Appendix E.

4.1.8 Citizen Participation Plan

The approved Citizen Participation Plan (CPP) for this project was included as RAWP Attachment F. A certification of mailing was sent by the Volunteer to the NYSDEC project manager following the distribution of fact sheets and notices that included: (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 repositories contained all of the applicable project documents.

Two document repositories were established at the following location and contain all applicable project documents:

New York Public Library - Harlem Branch	Manhattan Community Board 10
9 West 124th Street	215 West 125th Street, 4th Floor

New York, NY 10027
Phone: (212) 348-5620

New York, NY 10027
Phone: (212) 749-3105

The NYSDEC Project Manager is Nigel Crawford, P.E. and the NYSDEC Project Attorney is Grace Nam, Esq. The NYSDOH Project Manager is Anthony Perretta.

4.2 Remedial Program Elements

4.2.1 Contractors and Consultants

Contractor/Consultant	Company Name	Representative/Contact
Remedial Engineer (RE) and QEP	Langan	Jason Hayes (212) 479-5400
General Contractor/ Construction Manager (GC/CM)	Happy Living Development	Levi Balkany (718) 766-7073
Support of Excavation Contractor	Moncon Inc.	Naftali Lichtenstein (718) 869-6190
Foundation Contractor and Remediation Contractor (RC)	Rise Development	Barry Caldwell (929) 395-3591

Langan was retained as the RE and Mr. Jason Hayes, P.E. is the RE of Record certifying this FER.[2] The GC/CM selected Moncon, Inc. (Moncon) as the support of excavation (SOE) Contractor and Rise Development (Rise) as the Foundation Contractor for the site, collectively referred to as the Remediation Contractors (RCs). Happy Living Development and the RCs maintained staff and equipment to conduct remedial activities. The GC/CM and RCs were responsible for selecting soil disposal facilities based on waste characterization laboratory data and providing transportation for off-site soil disposal through waste hauling subcontractors.

4.2.2 Site Preparation

A pre-construction meeting was held with the Volunteer, NYSDEC, SOE Contractor, and Langan on April 17, 2018 to review remedial activities. Agency permits relating to the remediation project are provided in Appendix F.

[2] EBC was the QEP during implementation of the remedial investigation and AMC Engineering was the RE during implementation of the interim remedial measure activities that were performed prior to 2017. Langan was the RE during implementation of the remedial construction.

The GC/CM and RCs mobilized to the site and completed the following activities:

- Identified the location of the aboveground and underground utilities (e.g. power, gas, water, sewer, and telephone) prior to implementation of the remedy
- Mobilized necessary remediation personnel, equipment and materials
- Constructed temporary, stabilized construction entrances, located at the southern, eastern and northern parts of the site, which included a site-access ramp consisting of non-hazardous soil/historic fill material and petroleum-impacted soil/fill material from site excavation
- Installed erosion and sediment control measures, as necessary
- Installed temporary construction fencing around the perimeter of the site, including locked gates to limit unauthorized access to the site
- Stationed a water hose at the site access/loading ramps for truck cleaning/washing
- Obtained agency and city approvals and regulatory permits, including, but not limited to:
    - New York City Department of Buildings (NYCDOB) work permits
    - New York City Department of Transportation (NYCDOT) roadway and walkway closure permits
    - New York City Department of Environmental Protection (NYCDEP) construction noise and dust mitigation permits

4.2.3 General Site Controls

4.2.3.1 Site Security

The site perimeter was secured with gated, signed, plywood fencing with points of entry in accordance with NYCDOB and NYCDOT permits and requirements. The purpose of the fencing was to limit site access to authorized personnel, protect pedestrians from site activities, and maintain site security.

4.2.3.2 Job Site Record Keeping

Field observations and measurements were recorded in a project field book, spreadsheets, sketches/maps and field photographs. Daily field reports and monthly reports summarizing remediation activity and progress were submitted to the NYSDEC and NYSDOH project

managers. Daily and monthly reports are further discussed in Section 4.2.6. Daily and monthly reports are included as Appendix G.

4.2.3.3 Erosion and Sediment Control Plan

Erosion and sediment controls were performed in conformance with requirements presented in the New York State Guidelines for Urban Erosion and Sediment Control. Best Management Practices (BMP) for soil erosion were selected and implemented, as needed, to minimize erosion and sedimentation off-site. Barriers and hay bales were installed around the site perimeter and stormwater catch basins, as necessary. Barriers and hay bale checks were inspected and repaired and accumulated sediments were removed, as necessary.

4.2.3.4 Equipment Decontamination and Residual Waste Management

The RCs were responsible for managing the disposal of spent construction materials (e.g., wood, plastics, and metal) and general refuse/municipal solid waste. Machinery, equipment and materials were decontaminated before removal from the site at the truck washing stations, as necessary. No other special decontamination areas were required during the remedy based on the nature of on-site contamination.

4.2.3.5 Soil Screening Methods

Visual, olfactory, and PID soil screening and assessment was performed by an experienced environmental professional under the direction of the RE during remedial excavations into known or potentially contaminated material. Soil screening was performed regardless of when the invasive work was done and included excavation and invasive work performed during the remedy prior to the issuance of the certificate of completion.

4.2.3.6 Stockpile Methods

Stockpiles were inspected at a minimum once each week and after every storm event. Results of inspections were recorded in a logbook and maintained at the site and available for inspection by the NYSDEC.

Stockpiles were kept covered at all times with appropriately anchored tarps. Stockpiles were routinely inspected and damaged covers were promptly replaced. Hay bales were used as needed near catch basins, surface waters and other discharge points. Water was available on-site at suitable supply and pressure for use in dust control.

4.2.3.7 Problems Encountered

There were no problems encountered during this remedial action in relation to site control.

4.2.4 Nuisance Controls

4.2.4.1 Dust Control

The RCs under the direction of the RE employed dust suppression techniques while excavating, drilling, cutting, grading, stockpiling, and other construction activities. The RCs applied water to work zones and excavation areas and covered stockpiles with polyethylene sheeting, as needed, to minimize the amount of airborne particulates.

4.2.4.2 Odor Control

The RCs under the direction of the RE used odor suppressant solutions during excavations and ground intrusive activities in the eastern-central portion of the site where petroleum-impacted soil/fill material was present. The RCs applied RusFoam®OC foam solution or BioSolve® solution with hand-held sprayers to stockpiles and exposed areas of petroleum-impacted soil/fill material as needed to abate nuisance odors.

4.2.4.3. Materials Transport Off-site

Transport of materials was performed by licensed haulers in accordance with appropriate local, state and federal regulations, including 6 NYCRR Part 364. Haulers were appropriately licensed and trucks were equipped with proper placards. Trucks approached the site using West 122nd Street. Trucks loaded with site materials used commercial truck routes. In-bound and out-bound truck routes for the site were shown on RAWP Figure 12.

4.2.4.3 Responding to Complaints

No community complaints related to remedial activities were received to best of our knowledge.

4.2.5 CAMP Results

Langan performed air monitoring for particulates and VOCs began on May 7, 2018 and continued throughout the RAWP implementation during ground-intrusive activities in dry weather. CAMP was performed until October 3, 2019.

Particulate matter concentrations were measured above the 15-minute action level on 8 of 241 monitoring days during the project. Particulate matter that exceeded the limits was attributable to the following:

1. Equipment malfunctions
2. Breaking boulders and concrete in the immediate vicinity of the downwind CAMP station
3. Sweeping in the immediate vicinity of the downwind CAMP station

4. Truck traffic in the immediate vicinity of the downwind CAMP station

Particulate matter concentrations returned to normal after recalibrating the equipment or spraying the boulders/concrete or roadway with water.

Organic vapor concentrations (VOCs) were measured above the 15-minute limit on 5 of 241 monitoring days during the project. Organic vapor concentrations above the 15-minute limit were attributable to exhaust from heavy machinery in the immediate vicinity of the downwind monitoring station, painting activities in the immediate vicinity of the downwind monitoring station, or vapor emissions from excavation in petroleum-impacted areas. Organic vapor concentrations returned to normal after spraying odor suppressant solutions, recalibrating the equipment or termination of operation of heavy machinery in the excavation area.

Occurrences of particulate matter concentration or organic vapor concentration exceedances were summarized in daily and monthly reports to NYSDEC, located in Appendix G. Copies of all field data sheets relating to the CAMP are provided in electronic format in Appendix D.

4.2.6 Reporting

Field staff under the direction of the RE documented remedial activities, including waste characterization sampling, UST removals, excavation/earthwork, confirmation endpoint sampling, community air monitoring, stockpile management, and material import/export, in daily field reports with photographs and a summary of the CAMP results. The Project Manager or Field Team Leader submitted daily reports to the NYSDEC and NYSDOH project managers.

The Project Manager or Field Team Leader submitted monthly reports to the NYSDEC and NYSDOH Project Managers at the beginning of the month following the previous reporting period. Monthly reports included a summary of remedial activities during the reporting period and anticipated activities, field sampling results, and other information related to the remedy. Daily and monthly reports generated during the remedial action period are included in electronic format in Appendix G. The digital photograph log required by the RAWP is included in electronic format in Appendix H.

4.3 Contaminated Materials Removal

4.3.1 Soil/Fill

Remedial excavation to achieve residential SCOs included removal of non-hazardous soil/historic fill and petroleum-impacted material, and construction and demolition (C&D) debris. Remedial excavation to remove non-hazardous soil/historic fill and petroleum-impacted material extended to development depths ranging from 15 to 26 feet bgs across the site. The deepest remedial

excavation was completed in the eastern part of the site (an area of about 800 square feet) to a depth of about 26 feet bgs (about el. 3 feet) to remove residual petroleum-impacted soil to the extent practical. Residential SCOs were achieved and are shown in Table 1. An as-built drawing of the completed remedial excavation extents and depths are presented on Figure 3. Materials reuse is further discussed in Section 4.6.

4.3.1.1 Non-Hazardous Petroleum-Impacted Soil

During the RI, petroleum impacts, identified as weathered mineral spirits/Stoddard solvent through fingerprint analysis, were observed in an about 2,000-square-foot area in the eastern-central portion of the site. Petroleum-related VOCs and SVOCs were detected in soil samples above NYSDEC Part 375 PGW SCOs in this area and were excavated and disposed off-site.

4.3.1.3 Disposal Details

Waste characterization was performed in February 2018 by Langan to support disposal of soil/fill material removed by remedial excavation. Supplemental waste characterizations were later required to facilitate disposal approvals and export of excavated soil/fill material. The sampling methodology, field observations and results of the waste characterization are presented in Langan's April 3, 2018 *Waste Characterization Report for 300 West 122nd Street* (see Appendix I). A brief summary of the waste characterization and summaries of the supplemental characterizations are provided below. A sample location plan from the supplemental waste characterizations is included as Figure 4. Laboratory analytical data packages from the supplemental characterizations are provided in Appendix J.

Waste Characterization

Waste characterization was performed by Langan to support disposal of soil/fill material removed by remedial excavation. Waste characterization sampling and analyses conformed to typical disposal facility requirements. The site was divided into four approximately 5,000-square-foot sampling grids (WC01, WC02, WC03 and WC04). Three soil borings were completed within each grid using Geoprobe® 7822DT and 7830DT direct-push drill rigs to collect representative samples of subsurface media at intervals of 0-5 feet bgs, 5-10 feet bgs, and 10-16 feet bgs within grids WC01 and WC02 and at the interval of 13-16 feet bgs within grids WC03 and WC04. A total of twelve soil borings were drilled to about 18 feet bgs, including:

- LB03, LB05 and LB10 (Grid WC01)
- LB02, LB04 and LB07 (Grid WC02)
- LB06, LB09 and LB12 (Grid WC03)

- LB01, LB08 and LB11 (Grid WC04)

Eight sample sets, one duplicate sample set, and associated QA/QC samples were collected and submitted for laboratory analysis. Grab soil samples were analyzed for Target Compound List (TCL) and Toxicity Characteristic Leaching Procedure (TCLP) VOCs by United States Environmental Protection Agency (EPA) Method 8260C and for extractable petroleum hydrocarbons (EPH). Composite soil samples were analyzed for the following parameters:

- TCL SVOCs by EPA Method 8270
- Polychlorinated biphenyls (PCB) by EPA Method 8082
- TCL Pesticides by EPA Method 8081A
- TCL Herbicides by EPA Method 915A
- Target analyte list (TAL) metals by EPA Method 6010B/7471A
- Total cyanide by EPA Method 9010B/9012A
- Hexavalent chromium by EPA Method 7196A
- Trivalent chromium
- TCLP SVOCs, pesticides, herbicides, PCBs and metals
- Resource Conservation and Recovery Act (RCRA) characteristics - Ignitability, corrosivity, and reactivity
- Paint Filter Test (only one composite sample)

A review of the analytical soil results indicated that site material consists of non-hazardous soil/historic fill.

Supplemental Waste Characterization Sampling

At the request of waste disposal facilities, supplemental waste characterization was completed by Langan during the remedial excavation. The following supplemental waste characterization samples were collected:

Supplemental Waste Characterization Samples			
Sample Name	**Date Collected**	**Grid Collected**	**Depth Collected**
WC04	5/7/2018	Grid 4	9 to 13 feet bgs
WC03	5/7/2018	Grid 3	9 to 13 feet bgs
RAMP	1/22/2019	Grids 1 and 2	4 to 15 feet bgs
SP	1/22/2019	Grids 2 and 4	20 to 25 feet bgs
WC01,3	5/2/2019	Grids 1 and 3	14 to 18 feet bgs
RAMP2	5/2/2019	Grids 1 and 2	5 to 15 feet bgs
WC04_17-23	5/10/2019	Grid 4	17 to 23 feet bgs
RAMP3	6/13/2019	Grids 1 and 2	3 to 12 feet bgs
RAMP04	6/13/2019	Grids 1 and 2	5 to 13 feet bgs
WC02,4	7/19/2019	Grids 2 and 4	17 to 24 feet bgs
RAMP6	7/19/2019	Grids 1 and 2	6 to 14 feet bgs

Grab samples collected during supplemental waste characterization sampling were analyzed for TCL and TCLP VOCs and EPH. Composite samples collected during supplemental waste characterization sampling were analyzed for TCL and TCLP SVOCs, pesticides and herbicides, TCL PCBs, TAL metals including hexavalent and trivalent chromium and total cyanide, TCLP metals, paint filter and RCRA characteristics.

Excavation, Transportation, and Disposal

Material excavated from the site included non-hazardous soil/historic fill, petroleum-impacted soil and C&D debris. A total of 21,041.31 tons of non-hazardous soil/historic fill and petroleum-impacted soil was excavated and disposed of off-site. The excavated material was either directly loaded into trucks or stockpiled adjacent to the excavation pending off-site soil disposal. Separate stockpile areas were constructed as needed to avoid co-mingling differing materials.

A summary of material types disposed of off-site is presented below.

- About 21,041.31 tons of non-hazardous soil/historic fill and petroleum-impacted soil material were disposed of off-site for remedial excavation purposes.
- About 930 cubic yards of C&D debris were disposed of off-site for foundation excavation purposes.

The RCs arranged for transportation and off-site disposal of the excavated material, with oversight by the RE to document compliance with applicable federal, state, and local regulations. Exported materials were handled, transported and disposed of in accordance with local, state (including 6 NYCRR Part 360) and federal regulations. Exported loads were transported by

licensed haulers in accordance with appropriate local, state and federal regulations, including 6 NYCRR Part 364. Excavation was conducted using conventional hydraulic excavators (i.e., Hitachi 210LC excavator, Hitachi 350LC excavator, John Deere 345G LC excavator, John Deere 50G excavator, and Kubota KX033-4 excavator) and hand tools. Real-time air monitoring for VOCs and particulates was performed during active load-out of exported materials in accordance with the RAWP and CAMP.

Excavation activities occurred from May 7, 2018 through September 5, 2019. A full itemized account of excavated and exported materials is provided in Table 2A. Letters from the Volunteer to disposal facility owners and acceptance letters from disposal facility owners are included in Appendix K. Copies of facility-signed manifests and scale tickets are included in Appendix L.

The following table summarizes the total quantities of material disposed of at the corresponding facilities.

Exported Materials Summary Table (Remedial Excavation Phase)					
Disposal Facility Name and Address	**Material Type**	**Quantity Exported**	**Date Range of Export**	**Regulatory Permit/ Registration and ID Number**	**List of Supporting Documentation in Appendices L and M**
Bayshore Soil Management, LLC (Bayshore) 75 Crows Mill Road P.O. Box 290 Keasbey, New Jersey	• Non-Hazardous Soil/Historic Fill • Non-Hazardous Petroleum Contaminated Soil/Fill	21,041.31 tons	May 17, 2018 to September 5, 2019	NJDEP Permit No. CBG170003	• NJDEP Permit • Facility pre-approval request letter • Waste profile/application • Facility approval letter • Manifests/weight tickets • Part 364 waste transporter permits
Resource Management Technologies, LLC 2531 94th Street North Bergen, New Jersey	• C&D Debris	540 cubic yards	May 17, 2018 to August 27, 2018	NJDEP Permit No. CBG120002	• NJDEP Permit and Renewal • Part 360 Registration
Allocco Recycling, Ltd 540 Kingsland Avenue Brooklyn, New York	• C&D Debris	410 cubic yards	October 11, 2018 to May 22, 2019	NYSDEC Registration No. 24WA3	• Part 360 Registration
Soil Safe, Inc. 378 Route 130 South Logan Township, New Jersey	• Non-Hazardous Soil/Historic Fill • Non-Hazardous Petroleum Contaminated Soil/Fill	189.49 tons	August 30, 2019	NJDEP Permit No. CBG180002	• NJDEP Permit • Facility pre-approval request letter • Waste profile/application • Facility approval letter • Manifests/weight tickets • Part 364 waste transporter permits

Notes:
1. NJDEP – New Jersey Department of Environmental Protection

4.3.2 Groundwater

Petroleum-related VOCs, chlorinated VOCs (CVOCs), SVOCs, and one PCB were detected in groundwater at concentrations above NYSDEC Technical and Operational Guidance Series (TOGS) 1.1.1 Ambient Water Quality Standards and Guidance Values (collectively referred to as AWQSs) during the RI and the Remedial Design Investigation (RDI) conducted by Langan. Dewatering of contaminated groundwater was required to support contaminated soil removal. The dewatering additionally served to remediate groundwater in accordance with the groundwater remedy, as per the NYSDEC-approved Alternative Groundwater Treatment Plan. The Alternative Groundwater Treatment Plan is further discussed in Section 4.5. Groundwater extraction, treatment and disposal was implemented as follows:

- Groundwater was pumped into an on-site fractionalization tank for temporary on-site disposal. The fractionalization tank was periodically drained with vacuum trucks that transported and disposed of the water at Clean Water of New York (Clean Water). A total of about 145,878 gallons of water were removed from the fractionalization tank and sent to Clean Water for disposal.
- Groundwater extraction was also implemented with a temporary on-site dewatering and treatment system that discharged treated groundwater to the New York City (NYC) sewer system. Water Withdrawal Permit Equivalents were obtained from NYSDEC. In accordance with the NYCDEP Bureau of Wastewater Treatment (BWT) Letter of Approval and Bureau of Water & Sewer Operations (BWSO) approvals, the RC installed pretreatment units for dewatering fluids, including settling tanks and bag filters. About 74,988,384 gallons of water were pumped and treated before being discharged into the NYC sewer system between June 3 and September 11, 2019.
- Purge water from drilling activities was containerized in a 55-gallon drum on-site and removed by AARCO Environmental Services Corp. (AARCO) on May 10, 2018 for disposal at Dale Transfer Corp.

Groundwater exported to Clean Water is documented in daily and monthly reports that were sent to NYSDEC (Appendix G) and copies of facility permits and waste manifests are included in Appendices K and L, respectively. A complete summary of groundwater removed from the site and transported to Clean Water is included in Table 2B. Dewatering documentation, including the NYSDEC Water Withdrawal Permit Equivalent, NYCDEP permits, including NYCDEP BWT approvals and NYSDEP BWSO approvals and periodic dewatering reports are provided in Appendix M.

The following table summarizes the groundwater removed from the site via off-site transportation:

Exported Materials Summary Table (Remedial Excavation Phase)					
Disposal Facility Name and Address	**Material Type**	**Quantity Exported**	**Date Range of Export**	**Regulatory Permit/Registration and ID Number**	**List of Supporting Documentation in Appendices K, L, and M**
Clean Water of New York 3249 Richmond Terrace PO Box 030312 Staten Island, New York	Groundwater	145,878 gallons	September 4, 2018 to February 4, 2019	NYSDEC Permit No. 2-6401-00065	• Facility permit • Manifests/weight tickets
Dale Transfer Corp. 129 Dale Street West Babylon, New York	Non-hazardous Purge Water	55 gallons	May 10, 2018	NYSDEC Permit No. 1-4720-03277/00001	• Facility permit • Manifests/weight tickets
NYCDEP Sewer System	Dewatered groundwater	49,693,467 gallons	June 3, 2019 to September 10, 2019	NYCDEP Sewer Discharge Authorization Letter	• NYCDEP Discharge permit

4.3.3 Underground Storage Tanks

Seventeen USTs and one oil-water separator were removed from the site during the remedy as described below. USTs were decommissioned in accordance with 6 NYCRR Part 613.9, NYSDEC Commissioner's Policy (CP)-51, and other applicable NYSDEC tank closure requirements including DER-10 Section 5.5. The 17 USTs and the oil-water separator were out of service at the time of removal and registered with the NYSDEC under Petroleum Bulk Storage (PBS) No. 2-190810 as part of administrative closure.

The following table summarizes the USTs and oil-water separator that were removed during the remedial excavation:

Tank Removal Summary Table (Remedial Excavation Phase)					
Tank No.	**Tank Size**	**Tank Contents**	**Date Found**	**Date Removed**	**List of Supporting Documentation in Appendix N**
UST01	100-gallon	20 Gallons NON-DOT regulated, NON RCRA (Oil and Water)	6/8/2018	6/8/2018	• ABC Job Tickets • Tank Scrap Ticket • FDNY Affidavit
UST02	550-gallon	Historic fill material. No liquids.	6/20/2018	6/21/2018	
UST03	550-gallon	Soil	7/2/2018	7/3/2018	
UST04	150-gallon	Historic fill material. No liquids.	7/11/2018	7/13/2018	
UST05	1,080-gallon	30 Gallons NON-DOT regulated, NON RCRA (Oil and Water)	7/11/2018	7/13/2018	
UST06	550-gallon	750 Gallons Non-DOT regulated, Non RCRA (Oil and Water)	8/8/2018	8/10/2018	
UST07	550-gallon		8/9/2018	8/10/2018	
Oil/Water Separator	50-gallon	Unknown Liquid	8/10/2018	8/10/2018	• Tank Scrap Ticket
UST09	1,080-gallon	800 Gallons Non-DOT regulated, Non RCRA (Oil and Water)	8/10/2018	8/13/2018	• ABC Job Tickets • Tank Scrap Ticket • FDNY Affidavit
UST10	550-gallon	600 Gallons Non-DOT regulated, Non RCRA (Oil and Water)	10/8/2018	10/9/2018	
UST11	550-gallon		10/8/2018	10/9/2018	
UST12	550-gallon		10/8/2018	10/9/2018	
UST13	1,080-gallon	300 Gallons NON-DOT regulated, NON RCRA (Oil and Water)	10/22/2018	10/22/2018	
UST14	550-gallon	2,100 Gallons Non-DOT regulated, Non RCRA (Oil and Water)	12/5/2018	12/7/2018	
UST15	550-gallon		12/6/2018	12/7/2018	
UST16	550-gallon		12/6/2018	12/7/2018	
UST17	550-gallon		12/6/2018	12/7/2018	
UST18	50-gallon	10 Gallons Non-DOT regulated, Non RCRA (Oil and Water)	6/14/2019	6/17/2019	

Notes:
1. DOT – Department of Transportation
2. RCRA – Resource Conservation and Recovery Act

Concrete, petroleum-impacted water, petroleum-impacted historic fill, and tank scrap metal associated with tank removal were managed in accordance with the Remedial Documents and disposed of off-site at licensed facilities. Base and sidewall samples collected from UST excavations were analyzed for CP-51 VOCs and SVOCs.

Photographs of the tank removal activities are included in daily reports submitted to NYSDEC (Appendix I). Figures showing the UST locations and associated soil samples and results are shown in Figures 5A and 5B, respectively. The laboratory analytical data packages are included in Appendix J. The following documents associated with tank removal/closure are included in Appendix N:

- Fire Department of New York (FDNY) tank removal/closure affidavits[3]
- Part 364 Waste Transporter Permits

[3] An FDNY tank removal/closure affidavit is not required for closure of the oil-water separator.

- Facility-signed waste manifests
- Facility permits
- Tank scrap tickets
- PBS registration application

The following table summarizes the exported materials resultant from removal and closure of the USTs and oil-water separator:

Exported Materials Summary Table (UST Removal/Closure)			
Disposal Facility Name and Location	**Material Type**	**Quantity Exported**	**Source Location**
ABC Tank Repair and Lining, Inc. 28 East 88th Street Brooklyn, New York	• Steel Tank Metal • Non-DOT regulated, non-RCRA contaminated liquid	4,610 gallons liquid	• Ten USTs on the northern part of site • Five USTs on the central-eastern part of site • Three USTs on the southeastern part of site
Notes: 1. DOT – Department of Transportation 2. RCRA – Resource Conservation and Recovery Act			

A table including the soil sample analytical results collected beneath and around each tank is provided as Table 3. Figures showing the tank locations and soil sample locations are provided as Figures 5A and 5B, respectively.

4.4 Confirmation Endpoint Sampling

Post-excavation confirmation endpoint soil samples were collected at a frequency of one sample for every 900 square feet in accordance with the RAWP and NYSDEC DER-10. Site boundary sidewall samples were not collected since the remedial and foundation excavation extended site-wide and excavation support systems (i.e., lagging walls and underpinning piers) and adjoining building foundations precluded the collection of sidewall samples. Three initial confirmation endpoint soil samples, locations EP02, EP14, and EP20, exhibited concentrations of benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, chrysene, and/or indeno(1,2,3-cd)pyrene exceeding residential SCOs. An approximately 900-square-foot area surrounding confirmation endpoint locations EP02, EP14, and EP20 was over-excavated and a second round of base samples and localized sidewall samples were collected. A total of 32 confirmation endpoint soil samples were collected; 23 base samples and 9 additional confirmation samples for areas over excavated due to exceedances. Two duplicates, two matrix spike/matrix spike duplicates, and two field blanks were collected for QA/QC. Confirmation endpoint and QA/QC samples were analyzed for NYSDEC Part 375 VOCs, SVOCs, PCBs, pesticides, herbicides,

metals (including hexavalent and trivalent chromium) and cyanide in accordance with the Remedial Documents and QAPP, found in Appendices A and D, respectively. Samples were collected between September 12, 2018 and September 3, 2019 and were transported via laboratory-courier service to a NYSDOH Environmental Laboratory Approval Program (ELAP)-certified laboratory (Alpha Analytical, Inc. [Alpha], in Westborough, Massachusetts [ELAP ID #11148]).

Confirmation endpoint samples met the residential SCOs. Table 4 and Figure 6 summarize all confirmation endpoint sampling. Laboratory analytical data packages are included as Appendix J.

Data Usability Summary Reports (DUSRs) were prepared for all data generated as part of the remedial action. These DUSRs are included in Appendix O. The electronic data deliverables (EDDs) were uploaded to the NYSDEC database on October 4, 2019.

4.5 Groundwater Remedy

Petroleum-related VOCs were detected in groundwater at concentrations exceeding the AWQSs for Class GA water during the RI. In response, a groundwater remedy was provided in the Alternative Groundwater Treatment Plan, dated February 22, 2019, and the NYSDEC-approved Amended Alternative Groundwater Treatment Plan, dated April 1, 2019 (together referred to as the Alternative Groundwater Treatment Plans). The Alternative Groundwater Treatment Plans included the extraction, treatment, and discharge of an estimated 4.5 million gallons of groundwater to the NYC sewer system via a well point dewatering system, performance monitoring sampling during the dewatering phase to evaluate dewatering effectiveness, as well as the application of ORC as a post-groundwater extraction polishing measure. Dewatering is further discussed in Section 4.3.2.

In areas where petroleum-impacted soil existed below the groundwater table, ORC was applied to the open excavation. A total of 2,170 pounds of ORC were applied throughout three source areas totaling 2,150 square feet by the Foundation Contractor at a rate of about 1 pound per square foot between June 27, 2019 and August 15, 2019. Following ORC application, the excavations were backfilled with imported virgin stone to development grade. Location and quantities of ORC application are presented in Figure 7. The product specification and MSDS are provided in Appendix P.

4.5.1 Groundwater Performance Monitoring Sampling

A groundwater sample was collected biweekly throughout the duration of dewatering activities for performance monitoring purposes in general accordance with NYSDEC DER-10 and EPA's

Low Flow Purging and Sampling Procedures for the Collection of Groundwater Samples from Monitoring Wells by Langan field staff between June 30, 2019 and September 3, 2019. The groundwater performance monitoring samples were collected from dewatering well points temporarily disconnected from the dewatering system using a peristaltic pump connected to dedicated high density polyethylene tubing (HPDE) tubing. Before groundwater samples were collected, the wells were gauged and then continuously purged until groundwater quality parameters (pH, conductivity, turbidity, dissolved oxygen [DO], temperature, and oxidation-reduction potential) stabilized, to the extent practical, in accordance with the EPA Low Flow Procedures. A multi-parameter water quality system was used to monitor the groundwater quality parameters during sampling. Stabilization was achieved when three consecutive parameter readings, to the extent practical, were within the limits specified in the EPA Low Flow Procedures. Copies of groundwater sampling logs are included in Appendix Q. Purged groundwater was discarded into the on-site dewatering system for treatment and disposal to the sewer system.

Groundwater samples and QA/QC samples were collected into laboratory-supplied batch-certified clean glassware and submitted to Alpha via courier service under standard chain-of-custody protocol. Groundwater samples, field duplicates, and field blanks were analyzed for TCL list VOCs by EPA Method 8260.

4.5.1.1 Groundwater Performance Monitoring Results

As outlined in the RAWP (Appendix A), the RI detected VOCs, CVOCs, SVOCs, and one PCB in groundwater sampled throughout the site. A total of 7 performance groundwater monitoring samples and accompanying QA/QC samples were collected throughout operation of the on-site dewatering system from May 30 to September 3, 2019. The following table summarizes the analytes exceeding the NYSDEC AWQSs for Class GA water in groundwater performance monitoring samples:

Performance Groundwater Monitoring Summary Table					
Sample Name	**Sample Date**	**Treatment Area**	**Analytes Exceeding TOGS 1.1.1 AWQS**	**Analyte Concentration (µg/L)**	**Analyte NYSDEC AWQS (µg/L)**
PM_GW01_053019	5/30/2019	2	Chloroform	46	7
PM_GW02_062419	6/24/2019	2	PCE	14	5
PM_GW03_070819	7/8/2019	2	PCE	7	5
			1,2,4,5-Tetramethylbenzene	5.6	5
PM_GW04_072219	7/22/2019	2	PCE	5.4	5
PM_GW05_080519	8/5/2019	3	PCE	15	5
PM_GW06_081919	8/19/2019	3	1,2,4,5-Tetramethylbenzene	15	5
PM_GW07_090319	9/3/2019	3	PCE	15	5

Notes:
1. Treatment Area refers to the treatment areas outlined in the NYSDEC Alternative Groundwater Treatment Plans; shown in Figure 7.
2. PCE - Tetrachloroethene

The presence of the CVOC tetrachloroethene (PCE) is attributed to off-site sources as no on-site source was identified during the RI. The laboratory reported analytical data as an ASP Category B data deliverable consistent with the QAPP. The analytical data was validated and submitted to the NYSDEC as an EDD (see Section 4.10). The groundwater analytical results are presented in Table 5 and on Figure 8. The laboratory data packages are included in Appendix J.

4.6 Reuse Materials

Non-hazardous soil that did not exhibit petroleum staining or odor, and met residential SCOs was reused on-site as backfill material (after receipt of NYSDEC approval for on-site reuse) behind support of excavation lagging walls and to bring the site to development grade. Soil reuse analytical results and placement locations are shown in Table 6 and on Figure 9, respectively. Copies of reuse request submissions and NYSDEC approvals are included in Appendix R. The following table shows the materials excavated, sampled for NYSDEC residential SCOs, approved by NYSDEC for on-site reuse and used as backfill at the site:

Reuse Materials Summary Table					
Reuse Approval Submittal No.	**Excavation Date**	**Excavation Area**	**Approximate Volume Excavated**	**Placement Location**	**Date Approved by NYSDEC**
1	8/15/2018	Grid 3	80 cubic yards	Grids 2 and 4	8/28/2018
2	4/5/2019	Grid 4	40 cubic yards	Grid 3	4/15/2019
3	4/11/2019	Grid 4	20 cubic yards	Grid 3	5/3/2019
4	4/29/2019	Grids 3 and 4	80 cubic yards	Grid 3	5/3/2019
5	9/7/2018	Grid 4	15 cubic yards	Grid 2	8/19/2019

4.7 Imported Materials

A total of 110 cubic yards of backfill and 1,437.9 tons of virgin stone were imported to the site (after approval from NYSDEC) to bring the excavation to development grade. Materials transported on-site included 3 types of ¾-inch virgin stone, ½-inch minus virgin stone, fill, and screened fill. A full itemized account of imported materials is provided in Table 7. Copies of manifests/tickets, sieve analyses, laboratory analytical results, and NYSDEC approvals for imported materials are included in Appendix S. A figure showing the site locations where imported backfill was used at the site is shown on Figure 10. The following table summarizes the quantities of each material imported and its source.

Imported Materials Summary Table

Source Facility Name and Location	Regulatory Information	Material Type	Quantity Imported	Date Approved	On-site Location
Liberty Stone and Aggregates, LLC Clinton, New Jersey	NJ Mine Registration Certificate 004581	½-inch minus virgin stone	439.30 tons	May 3, 2019 and May 16, 2019	Shown in Figure 10
Liberty Stone and Aggregates, LLC Clinton, New Jersey	NJ Mine Registration Certificate 004581	¾-inch virgin stone	402.40 tons	July 8, 2019	
RockTech of New Jersey, LLC Jersey City, New Jersey	NJ Mine Registration Certificate 004657	¾-inch virgin stone	124.60 tons	April 16, 2019	
Tilcon New York, Inc. – West Nyack Quarry West Nyack, New York	NYSDEC Permit 3-3920-00054	¾-inch virgin stone	324.30 tons	May 24, 2019	
1 Boerum Place Brooklyn, New York	OER Project No. 17TMP0371K/17EH-N141K	Fill	20 cubic yards	May 17, 2019	
New York Recycling LLC Bronx, New York	NYSDEC Registration 03w87	Screened Fill	90 cubic yards	August 16, 2019	
Liberty Stone and Aggregates, LLC Clinton, New Jersey	NJ Mine Registration Certificate 004581	¾-inch DGA stone	147.30 tons	September 25, 2019	

Notes:
1. OER – NYC Office of Environmental Remediation

4.8 Contamination Remaining at the Site

4.8.1 Soil

Following excavation of the site, about 32 confirmation endpoint (base and sidewall) samples, plus required QA/QC samples, were collected from the extents of the site remedial excavation.

Endpoint soil samples were analyzed for Part 375 listed VOCs, SVOCs, metals (including cyanide, hexavalent and trivalent chromium), PCBs, and pesticides and compared to Track 2 RUR SCOs, which are listed in Table 1. All confirmation endpoint samples collected met Track 2 RUR SCOs, as shown in Table 4. Confirmation endpoint sample locations and results are shown on Figure 6.

Residual contamination at the site consists of site soil meeting residential SCOs, which is considered by NYSDEC appropriate for single- and multi-family residential use. There are exceedances of Track 1 UU SCOs; therefore, higher levels of site use (e.g., farming) is prohibited. In accordance with DER-10 Section 1.2(b)(1) and Part 375-3.8(e)(2), ECs and ICs are not allowed at Track 2 sites to manage remaining soil contamination.

4.8.2 Groundwater

Residual groundwater contamination at the site consists of CVOC impacts from off-site sources. The residual contamination in groundwater requires the use of long-term ECs and ICs, which are discussed in Sections 4.11 and 4.12, to avoid potential exposure. Table 5 and Figure 8 summarize the results of performance monitoring groundwater samples collected during the remedy that exceed the NYSDEC AWQSs. A copy of the SMP can be found in Appendix T.

4.8.3 Soil Vapor

Residual soil vapor contamination at the site consists of CVOCs from off-site sources. The residual contamination in soil vapor requires the use of long-term ECs and ICs, which are discussed in Sections 4.11 and 4.12, to avoid potential exposure. After the slab is completed, sub-slab vapor samples will be collected from three monitoring points to determine if the above-slab components and activation of the SMD system will be required. Soil vapor data from the Remedial Design Investigation is provided as Figure 12.

Since residual contaminated soil, groundwater, and soil vapor remain beneath the site after completion of the remedial action, ECs/ICs are required to protect human health and the environment. These ECs/ICs are discussed in Sections 4.11 and 4.12. Long-term management of these EC/ICs and residual contamination will be performed under the SMP approved by the NYSDEC. A copy of the SMP can be found in Appendix T.

4.9 Data Validation and Usability

Laboratory analyses of soil and groundwater samples were conducted by a NYSDOH ELAP-approved laboratory in accordance with the latest EPA SW-846 methods and analytical data was reported consistent with the NYSDEC ASP Category B deliverable format. Environmental data was reported electronically using the database software application EQuIS as part of NYSDEC's Environmental Information Management System (EIMS).

QA/QC sampling and procedures specified in the QAPP were completed and followed during soil and groundwater sampling programs. Field duplicates samples and field blanks were collected for laboratory analysis as required. QA/QC procedures required by the NYSDEC ASP and SW-846 methods were followed, including instrument calibration and analysis of quality control samples. The laboratory provided sample bottles, which were pre-cleaned and preserved. Where there were differences in the SW-846 and NYSDEC ASP requirements, the NYSDEC ASP took precedence.

Analytical data were validated by a Langan data validator in accordance with EPA and NYSDEC validation protocols for organic and inorganic data review. Validation included the following:

- Verification of QC sample results (both qualitative and quantitative)
- Verification of sample results (both positive hits and non-detects)
- Recalculation of 10 percent of all investigative sample results
- Preparation of DUSRs

The data was grouped by sample delivery group and matrix following receipt of the ASP Category B data packages. A DUSR, which presents the results of data validation, was prepared for each group.

Items subject to review for soil and groundwater results included holding times, sample preservation, sample extraction and digestion, instrument tuning, instrument calibration, laboratory blanks, laboratory control samples, system monitoring compounds, internal standard area counts, matrix spike/spike duplicate recoveries, target compound identification and quantification, chromatograms, overall system performance, serial dilutions, dual column performance, field duplicate, field blank and trip blank sample results.

DUSRs were prepared for UST endpoint samples, confirmation endpoint soil samples, re-use soil samples, performance groundwater samples, and associated QA/QC samples. All data are considered usable, as qualified. Completeness, defined as the percentage of analytical results that are judged to be valid, is 100%. EDDs were submitted to the NYSDEC on October 4, 2019.

4.10 Engineering Controls

Since remaining contaminated groundwater and soil vapor exists beneath the site, ECs are required to protect human health and the environment. The site ECs include a sub-slab depressurization system(SSDS), which are further described in the following subsection.

4.10.1 Sub-Slab Depressurization System

Potential exposure to soil vapor VOC intrusion will be minimized by a SSDS installed beneath about 40% of the building slab. Areas of the building slab that the SSDS does not cover are comprised of a 36-inch-thick reinforced concrete building slab with waterproofing/vapor barrier membrane. The SSDS was designed in accordance with the NYSDOH October 2006 Guidance for Evaluating Soil Vapor Intrusion in the State of New York. Refer to Appendix U for the signed/sealed certification letter and SMD system as-built drawing.

The SSDS consists of a series of horizontal, interconnected 4-inch-diameter perforated HDPE piping placed in an 8-inch layer of ¾-inch stone; the horizontal system is located beneath a vapor barrier system. The horizontal piping is connected to one vertical, subgrade vapor collection pipe located in the central portion of the site. The vertical collection pipe attaches to a 4-inch-diameter riser that extends through the floor slab.

The riser continues upward through the building interior, where it will be connected to a roof-mounted regenerative blower unit. The riser has a sample port above the floor slab.

After completion of the foundation slab, three sub-slab vapor samples will be collected from permanent sub-slab monitoring points. Sub-slab vapor results will be analyzed for VOCs and compared to the Decision Matrices contained in the *Guidance for Evaluating Soil Vapor Intrusion in the State of New York* (NYSDOH, 2006) and subsequent updates (2017). Analytical results will be presented to the NYSDEC and NYSDOH. If results fall below the minimum concentrations recommending mitigation, a proposal will be submitted to the NYSDEC and NYSDOH not to install the above-grade components of the SSDS (i.e., riser pipe and vacuum fan assembly). If results exceed the minimum concentrations recommending mitigation, the above-grade components of the SSDS will be installed and the SSDS will be activated in accordance with the SMP. The blower fan would remain in continuous operation until permission to discontinue its use is granted in writing by NYSDEC, at which point the active blower system would be transitioned to a passive system through the use of a wind turbine. Permits are not required to operate the active or passive SSDS as no air intake points are constructed at the roof near (less than 10 feet) from the SSDS blower discharge point.

Procedures for system start-up, testing, operation and maintenance of the SSDS are included in the SMP, found in Appendix T. The SMP also outlines the procedures to be followed in the event that the soil vapor mitigation system is disturbed after the development is complete. The as-built SSDS and vapor barrier layout is included in Figure 11.

4.11 Institutional Controls

The site remedy requires that an Environmental Easement be placed on the property to:

1. Implement, maintain and monitor the ECs
2. Prevent future exposure to residual contaminants of concern by controlling disturbances of the subsurface
3. Limit the use and development of the site to residential, restricted residential, commercial, and industrial uses only.

The environmental easement for the site was filed with the New York County Clerk on October 8, 2019. The County Recording Identifier number for this filing is 2019000326101. A copy of the easement and proof of filing is provided in Appendix B.

The SMP describes appropriate methods and procedures to ensure compliance with all ECs and ICs that are required by the Environmental Easement. Compliance with the SMP is required by the grantor of the Environmental Easement and grantor's successors and assigns.

4.12 Deviations From the Remedial Action Work Plan

There were no deviations from the RAWP during the remedy.