OCA LIC Fifth Street Mixed-Use Housing

Block 28, Lot 21 and 38

LONG ISLAND CITY, QUEENS COUNTY, NEW YORK

Final Engineering Report

NYSDEC Site Number: C241098

Prepared for:

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EWMA Project No. 207266

DECEMBER 2010

CERTIFICATIONS

I, Richard D. Arnold, 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. I certify that the Remedial Action Workplan and addenda were implemented and that all construction activities were completed in substantial conformance with the Department-approved Remedial Action Workplan and addenda or were included in the Site Management Plan (SMP) for implementation under that document.

I certify that the data submitted to the Department with this Final Engineering Report demonstrates that the remediation requirements set forth in the Remedial Action Workplan and in all applicable statutes and regulations have been or will be achieved under the SMP in accordance with the time frames, if any, established in for the remedy.

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.

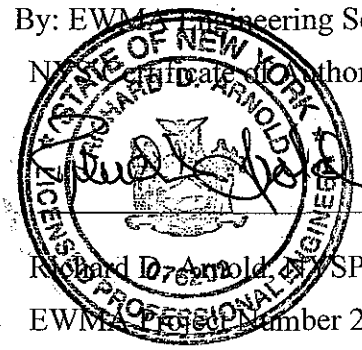
I certify that a Site Management Plan has been submitted for the continual and proper operation, maintenance, and monitoring of all Engineering Controls employed at the Site, including the proper maintenance of all remaining monitoring wells and that such plan has been approved by Department.

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, Richard D. Arnold of EWMA Engineering Services, LLC, am certifying as Owner's Designated Site Representative for the Site.

Note: include PE stamp

By: EWMA Engineering Services LLC

NYS Certificate of Authorization No. 0005216



12/23/2010

Richard D. Arnold, NYSPE No. 16076202

EWMA Project Number 207266

Note: It is a violation of Article 145 of New York State Education Law for any person, unless he is acting under the direction of a licensed professional engineer, to alter an item of this Final Engineering Report in any way. If an item is altered, the altering engineer shall affix to the item his seal and the notation "altered by" followed by his signature and the date of such alteration, and a specific description of the alteration.

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AOCs – Areas of Concern

bsg - below surface grade

BCA - Brownfield Cleanup Agreement

BCP – Brownfield Cleanup Program

BNA- Base/neutral/acid extractable compound

CAMP - Community Air Monitoring Plan

CHEMTECH - Chemtech Laboratory, Mountainside, NJ

COC – Chain of Custody

CPP - Citizen Participation Plan

CRP - Concrete Removal Plan

CUSCO - Commerical Use Soil Cleanup Objective (per 6 NYCRR Part 375-6.8(b))

DER – Department of Environmental Regulation

DUSR - Data Usability Summary Report

EWMA – Environmental Waste Management Associates, LLC or EWMA Engineering Services LLC

FER - Final Engineering Report

GA – Class GA Fresh Groundwaters

GPR – Ground Penetrating Radar

GWQS – Groundwater Quality Standards (per NYSDEC, Part 703)

HASP - Health and Safety Plan

IAL - Integrated Analytical Laboratory

IRM - Interim Remedial Measure

LNAPL -Light Non-Aqueous Phase Liquids

Mikula - Mikula Contracting, Inc., Parsippany

MDLs – Method Detection Limits

mg/m3 - milligrams per cubic meter

NYCDOB - New York City Department of Buildings

NYCRR - New York Code of Rules and Regulations

NYSDEC - New York State Department of Environmental Conservation
NYSDOH - New York State Department of Health
OCA LIC - OCA Long Island City, LLC
PAHs – Polynuclear aromatic hydrocarbons
PCBs – Polychlorinated biphenyls
PID - Photoionization Detector
ppb – parts per billion
ppbv – parts per billion by volume
ppm - parts per million
QAPP - Quality Assurance Project Plan
QHHEA - Qualitative Human Health Exposure Assessment
RAWP – Remedial Action Work Plan
RI - Remedial Investigation
RIR – Remedial Investigation Report
RIWP - Remedial Investigation Work Plan
RSCO - Recommended Soil Cleanup Objective (per TAGM 4046)
RUSCO - Restricted Use Soil Cleanup Objective (per 6 NYCRR Part 375-6.8(b))
SMP - Site Management Plan
SCO - Soil Cleanup Objectives (per 6 NYCRR, Subpart 375-6)
SSCOs - Site Specific Soil Cleanup Objectives
Summit - Summit Drilling Company
SVOCs - Semi-volatile Organic Compounds
TAGM - NYSDEC Technical and Administrative Guidance Memorandum
TAL Metals – Target Analyte Metals
TCL/TAL - Target Compound List/Target Analyte List
USEPA - United States Environmental Protection Agency
USGS - United States Geologic Survey
UST – Underground Storage Tank
UUSCO – Unrestricted Use Soil Cleanup Objectives (per 6 NYCRR, Subpart 375-6.8(a))
VOCs or VOs - Volatile Organic Compounds
Zebra – Zebra Environmental Corp., Lynbrook, NY

FINAL ENGINEERING REPORT

1.0 BACKGROUND AND SITE DESCRIPTION

OCA Long Island City, LLC (OCA) entered into a Brownfield Cleanup Agreement (BCA) with the New York State Department of Environmental Conservation (NYSDEC) in June 2007, to investigate and remediate a 1.1-acre property located in Long Island City, Queens, New York. The property was remediated to restricted residential use and will be used for commercial and residential use.

The Site is located in the County of Queens New York and is identified as Block 28 and Lots 21 and 38 on the Borough of Queens Tax Map. The Site is situated on an approximately 1.1-acre area bounded by 46th Road to the north, 47th Avenue to the south, commercial/industrial properties to the east, and 5th Street to the west (**Figure 1**). The boundaries of the Site are fully described in **Appendix 1**: Metes and Bounds. A site plan is provided as **Figure 2**.

An electronic copy of this Final Engineering Report (FER) with all supporting documentation is included as **Appendix 2**.

2.0 SUMMARY OF SITE REMEDY

The Site has been remediated to render the Site suitable for redevelopment under Track 4 Restricted Residential Use (reference 6NYCRR 375-6.4). Specifically, the soil contamination at the Site has been remediated to achieve compliance with Restricted Use Soil Cleanup Objectives (RUSCOs) for residential use (Table 375-6.8(b)) with the exception of lead, which was remediated to the restricted commercial SCO, and the Protection of Groundwater Standards for soils in the saturated zone. These criteria shall hereafter be referred to as the Site Specific Soil Cleanup Objectives (SSCOs).

The remedial measures included the following:

1) Excavation and truck loading activities as described below were conducted under a negative pressure fabric structure;

2) An IRM consisting of registration and removal of on-Site underground storage tanks (USTs) in accordance with NYSDEC requirements;

3) The soil contamination at the Site was remediated in order to achieve compliance with the SSCOs. The soil remedial mechanism was excavation, characterization and proper off-Site disposal of excavated soils. For a majority of the Site, excavation was performed to the perched water table (~7 ft bsg);

4) End-point soil samples were collected and analyzed to evaluate the performance of the remedy with respect to attainment of SSCOs for Site contaminants;

5) A minimum of two feet of clean fill was placed above a visual demarcation barrier to prevent human exposure to residual contaminated soil/fill remaining under the Site. Future redevelopment will include a composite cover system consisting of concrete building slabs with underlying sub-slab depressurization/ventilation systems or a minimum 2 feet of clean soil or crushed stone or pavement materials, all underlain by a warning visual demarcation barrier installed in accordance with the SMP;

6) On-Site source(s) of soil contamination (i.e., LNAPL and grossly contaminated soil) were removed to the extent practicable. LNAPL identified on the perched unit was remediated via excavation and vacuum extraction;

7) Additional perched unit LNAPL was identified during post-remediation confirmatory sampling at temporary monitoring well TW-4. The extent of the perched unit LNAPL plume was delineated, the plume was found to encompass an area of about 2,500 square feet, and remediation activity was implemented. Twenty four 4-inch extraction//monitoring wells and fourteen contingent 1-inch injection/monitoring wells were installed using a staggered 10-foot on center grid pattern across the plume area. Pump testing was performed and vacuum enhanced fluid removal testing was performed. The testing was successful, and perched unit LNAPL remediation was implemented under the RAWP. Initial extraction events were performed daily for a duration of 6-hours, and subsequent extraction events weekly for a duration of 6-hours. Weekly extraction events will be continued under the SMP as described within the SMP;

8) Lower sand unit LNAPL contamination was addressed via the installation of a capture wall, collection and recovery wells, and down-well skimming equipment to collect and remove the LNAPL. Successful recovery of LNAPL with this system has already begun and will be continued under the SMP. Five recovery wells were installed directly upgradient of the wall for product removal and four monitoring and recovery wells were installed downgradient of the wall. A network of 10 monitoring and recovery wells was installed directly into the LNAPL plume area for recovery of LNAPL from the plume area. A network of 10 monitoring and treatment wells was installed directly beneath the plume area as requested by NYSDEC. Finally, nine perimeter monitoring wells were installed in the sidewalk of 46th Road, 5th Street and 47th Avenue to monitor ground water quality and ensure that LNAPL did not migrate beyond the LNAPL capture system. All totaled, 38 wells were installed as part of the LNAPL recovery and monitoring system.

9) Materials were imported for use as backfill and cover in compliance with: (1) chemical criteria identified in 6 NYCRR Part 375-6.7(d), (2) all Federal, State and local rules and regulations for handling and transport of material;

10) Long-term groundwater monitoring to evaluate the performance of the remedy with respect to attainment of groundwater standards was included within and will be implemented under the SMP. A majority of the site perimeter monitoring wells were destroyed during construction activities and were replaced with the 38 monitoring and remediation wells discussed in item 8, above;

11) Installation and operation of a vapor intrusion mitigation system consisting of a synthetic vapor barrier and a sub-slab de-pressurization/ventilation system will be implemented beneath all building enclosures in conjunction with future redevelopment under the SMP;

12) An Environmental Easement, including Institutional Controls, was recorded to prevent future exposure to any residual contamination remaining at the Site;

13) A Site Management Plan for long term management of residual contamination includes plan for: (1) Institutional and Engineering Controls, (2) monitoring, (3) operation and maintenance and (4) reporting.

2.1 REMEDIAL ACTION OBJECTIVES

Based on the results of the Remedial Investigation, 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 containing contaminant levels exceeding drinking water standards.
- Prevent contact with, or inhalation of, volatiles emanating from contaminated groundwater.

RAOs for Environmental Protection

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

2.1.2 Soil RAOs

RAOs for Public Health Protection

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

RAOs for Environmental Protection

- Prevent migration of contaminants that would result in groundwater or surface water contamination.
- Prevent impacts to biota due to ingestion/direct contact with contaminated soil that would cause toxicity or bioaccumulation through the terrestrial food chain.

2.2 DESCRIPTION OF SELECTED REMEDY

The Site was remediated in accordance with the remedy selected by the NYSDEC in the Decision Document dated July 23, 2009, the RAWP dated July 15, 2009, the Remedial Design Report, dated May 20, 2010, and the RAWP Addendum, dated July 16, 2010.

The factors considered during the selection of the remedy are those listed in 6NYCRR 375-1.8. The components of the remedy set forth in the RAWP and the July 2009 Brownfield Cleanup Program Decision Document are as follows:

1. Excavation and removal of all on-site USTs in accordance with NYSDEC requirements;

2. Remediate the western LNAPL plume identified on the perched groundwater table via excavation and vacuum extraction. For the majority of the site, excavation will be performed to the perched groundwater table down to about 7 feet below street grade (bsg). In the former USTs areas, excavation will be performed to about 10 feet bsg. For excavation down to the top of the peat layer, if LNAPL was identified on the Peat layer, then the top 6 inch of the peat layer will have to be excavated for proper off-site disposal;

3. Remediate residual contaminated soil and dissolved-phase groundwater contamination in the perched zone via chemical treatment to be applied directly to the soil below the water table following completion of remedial excavation;

4. Remediate the eastern LNAPL contamination identified in the lower sand unit via installation of a capture wall and collection wells at the leading downgradient edge of the plume to collect LNAPL in the sand unit. The capture wall will consist of metal sheeting down to 20 feet below ground surface in the area below the proposed parking garage. The collected product will then be periodically pumped out from the collection wells and transported off-site for proper disposal;

5. Enhanced LNAPL contamination removal in the lower sand unit via installation of twenty four nested wells within the eastern LNAPL plume. The shallow wells will be utilized for LNAPL recovery via vacuum extraction. The deep wells will be used as part of the groundwater quality monitoring network, and may be utilized in the future for additional groundwater treatment, if the Department deems necessary;

6. Collect and analyze end-point soil samples (to be collected within 2 feet of the bottom of the excavation) to evaluate the performance of the remedy with respect to attainment of restricted residential RUSCOs;

7. Construct and maintain an engineered composite cover system consisting of the building's structural foundation slab, an asphalt paving system at least 6 inches thick, and/or a minimum of two feet of clean fill to prevent human exposure to residual contaminated soil/fill remaining under the Site. Imported soil to be used for backfill and cover must be in compliance with: (1) chemical criteria identified in 6 NYCRR Part 375-6.7(d), (2) all Federal, State and local rules and regulations for handling and transport of material;

8. Install and operate a soil vapor barrier and sub-slab depressurization system beneath the occupied portions of buildings;

9. All excavation and truck loading activities will be conducted under a negative pressure containment structure;

10. Imposition of an institutional control in the form of an environmental easement that would require (a) limiting the use and development of the property to

residential use, which would also permit commercial or industrial uses; (b) compliance with the approved site;

11. Development of a site management plan which would include the following institutional and engineering controls: (a) management of the final cover system to restrict excavation below the soil cover, demarcation layer, pavement, or buildings. Excavated soil would be tested, properly handled to protect the health and safety of workers and the nearby community, and would be properly managed in a manner acceptable to the Department; (b) continued evaluation of the potential for vapor intrusion for any buildings developed on the site, including provision for mitigation of any impacts identified; (c) monitoring of groundwater; (d) identification of any use restrictions on the site; (e) install and operate a soil vapor barrier and sub-slab depressurization system beneath the occupied portion of the building; and (f) provisions for the continued proper operation and maintenance of the components of the remedy;

12. The property owner would provide a periodic certification of institutional and engineering controls, prepared and submitted by a professional engineer or such other expert acceptable to the Department, until the Department notifies the property owner in writing that this certification is no longer needed. This submittal would: (a) contain certification that the institutional controls and engineering controls put in place are still in place and are either unchanged from the previous certification or are compliant with Department-approved modifications; (b) allow the Department access to the site; and (c) state that nothing has occurred that would impair the ability of the control to protect public health or the environment, or constitute a violation or failure to comply with the site management plan unless otherwise approved by the Department;

Deviations from the above remedial components are outlined in Section 2.0 and are discussed in greater detail in Section 4.9 of this FER.

3.0 INTERIM REMEDIAL MEASURES, OPERABLE UNITS AND REMEDIAL CONTRACTS

The remedy for this Site was performed as a single project, and no interim remedial measures, operable units or separate construction contracts were implemented.

An IRM consisting of registration and removal of on-Site underground storage tanks (USTs) in accordance with NYSDEC requirements was approved by NYSDEC. However, the USTs were closed and removed in conjunction with the project soil remediation and the work was not performed as an interim measure.

4.0 DESCRIPTION OF REMEDIAL ACTIONS PERFORMED

Remedial activities completed at the Site were conducted in accordance with the NYSDEC-approved RAWP, dated July 15, 2009, the RAWP Addendum, dated July 16, 2010, and the Remedial Design Report, dated May 20, 2010, for the OCA LIC Site. All deviations from the RD Report and the RAWP are noted below.

4.1 GOVERNING DOCUMENTS

The governing documents are as follows:

4.1.1 Site Specific Health & Safety Plan (HASP)

A Site specific HASP was provided in Appendix 9 of the approved RAWP. The HASP and requirements defined in the RAWP pertain to all remedial and invasive work performed at the Site until the issuance of a Certificate of Completion.

All remedial work performed under this Remedial Action was in full compliance with governmental requirements, including Site and worker safety requirements mandated by Federal OSHA.

The Health and Safety Plan (HASP) was complied with for all remedial and invasive work performed at the Site.

The Site Safety Coordinator was provided by CitiStructure on behalf of the Volunteer.

Confined space entry for USTs closure by EISCO complied with all OSHA requirements to address the potential risk posed by combustible and toxic gasses.

4.1.2 Quality Assurance Project Plan (QAPP)

A Site specific QAPP was included as Appendix 10 of the RAWP approved by the NYSDEC. The QAPP describes the specific policies, objectives, organization, functional activities and quality assurance/ quality control activities designed to achieve the project data quality objectives.

- Soil and ground water samples collected for volatile organic compounds and a forward library search (VO+10) were analyzed via EPA Method 8260+10.
- Soil samples collected for semi-volatile organic compounds and a forward library search (BN+20) were analyzed via EPA Method 8270+20.
- Soil samples collected for target analyte metals were analyzed via EPA Method 200.8/7000 Series 6010/6020 for the full Inorganic Target Analyte List (23 metals plus total cyanide).
- Ground water samples collected for BN+20 were analyzed via EPA Method 625+20.
- Ground water samples obtained for PPM analysis were analyzed via EPA 610A Series for the full Inorganic Target Analyte List (23 metals plus total cyanide).
- Semi-volatiles soil and water analyses by 8270 included 20 tentatively identified compounds.

All soil and ground water samples were analyzed by the following NYSDOH CLP-Tier ELAP certified laboratory:

Integrated Analytical Laboratories, LLC (IAL)
273 Franklin Road
Randolph, NJ 07869
New York Lab ID No. 11402
NYSDOH Certification Serial No. 32868

The Quality Assurance Officer and Data Validator for the Site was Margaret Halasnik, Compliance Services Director, EWMA. A Data Usability Summary Report (DUSR), which demonstrates that the QAPP was properly implemented, is included in **Appendix 12**.

4.1.3 Contractor Site Operations Plan

A Contractor Site Operations Plan (CSOP) was provided to NYSDEC under separate cover dated December 2009. The CSOP was a "live" plan which was subject to adjustment and revision as needed to respond to Site operations needs, discoveries, and changes during the remediation.

The CSOP included a summary of the approved remediation program, a summary of the planned Site operations, and a list of Site operations governing documents. Site specific remediation operations information, such as project organization, work hours, Site security, traffic control, worker training and monitoring, permits and approvals, were included and followed by all Site personnel. In addition, there were requirements for NYSDEC BCP Signage and Pre-Construction Meeting with NYSDEC.

Daily reports were submitted to NYSDEC and NYSDOH Project Managers following the reporting period and included:

- The NYSDEC assigned project number;
- An update of progress made during the reporting day;
- Locations of work and quantities of material imported and exported from the Site;
- References to alpha-numeric map for Site activities;
- A summary of any and all complaints with relevant details (names, phone numbers);
- A summary of CAMP finding, including excursions;
- An explanation of notable Site conditions;
- Photo documentation of daily activities performed.

Daily reports were not 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. Rather, these notifications were verbally communicated and documented via e-mail and/or in the daily reports. Daily Reports included a description of daily activities keyed to an alpha-numeric map for the Site that identifies work areas. These reports included a summary of air sampling results, odor and

dust problems and corrective actions, and all complaints received from the public. Copies of the Daily Reports are included in **Appendix 8**.

A Site map that shows a pre-defined alpha-numeric grid which was used to identify locations described in reports submitted to NYSDEC was provided as Figure 16 of the approved RAWP.

Monthly reports were submitted to NYSDEC and NYSDOH Project Managers following the reporting period and included:

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

Photographs were taken and submitted to NYSDEP and NYSDEC in the Daily Log Reports in digital (JPEG) format. The provided photographs illustrated key remedial program elements and were of acceptable quality. Representative photos of the Site prior to any Remedial Actions were previously provided in reports submitted to regulatory authorities. Representative photos are provided of each contaminant source, source area and Site structures before, during and after remediation were provided to NYSDEC in accordance with the submittal guidelines for these documents. The digital photo log is presented in **Appendix 9**.

Job-Site record keeping was documented via field notes and daily field report recorded by the QEP in a dedicated field book and digitally. These records were maintained on-Site during the project and were available for inspection by NYSDEC and

NYSDOH staff. These documents are entered in EWMA files for long-term storage in accordance with EWMA file storage protocols.

4.1.4 Soil/Materials Management Plan (S/MMP)

Soil, construction and demolition debris, underground storage tank liquids, excavation liquids, scrap metal, wood and garbage debris were encountered at the Site during remedial actions. The following details are provided for management of these materials.

4.1.4.1 Soil Screening Methods

Visual, olfactory and PID soil screening and assessment was performed by a qualified environmental professional during all remedial excavation activities Soil screening was performed during invasive remedial work to include excavation and stockpiling, load out and well installation.

As excavation work proceeded sequentially area by area across the Site, the excavation floor was surveyed by a Surveyor licensed to practice in the State of New York. Refer to figure entitled **Survey No. 26227-6** for Survey of Residual Contamination/Demarcation Barrier Elevation.

4.1.4.2 Stockpile Methods

Temporary stockpiling of excavated soils was kept to a minimum, and did not exceed 200 tons during the duration of the remedial project. The excavated soil was temporarily stockpiled on-Site on 6 mil plastic sheeting under the fabric structure in preparation for load out and transport for off-Site disposal the following day. Any stockpiled material that remained on-Site at the end of the day was covered with anchored 6 mil plastic sheeting. Stockpiles were inspected daily during construction activities and damaged plastic sheeting was promptly replaced. Soil stockpiles were located under the fabric structure remote from catch basins, surface waters and other discharge points, so silt fences and hay bales were not required for stockpile erosion control.

Construction and demolition (C&D) debris, consisting of bricks and concrete from all areas except the RCRA encapsulated area, was staged in piles, pending off-Site transport for disposal and/or recycling.

RCRA area concrete was characterized in place and left undisturbed until the fabric structure was moved to cover the RCRA area. The RCRA area concrete materials were then removed within the fabric structure and loaded directly into trucks for off-Site disposal, or temporarily staged within the fabric structure area prior to loading for off-Site disposal.

Results of inspections were recorded in a logbook and maintained at the Site and available for inspection by NYSDEC.

4.1.4.3 Materials Excavation and Load Out

Invasive work and excavation and load-out of all excavated material were performed with oversight by a qualified environmental professional.

The presence of utilities and easements on the Site were investigated prior to the work to mitigate risk of damage or impediment to the ongoing work.

The excavation activities were conducted in four phases at the Site. Each area was excavated to approximately seven feet below original surface grade. Refer to figure entitled **Survey No 26627-2** and **No. 26627-6** for pre and post excavation surveys. Shoring in the form of soldier beams and lagging was installed around the excavation perimeter for earth support and to prevent perimeter sloughing of soil and sidewalk areas not targeted for removal.

As required by NYSDEC, the excavation work was performed under negative pressure within a fabric structure with an integrated vapor management system. During the work, the vapor management system operations and air quality conditions within and outside the fabric structure were monitored in accordance with NYSDEC requirements. In addition, Site and perimeter monitoring was performed in accordance with the CAMP. The monitoring results are provided as **Appendix 7** of this FER.

Based on the potential for vapor and dust accumulation within the fabric structure, air monitoring was conducted to ensure that the air quality within the fabric structure met

the criteria established in the Site HASP. Air removed from the interior of the fabric structure by the vapor management system was treated with particulate filters and activated carbon in large carbon vessels prior to discharge. Air monitoring was conducted throughout the work day to ensure that the removed, treated and discharged air did not adversely impact the surrounding community. The discharged air quality was monitored to ensure that air vented to the atmosphere met the air emission requirements. The air monitoring results are provided in **Appendix 7** of this FER.

Loaded vehicles leaving the Site were appropriately lined, tarped, securely covered, manifested, and placarded in accordance with appropriate Federal, State, local, and NYSDOT requirements.

The egress points from the Site were kept free of soil during Site remediation. The locations where vehicles associated with the remedial activities entered or exited the Site were inspected daily. The exteriors of the loaded trucks and the truck tires were inspected, and soils were removed from the truck exteriors and truck tires on a tracking pad before the trucks left Site.

A truck washing station was also utilized to ensure that the exteriors of the trucks exiting the Site were clean. The truck wash station was relocated after completion of each stage of work in tandem with relocation of the fabric structure, the vapor management system equipment, and the tracking pad. Refer to **Appendix 7** for figures depicting four phases of fabric structure and truck wash station relocations.

As excavation work was completed sequentially area by area across the site, the excavation floor was surveyed by a Surveyor licensed to practice in the State of New York.

4.1.4.4 Materials Transport Off-Site

Transport of soils, excavation liquids, tank liquids, construction and demolition debris, wood and garbage, as well as scrap metal were performed by licensed haulers in accordance with appropriate local, State, and Federal regulations, including 6 NYCRR Part 364. Haulers were appropriately licensed and trucks properly placarded based on the materials transported.

The approved truck routes are presented in **Appendix 3.** Unless emergency situations blocked the use of proposed roadways (i.e. closure of the roadway by authorized local personnel), all trucks loaded with Site materials exited the vicinity of the Site using only these approved truck routes.

During planning and approval of the truck routes, the planning process considered the following factors: a) limiting transport through residential areas and past sensitive Sites; b) use of city mapped truck routes; c) prohibition of off-Site queuing of trucks entering the facility; d) limiting total distance to major highways; e) promoting safety in access to highways; and f) overall safety in transport. Trucks were prohibited from stopping and idling in the neighborhood outside the project Site, and queuing of trucks was performed on-Site.

The truck bodies of the trucks exiting the Site were secured with tight-fitting covers. Loose-fitting canvas-type truck covers were prohibited. Wet soil material with potential to produce free liquid during transport was solidified prior to loading and transport, and trucks were inspected and cleaned prior to leaving the Site.

There were no citations, complaints, or adverse incidents involving trucking during the entire duration of the project.

4.1.4.5 Materials Disposal Off-Site

Materials that were excavated and removed from the Site were transported and disposed to regulated facilities in accordance with all local, State (including 6NYCRR Part 360) and Federal regulations. Disposal documentation for soil and other waste materials is provided in **Appendix 10.**

Before any materials were removed from the Site, disposal waste classification was performed for off-Site disposal in a manner suitable to the receiving facility and in conformance with applicable permits and regulatory requirements. The required disposal waste classification data was submitted to the disposal facility with suitable explanation prior to transport. Waste classification information including sampling and analytical methods, sampling frequency, analytical results and QA/QC documentation is included in **Appendix 5**.

Waste classification sampling confirmed that all excavated materials were non-hazardous. A waste classification sample location plan is included as **Figure WC**. Therefore, hazardous waste manifests were not required. A Bill-of-Lading system was used for off-Site movement of non-hazardous wastes and soils. Appropriately licensed haulers were used for material removed from this Site and were in full compliance with all applicable local, State and Federal regulations. Refer to **Appendix 10** for transport and disposal documentation.

Material was transported to Clean Earth of New Castle, 94 Pyles Lane, Delaware and Clean Earth of Carteret, 24 Middlesex Avenue, Carteret, New Jersey for disposal. All soil and fill disposal was pre-approved by the respective disposal facility, which were located in New Jersey and Delaware. No materials originating from the Site were disposed at a New York State recycling facility (6NYCRR Part 360-16 Registration Facility), a Part 360-26 Registration Facilities (also known as soil Recycling Facilities), or a New York permitted part 360 landfill.

C&D brick and concrete construction materials from all locations except the RCRA encapsulated area were disposed off-Site and/or recycled at T. Fiore Recycling Center, 411 Wilson Boulevard, Newark, New Jersey and Nacirema Industries, Inc. (Nacirema), Bayonne, New Jersey. Wood and garbage from the Site was disposed off-Site at Nacirema.

Documentation of acceptance for all disposal facilities is presented in **Appendix 4.**

4.1.4.6 Materials Reuse On-Site

There was no on-Site soil reuse during this project.

4.1.4.7 Fluids Management

Liquids to be removed from the Site, including dewatering fluids, were handled, transported and disposed in accordance with applicable local, State, and Federal regulations. Excavation liquids were characterized and disposed at Clean Water of New York, Inc., 3249 Richmond Terrace, Staten Island, New York. Documentation is provided in **Appendix 10** of this FER.

Liquids that were encountered within on-Site USTs were characterized and disposed in accordance with applicable local, State, and Federal regulations as documented in **Appendix 10.** No remedial liquids were discharged into the New York City sewer system, nor recharged back to the land surface, discharged to the subsurface of the Site or discharged to surface waters. As mentioned above, dewatering fluids were transported off-Site to an approved disposal facility.

4.1.5 Demarcation

After the completion of soil removal and prior to backfilling, a topographic survey of the excavation floor was performed by a New York State licensed surveyor. A physical demarcation, consisting of an orange Mirafi geotechnical fabric warning barrier, was placed on the excavation floor. This demarcation constitutes the top of the 'Residuals Management Zone', the zone that requires adherence to special conditions for disturbance of contaminated residual soils defined in the Site Management Plan included as **Appendix 14**. A map showing the survey results is included as a figure entitled **Survey No. 26627-6** of this FER.

4.1.6 Storm-Water Pollution Prevention Plan (SWPPP)

A Storm-Water Pollution Prevention Plan (SWPPP) was prepared by Dewberry-Goodkind, Inc. In accordance with the SWPPP, silt fencing was installed around the entire perimeter of the remedial construction area for erosion control.

The SWPPP addressed requirements of New York State Storm-Water Management Regulations including physical methods to control and/or divert surface water flows and to limit the potential for erosion and migration of Site soils, via wind or water.

The erosion and sediment controls were installed, implemented, maintained, and inspected in conformance with SWPPP practices and requirements as presented in the New York State Guidelines for Urban Erosion and Sediment Control the Site-specific Storm Water Pollution Prevention Plan as presented in Appendix 16 of the approved RAWP.

4.1.7 Community Air Monitoring Plan (CAMP)

The CAMP plan was designed to monitor for fugitive dust and organic compounds to be protective of the localized public health outside of the tent where active remedial actions were being performed. The CAMP included the following:

- The perimeter air monitoring program for dust and organic compounds was designed to be protective of the off-Site public within close proximity to the remedial action Site.
- The CAMP included action levels for organic vapors and particulate levels.
- The CAMP included methods for air monitoring; and
- The CAMP addressed analytes measured and instrumentation to be used.

Monitoring Approach

One upwind and two downwind perimeter monitoring stations were located at the Site during each day that intrusive remedial actions were conducted. The location of these stations were determined daily, based upon Site-specific wind direction measurements and the location of the fabric structure over the active area of remediation during each phase of work. The predominant wind direction at the Site was from the west-southwest. Additionally, perimeter monitoring was performed on a daily basis utilizing hand held instruments.

During the remedial activities, a weather station was set up to provide indication of the predominant wind direction during remedial activities at the Site. Area-specific monitoring was also conducted within the fabric structure for worker protection. The locations of the CAMP stations were reported to the NYSDEC Project Manager as part of the daily reports. The monitoring results were reported to NYSDEC and NYSDOH Project Managers and included in the Daily Reports.

Organic compounds were monitored continuously using a MiniRAE 3000 Photoionization detector or the equivalent. Dust and other airborne particulates were measured continuously with a Thermo MIE pDR-1000 or equivalent.

Action Levels

If ambient organic vapors were measured to be greater than 5 ppm sustained for more than 1 minute above background at the perimeter of the work area, activities were to be halted and monitoring continued. If the organic vapor level decreased to below 5 ppm above background, work activities were to be resumed. If the organic vapor levels were greater than 5 ppm over background but less than 25 ppm over background at the perimeter of the work area, activities were to be resumed provided the organic vapor level 200 feet downwind of the perimeter of the work area, or half the distance to the nearest residential or commercial structure, whichever was less, was below 5 ppm over background.

If the organic vapor level was above 25 ppm at the perimeter of the work area, activities were to cease. If work shutdown occurred, downwind air monitoring as directed by the Safety Officer was to be implemented to ensure that vapor emissions did not impact the nearest residential or commercial structure at levels exceeding those specified in the Major Vapor Emission section.

If any organic levels greater than 5 ppm over background were identified 200 feet downwind from the perimeter of the work area, or half the distance to the nearest residential or commercial property, whichever is less, all work activities were halted. If, following the cessation of the work activities, or as the result of an emergency, organic levels were found to persist above 5 ppm above background 200 feet downwind or half the distance to the nearest residential or commercial property from the work area, then the air quality was to be monitored within 20 feet of the perimeter of the nearest residential or commercial structure (20 Foot Zone).

If the downwind airborne particulate concentration were greater than 150 micrograms/cubic meter ($\mu g/m^3$) than the background concentration, work was to cease and both the work activity and dust suppression techniques were to be re-evaluated to reduce further particulate dispersion. Work was only to resume after the downwind airborne particulate concentration was reduced below 150 $\mu g/m^3$ above background level and no visible dust was observed leaving the work area.

Operational Findings

During the Site remediation activities, it was never necessary to cease work due to on Site conditions. Based on monitoring of vapor levels within the tent, Site worker PPE levels were occasionally increased to Level C with respiratory protection. Based on monitoring of vapor levels and dust levels outside the tent, within the Site or around the Site perimeter, dust control was occasionally necessary and was accomplished with use of the dedicated water truck or with spraying from hoses. Further discussion is provided in Section 4.2.5 of this FER.

4.1.8 Community Participation Plan (CPP)

After approval of the RAWP, and in accordance with Appendix D of Appendix 8 of that document, a Fact Sheet was distributed before the start of construction. A certification of mailing was sent by the Volunteer to the NYSDEC project manager following the distribution of all 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 (site contact list); and (5) a statement that the repository was inspected on (specific date) and that it contained all of applicable project documents.

No changes were made to the approved Fact Sheets authorized for release by NYSDEC without written consent of the NYSDEC until the project was completed. A total of eight Fact Sheets have been distributed to the site contact list as of the date this FER was prepared. Refer to **Appendix 6** for copies of project Fact Sheets.

In addition, document repositories were established at the following locations and contain all applicable project documents:

Court Square Library (CitiCorp Building)
25-01 Jackson Avenue
Long Island City, NY 11101

Queens Community Board 2
43-22 50th Street, 2nd Floor
Woodside, NY 11377

NYSDEC, Region 2 Office
47-40 21st Street
Long Island City, New York 11101

The following project documents were provided to the document repositories listed above:

- Remedial Investigation Workplan (RIWP) and Fact Sheet #1;
- Remedial Investigation Report (RIR) and RIR Fact Sheet #2;
- Draft Remedial Action Workplan (RAWP) and Draft RAWP Fact Sheet #3;
- Revised Draft RAWP and Fact Sheet #4;
- Interim Remedial Measures (IRM) Workplan for tank removals and IRM Workplan Fact Sheet #5;
- Final approved RAWP dated July 2009 and Fact Sheet #6, July 2009;
- Remedial Design Report dated May 2010;
- RAWP addendum and Fact Sheet #7, August 6, 2010;
- Draft Final Engineering Report dated September 2010 and Fact Sheet #8.

4.2 REMEDIAL PROGRAM ELEMENTS

4.2.1 Contractors and Consultants

Personnel	Affiliation	Responsibilities
Richard Arnold	EWMA Engineering Services LLC 100 Misty Lane Parsippany, New Jersey 07054 973-560-1400 x174 973-560-0400-fax	o Remedial Engineer o Review/oversight of project remediation activities with SPM and SM. o Preparation and certification of the final engineering report with the SPM.
Sharon McSwieney	Environmental Waste Management Associates, LLC 51-A Everett Drive West Windsor, New Jersey 08550 609-799-7300 x196 609-799-0108-fax	o Senior Project Manager (SPM). o Provides overall direction from the office upon consultation with the SM.
Daniel DiRocco	Environmental Waste Management Associates, LLC 100 Misty Lane Parsippany, New Jersey 07054 973-560-1400 973-560-0400-fax	o Site Manager (SM); reports to SPM. o Supervises all on-Site activities in connection with the work plan. o Assures adherence with the technical requirements of the work plan. o Primary contact for on-Site H&S emergencies. o Primary contact concerning activities, field personnel, contact with the SPM and public inquiries.

Margaret Halasnik		○ Quality Assurance Officer
Kenneth Bickerton, CIH, CSP (as needed for support to CitiStructure SSM).	Phase Associates, LLC 316 Eisenhower Parkway Livingston, New Jersey 07039 973-597-0750 973-597-6445-fax	○ Site Safety Manager (SSM); reports to SM. ○ Assures adherence with the HASP of the work plan. ○ Assists in ensuring adherence with the QA/QC procedures of the work plan. ○ Has authority in stopping work per SM approval when H&S concerns arise.
Craig Gorczyca, CHMM	Environmental Waste Management Associates, LLC 100 Misty Lane Parsippany, NJ (973) 560-1400	• Director, Operations & Waste Management • Project Hazardous Waste Manager
Frank Gherling	Frank Gherling Galli Engineering Mellville, NY	• UST Closure Engineer • Permitting. • Controlled Inspections. • Letter of Completion.
Lawrence Johnsen	Heller & Johnsen 20 Foot Of Broad Street Stratford, CT 06615	• Geotechnical Engineer • Shoring and Sheeting • Excavation Earth Support
Dave Banerjee	Impact Concrete & Control Inspections Inc 15-46 129th Street College Point, NY 11356	• Control Inspections/Impact Testing (H-piles, foundations)
Steve Fatzinger, P.E & Chander Nangia, P.E.	AllSite Structure Rental 1205 St Paul Street Baltimore, MD 21202 410.605.9216	• Tent Engineer • Calculations and Drawings • Tent Certification
Jeff Thorne	EISCO-NJ 900 Port Reading Avenue Suite B-2 Port Reading, New Jersey 070640 732-969-4888 732-969-9599-fax	• All physical activities associated with uncovering, removal and disposal of the UST. • Waste disposal (UST contents). • Backfill of excavation.
Ravi Reddy & Wayne Warner	Citistructure 50 Harrison Street – Suite 303 Hoboken, NJ 07030 201-798-4470	• Excavation • Excavation Dewatering and off-Site disposal
Montrose Surveying	116 20 Metropolitan Ave Richmond Hill, NY 11418-1090	• Surveyed top of residual management zone; top of clean cover materials
Robert Deriberprey	Construction Site Safety 1205 St Paul Street Baltimore, MD 21202 410.605.9216	• Construction safety oversight

Remedial Engineer

The Remedial Engineer for this project is Richard Arnold. The Remedial Engineer is a registered professional engineer licensed by the State of New York. The Remedial Engineer had primary direct responsibility for implementation of the remedial program for the OCA-LIC Fifth Street Site (NYSDEC BCA Index No. A2-0584-0307; Site No. C241098). The Remedial Engineer has certified in this Final Engineering Report that remedial activities were observed by qualified environmental professionals under his supervision and that the remediation requirements set forth in the Remedial Action Work Plan, and any other relevant provisions of ECL 27-1419, have been achieved in substantial compliance with that plan.

The Remedial Engineer or delegated personnel coordinated the work of other contractors and subcontractors involved in all aspects of remedial construction, including soil excavation, stockpiling, characterization, removal and disposal, air monitoring, emergency spill response services, import of back fill material, and management of waste transport and disposal. The Remedial Engineer or delegated personnel were responsible for all appropriate communication with NYSDEC and NYSDOH

The Remedial Engineer reviewed all pre-remedial plans submitted by contractors for compliance with the RAWP, as well as the performed remedial actions, which are certified in compliance with the approved RAWP in this Final Engineering Report. The required certifications listed in Section 10.1 of the approved RAWP are provided within this FER.

4.2.2 Site Preparation

The following is a summary of activities that were performed prior to commencement of remedial activities.

4.2.2.1 Mobilization

The mobilization of equipment, including the delivery and installation of the fabric structure and vapor management equipment needed for the soil excavation activities began on December 14, 2009 after the RWP was approved by the

NYSDEC/NYSDOH and all required SWPPP/soil erosion and sediment controls were constructed.

4.2.2.2 Erosion and Sedimentation Controls

Erosion and sedimentation controls were constructed and maintained as outlined in the SWPPP and included placement of hay bales and silt fencing. Erosion and sediment control measures identified in the SWPPP were routinely inspected to ensure that they are operating correctly.

4.2.2.3 Stabilized Construction Entrance(s)

The remedial construction entrance was located on 47th Avenue and the remedial construction exit was located on 46th Road. The construction entrance/exit had a stabilized aggregate pad underlain with filter cloth to prevent vehicles from tracking sediment off-Site. The stabilized construction entrance was constructed across the full width of the gated entrance, and the entranceway was fitted with a modular truck washing station that provided vertical washing beneath the trucks and lateral washing of the sides of the trucks with spray jets.

4.2.2.4 Utility Marker and Easements Layout

The presence of utilities and easements on the Site was investigated by the Remedial Engineer. It was determined that no risk or impediment to the planned work under this Remedial Action Work Plan was posed by utilities or easements on the Site.

The Volunteer and its contractors were responsible for the identification of utilities that might be affected by work conducted in accordance with the approved RAWP and implementation of all required, appropriate, or necessary health and safety measures during performance of work under this RAWP. The Volunteer and its contractors were solely responsible for safe execution of all invasive and other work performed under this RAWP. The Volunteer and its contractors obtained the necessary local, State or Federal permits or approvals pertinent to such work under the approved RAWP. As mandated by the Restrictive Declaration, the Volunteer obtained a Notice to Proceed from NYCDEP. Copies of the approvals to enable performance of this project are provided in **Appendix 6**.

4.2.2.5 Sheeting and Shoring

During earthwork and excavation operations at the Site, earth support was implemented in accordance with OSHA 29 CFR 1926 Subpart P and in accordance with utility protection, odor control, intrusive work control, and other protective practices as set forth elsewhere (i.e. RAWP Appendix 9, Health and Safety Plan, RAWP Appendix 11, Community Air Monitoring Plan).

The areas proximal to the Site perimeter were supported via the installation of H-piles and lagging. The majority of the remedial excavation work, however, was accomplished without sheeting or shoring.

The Volunteer and its contractors executed the excavation work and excavation related activities in accordance with the approved RAWP, obtained required local, State or Federal permits and/or approvals required to perform work under the approved RAWP.

4.2.2.6 Equipment and Material Staging

All materials were stored away from the surrounding roads and associated storm sewers and, where possible, were stored in covered areas such as in the tent.

4.2.2.7 Decontamination Area

Large-scale washing of trucks and equipment was performed during excavation activities. A truck washing station was constructed at the Site as provided in Appendix 15 of the approved RAWP. The bucket of the excavation equipment was cleaned before moving to a new area of concern by removing any solid residue, washing with an alconox/water solution and rinsing with clean water in the truck washing station area followed by transfer of the water into frac tanks for off-Site disposal along with the other fluids that were disposed off-Site.

Disposable supplies (i.e. boot over covers, gloves, sampling scoops, etc.) were collected in bags proximate to their area of usage and containerized in 55-gallon drums for disposal in accordance with applicable regulations.

4.2.2.8 Site Fencing

The perimeter of the Site is surrounded by a solid wooden fence. A locking gate is situated at the entrance point located at the corner of 5th Street and 47th Road. These controls were maintained for the duration of the remedial activities.

4.2.2.9 Demobilization

Following placement of the demarcation barrier, all excavations were backfilled to approximately five feet below surface grade using imported material which met the chemical criteria established in Part 375-6.7(d). At a minimum, 2 feet of material meeting the above criteria was placed above the demarcation barrier.

Any equipment that was utilized on Site exclusively for the remediation activities was decontaminated and removed. All materials generated during the course of the remedial activities were disposed off-Site in accordance with acceptable rules and regulations.

Sediment and erosion control measures will remain in effect for the duration of the development project, which will commence after the issuance of the BCP Certificate of Completion (COC).

4.2.3 General Site Controls

4.2.3.1 Site Security

The perimeter of the Site was fitted with a solid wooden fence for the duration of the remediation activities. A locking gate was installed and is situated at the entrance point located at the corner of 5th Street and 47th Avenue. These controls are still in place. Additionally, the Volunteer retained an outside Site Security firm that provided 24-hour, 7-day a week Site security for the duration of intrusive remedial action activities.

4.2.3.2 Job Site Record Keeping

Job Site field notes were maintained in dated and bound field book maintained on-Site throughout the project. The project was further documented via preparation of daily progress reports and digital photography that are provided in **Appendices 8 and 9** of this FER.

4.2.3.3 Soil Screening Methods

As detailed in Section 4.1.4.1, soil screening and assessment were performed by the qualified environmental professional during the remedial excavation activities.

4.2.3.4 Stockpile Methods

As detailed in Section 4.1.4.2, stockpile methods included stockpiling of no more than 200 tons of excavated soil from the remediation areas; temporary staging of excavated soil on and covered with plastic. Stockpiles were inspected daily during construction activities, were not located near catch basins, surface waters and other discharge points, and a dedicated water truck was on-Site for dust control.

4.2.4 Nuisance controls

This FER documents the completion of the approved remedial actions including the implementation of odor, dust and other nuisance control plans and is appropriately certified, as required by NYSDEC. As required by NYSDEC in the February 9, 2009 meeting, a fabric structure with vapor management system was constructed and utilized for all remedial activities. A permit from NYDCOB was obtained prior to construction of this structure and is provided in **Appendix 6.** A figure showing the schematic layout of the vapor management system for the tent structure was provided in Appendix 17 of the approved RAWP.

4.2.4.1 Truck Wash

A truck wash station was utilized on-Site to clean the exteriors of trucks exiting the Site. Wash water was collected in a storage vessel and periodically disposed.

4.2.4.2 Odor Control Plan

The odor control plan provided for control of off-Site migration of nuisance odors. Specific odor control methods that were used on a routine basis include monitoring of odors at the Site perimeter, direct load-outs of soils to trucks for off-Site disposal, and performance of excavation and soil management activities inside a negative pressure fabric structure with a vapor management system. The odor controls were effective, no nuisance odors migrated off-Site, and there were no odor events that required notification to NYSDEC and NYSDOH.

4.2.4.3 Dust Control Plan

A dust suppression plan was implemented at the Site. Dust monitoring was performed under the CAMP to monitor fugitive dust emissions during invasive work. The following actions were performed to ensure that dust emissions were minimized:

- Gravel was used on roadways to provide a clean and dust-free road surface;
- On-Site roads were limited in total area to minimize the area required for water truck sprinkling; and
- On-Site water truck and water hose connections were maintained and available during Site remedial activities.

4.2.4.4 Other Nuisances

A Noise Mitigation Plan was prepared and utilized by the contractor for all remedial work and conformed to the NYCDEP Citywide Construction Noise Mitigation (Chapter 28 of the NYC Noise Code). As required by the NYCDEP noise code, the Site contractor provided EWMA with a Site specific Noise Mitigation Plan. A copy of the noise mitigation documents required by the NYCDEP was included as Appendix 18 of the approved RAWP.

4.2.4.5 Truck Routing

All vehicular traffic involved in the Site remediation activities entered the Site via established truck entrances located on 46th Street or 47th Avenue. Trucks initially exited the Site initially via 46th Street until the excavation progress dictated exiting via 47th Street. All vehicular traffic involved in the Site remediation activities was parked on the Site and the local roadways were not utilized for parking or idling.

Approximately 20 trucks exited the Site on average each day and traffic control was not a problem. The approved truck routes are included in **Appendix 3** and were developed with local input from Community Board 2.

4.2.5 CAMP results

Perimeter monitoring, monitoring of the tent enclosure interior and pre-treated, vented exhaust, and CAMP air monitoring at three stations was employed during performance of intrusive Site activities as per the approved RAWP and discussions with NYSDEC. Station A was located upgradient of the tented work area and stations B and

C were located downgradient. The CAMP monitoring station locations were relocated based on the prevailing wind direction and active location of work. Locations during each day of work performed on-Site were reported in the daily logs provided in **Appendix 8**.

As expected, the highest concentrations of measureable volatile organic compounds occurred in the tent while accessing the USTs at the varnoline vault, draining product from the USTs, excavating at the varnoline vault and loading of soil from the varnoline vault area. These activities were all performed inside the negative pressure fabric structure. The peak (unsustained) concentration of 21.3 ppm that was detected in the tent occurred on January 6, 2010 and did not impact exterior air quality conditions as measured during the CAMP monitoring.

Peak Site exterior air quality PID readings were encountered when uncovering and draining tank product at the varnoline vault area inside the tent on January 12-14, 2010, with a peak, unsustained reading of 14.2 ppm at Station A on January 14, 2010.

On March 10, 2010 a peak, unsustained PID concentration of 24.3 ppm was detected at exterior monitoring location 4 associated with the tent vapor management system. A review of the CAMP monitoring data for that day indicates an unsustained peak of 5.1 ppm at CAMP Station B, with all CAMP Stations exhibiting a 0.0 ppm average for the day.

It should also be noted that truck and local traffic and excavation equipment were contributing sources of organic compound readings.

Dust monitoring was regularly performed at the perimeter of the Site with field instruments and at CAMP Stations A, B and C with automated measurement equipment. Exceedances of the 150 $\mu g/m^3$ perimeter dust monitoring action level were noted on March 11, April 12-14, April 19-23, April 29, May 4-5, May 7 and May 10, 2010. A review of the CAMP data from the same time as the perimeter monitoring exceedances generally reveals dust readings one order of magnitude lower than the perimeter monitoring number. As noted in the daily logs, windy conditions on many of these days were generating non-remediation dust from the adjacent roadway and adjacent Sites. A peak, unsustained dust concentration of 2,680 $\mu g/m^3$ was detected on March 11, 2010 at

Station C, while the average dust concentration at Station C was 60.5 $\mu g/m^3$. Peak dust periods generally occurred at the commencement of daily Site activities during loading and movement of trucks.

Copies of all field data sheets relating to the CAMP are provided in electronic format in **Appendix 7.**

4.2.6 Reporting

Daily and Monthly Progress Reports were filed with NYSDEC in accordance with the approved RAWP. A description of these reports is provided below.

4.2.6.1 Daily Reports

Daily reports were submitted to NYSDEC and NYSDOH Project Managers by the end of each day following the reporting period and included:

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

The Daily Reports included a description of daily activities keyed to an alpha-numeric map for the Site that identifies work areas. These reports included a summary of air sampling results, odor and dust problems and corrective actions, and any complaints received from the public (only two minor complaints were received during the course of the project).

A Site map that shows a predefined alpha-numeric grid for use in identifying locations described in reports submitted to NYSDEC is attached in **Figure 4.**

4.2.6.2 Monthly Reports

Monthly reports were submitted to NYSDEC and NYSDOH Project Managers following the month of the reporting and are included as **Appendix 8** of this FER. The monthly reports included the following information:

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

All daily and monthly reports are included in electronic format in **Appendix 8.**

The digital photo log required by the RAWP is included in electronic format in **Appendix 9**.

4.3 CONTAMINATED MATERIALS REMOVAL

Contaminated materials and sources of contamination removed from the Site included soil, construction and demolition (C&D) building materials, underground storage tanks (USTs), UST products, petroleum impacted excavation water and commercial refuse (wood and garbage). The following is a summary of disposal by media for this project.

DISPOSAL SUMMARY BY MEDIA	
MEDIA	VOLUME
SOIL/FILL (ALL)	16,435.6 tons
SOIL/FILL (RCRA ONLY)	3,044.58 tons
CONSTRUCTION/DEMOLITION DEBRIS	2,170 yd3
HAZARDOUS UST PRODUCT	32,390 gallons
NON-HAZARDOUS UST PRODUCT	14,400 gallons
EXCAVATION WATER	81,232 gallons

A list of the SSCOs for the contaminants of concern for this project is provided in **Table 3.** A figure of the location of original sources and areas where excavations were performed is shown on **Figure 3**.

4.3.1 Soil

As per the approved RAWP, the soils were remediated Site-wide via excavation to an average depth of 7' below surface grade. Additional deeper excavations were conducted at several locations due to elevated concentrations of non-fill related contaminants detected in end point base soil samples collected from 7-7.5' bsg. The additional excavations were performed at the varnoline tank field (AOC-8) and post-excavation base sample locations PEB-13, PEB-15, PEB-16 and PEB-24; and sidewall sample locations PES-1 and PES-20. The excavation locations and depths are depicted on **Figures 3** and **4** of this FER.

A total of 16,435.6 tons of Non-Hazardous Petroleum Contaminated soil and fill materials were excavated from the Site and transported for disposal at Clean Earth of New Castle, Delaware and Clean Earth, Carteret, New Jersey from January 4 to April 20, 2010. A total of 3,044.58 tons of soil was excavated from the former deed noticed area and disposed off-Site at Clean Earth, New Castle, Delaware as non-hazardous petroleum contaminated material based on pre-project waste classification results and additional waste classification results performed during remedial action activities. The EPA Deed Notice area excavated soils are highlighted in red italics on the soil disposal summary.

A summary of soil disposal and copies of the bills of lading and manifests are provided in **Appendix 10**. Pre- and post- remedial surveys are included herein as figures entitled **Survey No. 26627-2** and **No. 26627-6**.

4.3.2 Perched Unit

The approved RAWP provided for remediation (via excavation, vacuum extraction, and treatment) of LNAPL on the perched water unit, if identified to be present, in the western portion of the Site. However, observations in the field during Site-wide excavation activities, including deeper excavations into the perched unit around the two main source areas (the Varnoline vault and the heating oil UST area along 5th Street), did not identify any LNAPL impacted soils or perched water impacts beyond these two tank vault areas. Vacuum extraction was used to remove LNAPL/water mixture contained with the Varnoline vault, but since no LNAPL was observed in the

perched unit outside of the Varnoline vault area, there was no need for any additional vacuum extraction or treatment of LNAPL in the perched water unit.

As summarized in the Monthly Progress Reports and in this FER, the end point sample data collected demonstrate compliance with the SSCOs and did not indicate the presence of contaminants related to LNAPL. Further, during Site flooding due to heavy rain storms on several occasions, standing water was observed to be clear and free of sheen or any signs of LNAPL. Also, during recent installation of lower sand unit LNAPL-related wells, no evidence of LNAPL was observed in the perched zone.

In response to a NYSDEC request for post remedial groundwater confirmatory sampling in the perched unit in the northwestern quadrant of the Site, temporary wells were installed, the perched zone conditions were examined, and samples were obtained and provided to the analytical laboratory for analysis. The perched unit investigation locations are presented on **Figure 10.**

Initially, four temporary well points (TW-1, TW-2, TW-3 and TW-4) were installed at representative locations within the northwest quadrant of the Site. A NAPL material was encountered in the perched water at three of the four locations (TW-2, TW-3 and TW-4) just above the peat and clay layer. Therefore, per NYSDEC, additional investigation work was performed. The NAPL in the easternmost two temporary wells (TW-2 and TW-3) was found to be a black, very sticky, viscous material. The NAPL in the westernmost temporary well (TW-4) appeared to be browner in color and less viscous. The NAPL was sampled and subjected to GC fingerprint analysis. Using additional temporary wells, delineation of the extent of the material in the perched water around TW-2 and TW-3 was performed. In the same manner, delineation of the extent of the material in the perched water around TW-4 was also performed.

The NAPL in TW-2 and TW-3 did not match any of the lab's GC fingerprint library standards. The material appeared very old and weathered. The perched zone water quality results from TW-2 and TW-3 water samples (**Table 13**) generally met the TOGS 1.1.1 Class GA Groundwater Quality Standards (**Table 12**) with a few exceptions (acenaphthene, antimony, manganese, and sodium). Therefore, no further action was undertaken in the vicinity of TW-2 and TW-3.

The results of the water quality analyses of the sample from TW-1 generally meet the TOGS 1.1.1 Class GA Groundwater Quality Standards with a few exceptions (naphthalene, 2-methylnaphthalene, and a few metals). Therefore, no further action was undertaken in the vicinity of TW-1.

The NAPL found in TW-4 did not match any of the lab's GC fingerprint library standards. In addition, based on the results of the water quality analyses of the sample from this well, the NYSDEC required further investigation. Delineation of the material in the perched water in the locale of TW-4 was performed and the results are presented on **Figure 11**. The results of water quality analyses in the locale of TW-4 indicate VOCs including acetone, MEK, benzene, toluene, xylenes, isoproplybenzene and propyl benzene exceed the TOGS 1.1.1 Standards . The water quality results indicate a strong decreasing concentration trend out from TW-4, indicating a limited localized source. A conceptual approach for the remediation of the LNAPL in the perched unit was presented to and approved by NYDEC in October 2010. As detailed in Section 4.7.4, a series of extraction/monitoring and contingency injection/monitoring wells were subsequently installed in and around the approximately 2,500 square-foot LNAPL plume area. The remediation well layout is presented in **Figure 13.** The remediation was implemented under the RAWP, and current recovery activities include weekly vacuum events. Refer to **Table 14 and Table 15** for a summary of perched unit well information and LNAPL recovery information. Operation, maintenance and optimization of the remedial components will be performed under the SMP. In addition, the SMP contains a provision for chemical oxidant treatment of groundwater (if necessary) following completion of the NAPL recovery phase.

4.3.3 Construction and Demolition Debris (C&D)

A total of approximately 2,170 cubic yards of building debris consisting of brick, concrete, cinderblock and wood was transported off-Site for recycling via roll offs and dump trucks to:

- T. Fiore Recycling Corporation, 411 Wilson Avenue, Newark, New Jersey 07105.

The following companies transported C&D materials:

- All Around Trucking, 188 Berkley Avenue, Newark, New Jersey 07107
- Nacirema Industries, Inc., P.O. Box 183, Bayonne, New Jersey 07002
- B&B Excavating, 130 West 117 Street, New York, New York 10026

Building materials associated with the former Deed Notice (RCRA) area were demolished and disposed off-Site, and soil beneath the building materials was excavated and disposed off-Site under the BCP remedial actions. Non-contaminated building debris consisting of brick, concrete and cinderblock were transported off-Site for recycling by B&B Excavating to Fiore Recycling Corporation of Newark, New Jersey, crushed, then reloaded and returned to the Site and used for tracking pads.

A portion of the demolition materials were crushed, then reloaded and returned to the Site and used for tracking pads and temporary stabilized fill in the varnoline vault void after tank removal. All recycled demolition materials temporarily used on-Site during remedial activities were later excavated and disposed as non-hazardous materials with excavated soils. Approximately 700 tons of recycled stone was brought to the Site for tracking pads and temporary fill in the varnoline vault. These materials were not retained at the Site and were not used as imported fill. They were used only as a construction expedient

Subsurface concrete structures from the RCRA deed noticed portion of the Site were sampled for waste classification parameters prior to off-Site disposal, determined to be non-hazardous and disposed with other construction debris

A summary of demolition disposal and copies of the bills of lading and manifests are provided in **Appendix 10**.

4.3.4 Underground Storage Tanks (USTs)

A total of 36 underground storage tanks were identified. Only two of the tanks were registered with the NYSDEC prior to commencement of field activities. The remaining USTs were located during field remedial activities and subsequently registered with the NYSDEC (under Petroleum Bulk Storage facility numbers 2-213209 and 2-349666). Copies of the registration submittal are presented in **Appendix 6**.

Two tanks were formerly utilized for storage and dispensement of gasoline, 22 tanks were formerly utilized for varnoline storage for historic on-Site dry cleaning operations, while the remainder of the tanks are suspected to have stored fuel oil for on-Site heating purposes. The tank locations are depicted on **Figure 4** and are summarized on the **Table 2**. Piping for the UST systems was underground or encased in concrete, traversing building foundations in many directions. Therefore, the UST systems could not be delineated in the field during tank removal activities. Vents, where encountered, extended through the roofs of the former buildings. Fill pipes were generally located above the tanks. Many of the tank tops were encased in concrete. The varnoline tanks were situated within a concrete vault and the tops of the tanks were partially exposed through the concrete top. The bottom of the tanks rested on the concrete floor of a vault. The concrete vault walls were removed. However, the vault floor remains in place within the underlying clayey peat layer. Liquids in piping, if encountered, were drained and disposed with tank contents. All tanks were drained of encountered liquid contents and disposed in accordance with Federal, State and local requirements. The tank interiors were then cleaned in accordance with the American Petroleum Institute (API), USEPA, NYSDEC and NYCDEP requirements. The tank carcasses were then exhumed from the earth and recycled at the following approved scrap metal recycling centers by EISCO and Clean Venture.

- Benson Scrap Iron & Metal, 543 Smith Street, Brooklyn, New York 11231 License # 0987300
- A.R.C. Metal Recycling, 540 Kingsland Avenue, Brooklyn, New York 11222
- All American Alloys and Recycling, Inc., 200 South First Street, Elizabeth, New Jersey 07206

Copies of the scrap metal bills of lading are provided in **Appendix 10**.

4.3.5 Liquid Disposal

A total of 32,390 gallons of waste petroleum distillates, n.o.s. 3 UN1268 PG III, classified under hazardous waste code D001 (ignitable wastes for disposal) were drained from the varnoline tanks by Clean Venture, Inc. (USEPA ID number NJ0000027193) and disposed at Cycle Chem, Inc., 217 South First Street, Elizabeth, New Jersey 07206. Cycle

Chem's USEPA ID number is NJD002200046. A summary of varnoline waste disposal and copies of the hazardous waste manifests are provided in **Appendix 10**

A total of 18,400 gallons of non-hazardous waste classified as Non-DOT, Non-RCRA petroleum and gasoline contaminated wastes were drained from the remaining tanks and disposed at Cycle Chem and Clean Water. A summary of the non-hazardous waste disposal and bills of lading/manifests for UST product is provided in **Appendix 10**

Accumulated surface water resulting from seasonal precipitation events and ground water encountered at AOC-7 and AOC-8 (gasoline USTs were also found within the varnoline vault) exhibited a sheen and was, therefore, dewatered via vacuum trucks and disposed as Non-DOT, Non-RCRA petroleum contaminated water at:

Clean Water of New York, Inc.
3249 Richmond Terrace
Staten Island, New York 10303

A total of 81,232 gallons of water was removed from AOC 7 and disposed off-Site at Clean Waters. The liquids were transported by Terrence Transportation, LLC and William J. Lauer Corp. A summary of the non-hazardous water waste disposal and bills of lading/manifests are provided in **Appendix 10**.

4.3.6 Waste Characterization

Waste characterization samples were collected from soil, water, tank product and building debris scheduled for disposal. The following discussion details the waste characterization activities for the Site media.

4.3.6.1 Waste Characterization - Soil

The BCP Site was divided into six grids for soil waste characterization sampling. One Five point composite sample was collected from every 100 cubic yards of soil scheduled for disposal and analyzed for TPH-DRO. One eight point composite sample was collected from every 800 cubic yards of soil scheduled for disposal and laboratory analyzed for total VOCs, PAHs, RCRA Total and TCLP Metals, PCBs and RCRA Characteristics Ignitability, Corrosivity, Reactivity, sulfide and cyanide.

The characterization profile is consistent with DER-10, the RAWP, and the requirements of the disposal facility. The results of the waste classification sampling indicated all tested soil was suitable for non-hazardous disposal.

Summaries of the soil/historic fill waste classification data and the laboratory analytical data package are provided in **Appendix 5**. Requests for disposal and facility approvals are presented in **Appendix 4**.

4.3.6.2 Waste Characterization – RCRA Area Brick, Concrete and Soil

Two composite brick samples were initially collected in January 2009 to evaluate the former RCRA Area bricks environmental quality for disposal. The samples were analyzed for full TCLP waste classification parameters and TPH-DRO. TCLP VOCs, SVOCs, pesticides and herbicides were non-detect. Total PCBs were non-detect. TCLP arsenic, lead and mercury were detected at concentrations below the Toxicity Characteristics for hazardous waste. TPH-DRO was detected at 183 ppm and 46,700 ppm (Brick-1) in the samples. The results indicated the material was petroleum contaminated and non-hazardous for disposal.

Baseline soil waste classification sampling was performed in June 2009. Three composite soil samples were submitted for VOCs, PAH, PCBs, TCLP metals, RCRA characteristics and TPH-DRO. An additional 18 composite soil samples were collected and submitted for TPH-DRO analysis, as required by Clean Earth for soil characterization. TPH was detected at concentrations ranging from 2,470 to 8,270 ppm in these samples. PCBs were detected in one of the three waste class samples with aroclor 1254 detected at concentrations below 1 ppm. TCLP lead was detected in all three samples at concentrations below the Toxicity Characteristics levels for hazardous waste. The results indicated that the concrete was non-hazardous for disposal.

Additional samples were collected from the former RCRA Area concrete and soil at the request of the NYSDEC to confirm Non-Hazardous concentrations for disposal of soil and C&D materials. The concrete sampling included the sub-grade concrete trenches and pits that would be removed.

Two composite concrete samples were initially collected from encapsulated painted RCRA concrete areas in January 2010 and analyzed for full TCLP waste classification parameters and TPH-DRO. TCLP VOCs, SVOCs, pesticides and herbicides were non-detect. Total PCBs were non-detect. TCLP chromium was detected at concentrations below the Toxicity Characteristics for hazardous waste. TPH-DRO was detected at 75.7 and 206 ppm in the samples. The results indicated the concrete was non-hazardous for disposal.

Additional composite soil and concrete samples were collected at the request of the NYSDEC from the sub-grade concrete structures and soil beneath the structures to further evaluate the material for disposal. Soil sample AOC 14-A was collected on March 2, 2010 and analyzed for TCLP metals. Barium, cadmium and lead were detected at concentrations below the Toxicity Characteristics for hazardous waste. The composite concrete sample also identified as AOC-14-A was non-detect for all TCLP metals.

Two additional composite soil and concrete waste classification samples were collected on March 31, 2010, identified as AOC-14-B and AOC-14-C to further evaluate concrete and soil quality at additional former RCRA Area sub-grade trenches and sumps. The samples were analyzed for TCLP metals. Chromium was the only detected TCLP metal detected in the concrete at concentrations below the Toxicity Characteristics for hazardous waste. Barium and lead were detected in soil at concentrations below the Toxicity Characteristics for hazardous waste.

4.3.6.3 Waste Characterization – Excavation Water

A water sample was collected by EISCO – NJ on January 5, 2010 to classify standing water in the varnoline vault for disposal, which was encountered while uncovering the tops of the tanks water. The sample was submitted to Accredited Analytical Laboratories, LLC of Carteret, New Jersey for total VO+15 and metals analysis. The results of the sampling indicated low level concentrations of acetone (41 ppb) methylene chloride (5.4 ppb), 2-butanone (6.8 ppb) and total xylenes (6.3 ppb). Benzene, toluene and ethylbenzene were detected at concentration below 1 ppb. VO TICs totaled 665 ppb, comprised of derivative cyclohexane, benzenes, unknown hydrocarbons and unknowns. Five total metals were detected to include arsenic (50.4

ppb), barium (1,350 ppb), chromium (35 ppb), lead (420 ppb) and selenium (13 ppb). The results indicated that the water was non-hazardous for disposal as petroleum contaminated water.

As an aid to the waste classification process, five samples were collected for GC Fingerprint analysis during BCP remedial activities to qualitatively characterize unknown product encountered during remedial activities. Two samples were collected from the USTs and three samples were collected from product encountered during remedial activities.

Three samples were collected from product encountered at the Varnoline Vault Tank Area (AOC 8), immediately west (AOC 10) adjacent to this area and entering the Site from 46th Road in Grid M-1. The samples were labeled as AOC-8 Product, AOC-10 Product and M-1 Off-Site LNAPL. Samples AOC-8 Product and AOC-10 Product (IAL lab Case E10-00533) exhibited similar characteristics to 30W or 40W motor oil or Hydraulic Fluid standards, but were not identical matches possibly due to alteration of the chemical composition of the original product due to weathering. The M-1 Off-Site LNAPL (IAL lab case E10-01848) product exhibited characteristics of Hydraulic Fluid, Transformer Oil and Automatic Transmission Fluid standards. This sample also exhibited characteristics of highly degradation Fuel Oil, but did not exhibit gasoline or light volatile organic compounds. The GC Fingerprint water results and the EISCO-NJ analytical data for VO+10 and total metals collected from the water in the Varnoline Vault were provided to Clean Water to obtain approval for disposal of excavation water. The GC Finger print results are provided in **Appendix 5**.

A fourth GC Fingerprint sample, identified as T3-Product (IAL lab Case E10-02208), was collected from material observed to be entering the Site at grid T-3 from beneath the 5th Street lagging. The sample exhibited characteristics in common with the Fuel Oil/Diesel Oil standards, but positive identification was not possible due to extreme weathering. The GC Finger print results are provided in **Appendix 5**.

4.3.6.4 Waste Characterization – Tank Products

The tanks in the varnoline vault area contained a mixture of water/varnoline, which was disposed as hazardous waste as Waste Petroleum Distillates, n.o.s. 3 UN1268

PG III D001 ignitable wastes. The remaining tank products were disposed as Non-RCRA, Non-DOT petroleum contaminated wastes

A GC Fingerprint sample identified as AOC-7A-T2 (IAL lab Case E10-01353) was collected from 10,000 gallon tank 1 in AOC-7A to identify the contents. The provided sample was a close match to #2 fuel oil. The contents were disposed as #2 fuel oil waste based on the GC Fingerprint confirmation.

The summary Table in Section 4.3 above shows the total quantities of each category of material removed from the site and the disposal locations. A summary of the samples collected to characterize the waste, and associated analytical results are summarized on Tables in **Appendix 5**.

Letters from Applicants to disposal facility owners and acceptance letters from disposal facility owners are attached in **Appendix 4**.

Manifests and bills of lading are included in electronic format in **Appendix 10.**

4.3.7 On-Site Reuse

There was no on-Site reuse of materials excavated from the Site. Temporary reuse of a portion of the C&D materials was used for tracking pads and temporary stabilized fill in the varnoline vault void after tank removal. All recycled C&D materials temporarily used on-Site during remedial activities was excavated and disposed as non-hazardous materials with excavated soils. Approximately 700 tons of recycled stone was brought to the Site for tracking pads and temporary fill in the concrete varnoline vault.

4.4 REMEDIAL PERFORMANCE/DOCUMENTATION SAMPLING

Following remedial excavation, sidewall, base and targeted AOCs soil samples were collected to document the effectiveness of the remedial action. Refer to **Table 1 and 1A** for a summary of post-excavation sample and analysis summary. The end-point sample results are summarized in **Tables 4 through 11** and **Figures 6 through 9**, respectively. Any exceedances of SSCOs are highlighted.

In accordance with the approved RAWP, post-excavation base soil samples were collected at the rate of one sample per every 1,500 square feet of base and one sidewall

sample per every 50 linear feet with the exception of the (varnoline) UST and RCRA areas which were sampled at a frequency of one sample per every 900 square feet of base and one sidewall sample per every 30 linear feet of sidewall. The endpoint sidewall and base samples were submitted for full TCL/TAL+30 analysis to a laboratory that is accredited pursuant to the NYSDOH Environmental Laboratory Accreditation Program (ELAP) for the category of parameters analyzed. Initial sample locations requiring additional remediation were also sampled for the full TCL/TAL+30 analytical parameters. Delineation of hotspot lead samples was performed on July 12, 2010. NYSDEC pre-approved analyzing these samples for lead only. The NYSDEC also approved utilizing delineation sample results below the lead CUSCO as endpoints for the excavation of impacted material. Hot spot lead locations PES-1, PEB-13 and PEB-16A were excavated on July 28, 2010. Post-excavation soil sample results were compared to the Track 4 SSCOs listed in Table 375-6.8(a) & (b) of 6 NYCRR Subpart 375-6. Soil samples collected from beneath the water table around the Varnoline vault were compared to the NYSDEC Part 375-6 Protection of Ground Water Soil Cleanup Objectives (POGW).

Tables 4 through 11 compare endpoint soil data to the desired Track 4 SSCO. The remedial excavation was generally terminated at 7' below surface grade or just above the perched water unit (except where noted herein). Contaminants usually associated with historic fill include SVOCs and metals. As anticipated, these compounds were detected above the SSCO in post-excavation sidewall and base samples.

VOC soil contamination was detected adjacent to the Varnoline tank vault. VOCs, including ethylbenzene, total xylenes, and isopropyl benzene and naphthalene and other select SVOCs were detected above the SSCOs. In addition, arsenic, barium, copper, lead, manganese and mercury were detected above the SSCO at the varnoline vault area.

Much of the detected soil contamination in and around the Varnoline vault area was remediated via additional excavation at sample locations PEB-VV-W1 and PEB-VV-E2, leaving only two isolated isopropyl benzene exceedances at PEB-VV-N2 (5.7 ppm) and PEB-VV-W2 (7.46 ppm). It should be noted that since there is no SCO for

isopropylbenzene in Part 375, isopropylbenzene was evaluated using the TAGM 4046 Recommended Soil Cleanup Objective (RSCO)[1]. Isopropyl benzene was detected above the TAGM 4046 RSCO of 2.3 ppm in sample PEB-40 at 3.79 ppm.

Test pits were installed on March 10, 2010 around the vault area to evaluate soil quality at this potential source area beneath the originally proposed excavation and post-excavation sampling depth of 7-7.5' bsg. VOCs and SVOCs were detected in samples PEB-VV-W1 and PEB-VV-E2. Impacted soils were excavated to 15.5' bsg (15' x 5' x 8' deep) at PEB-VV-W1 and to 12.5' bsg (15' x 5' x 5.5' deep) at sample location PEB-VV-E2. Post-excavation samples were collected from the 0-0.5' increment beneath the excavation to verify soil quality. Additionally, one sample was collected beneath the Varnoline vault concrete floor to document soil quality beneath the structure.

End point sample data was compared to the SSCOs as presented on **Table 6**. A review of the data indicates isopropyl benzene exceeds the RSCO in samples PEB-VV-W2 and PEB-VV-N2 at 7-7.5' bsg which are above the perched water unit, while select SVOCs and metals, generally associated with historic fill, exceed the SSCO in post-excavation soil samples remaining on-Site.

The soil data collected from soils within the water table (below 8' bsg) was compared to the POGW on **Table 9**. Select SVOCs were detected above the POGW in samples PEB-VV-N1 and PEB-VV-S2, while selenium was the only metal detected above the POGW in sample PEB-VV-S2.

Additional excavation was performed at PEB-15, PEB-16 and PEB-24 (as shown on **Figure 3**) in an effort to comply with the SSCOs for VOCs and metals. An additional 5' x 5' x 0.5' deep excavation was performed at post-excavation base sample location PEB-16 to remediate elevated concentrations of naphthalene detected at 323 ppm. Post-excavation analytical results indicate concentrations below the SSCO for naphthalene in the sidewall and base samples PEB-16A. Barium, lead and mercury concentrations above the SSCO were noted in the 2nd effort post-remedial sample results. Per NYSDEC, a second remedial effort was performed on July 28, 2010 to remediate elevated, post-

[1] The standard for isopropylbenzene in the newly adopted CP-51 Soil Cleanup Guidance is the same 2.3 ppm.

excavation concentrations of lead (1,570 ppm) that exceeded the SSCO. As noted in Section 2.0, an alternate SSCO of 1,000 ppm was approved for lead, and a fact sheet (No. 7) was provided to the CPP contact list. A 10' x 5' x 1' deep excavation was performed to pre-delineation endpoint samples. The lead concentration for the western sidewall delineation sample point PEB-16W, 7/7.5' bsg was marginally above the SSCO at 1,050 ppm and per NYSDEC, further remediation was not required.

Two remedial efforts were performed at base sample location PEB-15 to remediate concentrations of SVOCs, barium, copper, lead, mercury and total cyanide detected above the SSCO. The 1st remedial effort was a 5' x 5' x 0.5' deep excavation, but SVOCs, barium, lead and mercury concentrations still exceeded the SSCO, so a 2nd remedial effort was performed excavating an additional 10' x 10' x 0.5' deep. The 2nd remedial effort post-excavation results indicated only one detection for mercury above the SSCO and lower detection of SVOC compounds.

An additional 5' x 5' x 0.5' deep excavation was performed at post-excavation base sample location PEB-24 to remediate elevated concentrations of VOCs benzene, ethylbenzene and isopropyl benzene, SVOCs, barium, copper, lead, manganese and mercury. VOCs benzene, ethylbenzene and isopropyl benzene were not detected in the post-excavation analytical results and a decrease in SVOC concentrations was noted. Arsenic, barium, lead and mercury were detected at concentrations above the SSCO were noted in the sidewall and base soil sample PEB-24A.

Delineation of lead impact only was performed with NYSDEC approval at initial post-excavation sample locations PES-1, PEB-13 and PEB-16A. Initial sample results were successful in delineation of lead impact with the exception of sample location PES-1-N which exhibited a lead concentration of 7,230 ppm at 7/7.5' bsg. An additional delineation sample was collected from 7/7.5' bsg north of the impacted soil sample, identified as PES-1-N2 that exhibited a lead concentration of 215 ppm. A 10' x 10' x 1' deep area of lead impacted soil was excavated on July 28, 2010 at and adjacent to original sidewall sample location PES-1.

Horizontal and vertical delineation results at original base sample location PEB-13 were all below the lead SSCO. Therefore, these data were used to define the extent of

the excavation of lead impacted soils exceeding the SSCO in initial sample location PEB-13. On July 28, 2010, an area approximately 10' x 10' x 0.5' deep centered on PEB-13 was excavated and disposed off-Site.

Two remedial efforts were performed at sidewall sample location PES-20 to remediate elevated concentrations of lead detected in the March 31, 2010 sample (2,930 ppm). The wooden sheeting was removed to permit excavation at this location. The first remedial effort removed an additional 1' of soil and was re-sampled for full TCL/TAL analytical parameters. Lead was detected at 1,050 ppm in the April 19, 2010 sample, prompting an additional 1' remedial effort, with re-sampling for full TCL/TAL parameters. Lead was detected in the 2nd post-remedial effort endpoint sample at 808 ppm, below the revised lead SSCO. Mercury and select PAH compounds also exceeded the SSCO in this endpoint sample.

A total of 92 post-excavation endpoint soil samples were collected to document post-excavation soil quality. A total of 79 of these endpoint post-excavation soil samples were collected from above the perched water table with the remaining 13 soil samples collected from within the perched water unit. Initial and subsequent post-excavation endpoint soil samples (73) collected from January to April 2010 were submitted for full target compound/target analyte list (TCL/TAL) analysis. Lead hotspot delineation samples utilized as endpoint samples (15) were only submitted for lead analysis with pre-approval from the NYSDEC. Additional remedial actions were performed at 11 of the base sample locations to further remediate elevated contaminant concentrations.

Summaries of the soil contaminant concentrations remaining on Site at the conclusion of soil remedial actions are provided below.

Volatile Organic Compounds (VOC)

A review of the post-excavation soil data indicates that only isolated final post-excavation soil results exceeded the SSCO. Specifically, three samples exceeded the TAGM 4046 RSCO of 2.3 ppm for isopropyl benzene. Two of the samples were located at the varnoline vault area (PEB-VV-N2 and PEB-VV-W2), and one sample (PEB-40) was located south of the varnoline vault area in the northern portion of the former RCRA

area. No soil samples collected from below the water table exceeded the POGW for VOCs. An overview of the soil data is provided below.

SUMMARY OF POST-EXCAVATION ENDPOINT VOC SOIL CONCENTRATIONS				
Parameter	RSCO[1] ppm	Total # of Endpoint Samples	# Samples > SSCO	Maximum Concentration (ppm)
Targeted VOCs				
Isopropyl benzene	2.3	73	3	7.46

1 NYSDEC TAGM Recommended Soil Cleanup Objective.
All results shown in ppm (Parts per Million)

Semi-Volatile Organic Compounds (SVOC)

A review of the post-excavation soil data indicates that a number of SVOC's exceeded the SSCO. As detailed in Section 4.9, Deviations from the Remedial Action Work Plan, the remaining SVOCs are generally associated with historic fill materials, which were documented during RI activities to extend to a depth on-Site between 10-12' bsg. The excavation to 7' bsg was performed to eliminate direct contact with impacted historic fill and impact due to Site related activities. SVOCs tend to adhere strongly to soil particles and have low volatility, therefore, these compounds generally do not pose a concern for vapor intrusion or impact to ground water. Imported supplied virgin quarry process (QP) was used to fill excavation voids below the Mirafi orange geotechnical fabric demarcation barrier, an additional 2' feet of QP was installed above the demarcation barrier. These elements of the composite cover system prevent direct contact with historic fill with elevated SVOC concentrations. An overview of the soil data is provided below.

SUMMARY OF POST-EXCAVATION SVOC SOIL CONCENTRATIONS				
Parameter	SSCO (ppm)	Total # of Endpoint Samples	# of Samples > SSCO	Maximum Concentrations
Targeted SVOC's (ppm)				
Naphthalene	100	73	0	58.1
Acenaphthene	100	73	0	78.1

Dibenzofuran	59	73	0	43.3
Fluorene	100	73	0	59
Phenanthrene	100	73	1	114
Benzo[a]anthracene	1	73	48	25
Chrysene	3.9	73	25	25.8
Benzo[b]fluoranthene	1	73	45	27.9
Benzo[k]fluoranthene	1	73	45	21.1
Benzo[a]pyrene	1	73	51	27.2
Indeno[1,2,3-cd]pyrene	0.5	73	48	17.5
Dibenz[a,h]anthracene	0.33	73	41	7.06

ppm – Parts per Million

Metals

A review of the post-excavation soil data indicates that several metals exceeded the SSCOs. The locations where lead concentrations were found in excess of the 1,000 ppm revised SSCO were excavated except as follows: at the locations of two sidewall endpoint samples, PES-3 and PES-4, along the eastern sidewall of the Site right at the property boundary, lead concentrations were detected at 1,650 ppm, which is above the 1,000 ppm SSCO. There are off-Site buildings directly over the property boundary in this area, the buildings are supported by the soils that reside at the property boundary, and foundation underpinning has already been needed to prevent building damage. For this reason, the Remedial Engineer prohibited further sidewall excavation in this area to prevent the risk of damage to off-Site property.

As detailed in Section 4.9, Deviations from the Remedial Action Work Plan, metals are generally associated with urban historic fill materials. The excavation to 7' bsg was performed to eliminate direct contact with impacted historic fill and possible impacts due to Site related activities. Similar to SVOCs, metals tend to adhere strongly to soil particles. Therefore, these compounds generally do not pose a concern for impacts to ground water. As discussed, herein, imported virgin QP was used to fill excavation voids below the Mirafi orange geotechnical fabric demarcation barrier, and an additional 2' feet of QP was installed above the demarcation barrier. These elements of the composite cover system prevent direct contact with historic fill with elevated metal concentrations. An overview of the soil data is provided below.

SUMMARY OF POST-EXCAVATION METALS SOIL CONCENTRATIONS				
Parameter	**SSCO (ppm)**	**Total # of Samples**	**# Samples > SSCO**	**Maximum Concentration (ppm)**
Metals (ppm)				
Arsenic	16	73	7	104
Barium	400	73	10	804
Cadmium	4.3	73	0	2.32
Chromium, Trivalent	180	73	0	77.7
Copper	270	73	6	974
Lead	1000*	87	2	1,650*
Mercury	0.81	73	38	10.6
Nickel	310	73	0	127
Selenium	180	73	0	4.81
Silver	180	73	0	8.46
Zinc	10000	73	0	1540
Cyanide, Total	27	73	1	217

* Two sidewall endpoint samples collected from the eastern sidewall of the Site had concentrations above 1,000 ppm as indicated in the table above. However, it was not feasible to excavate further eastward due to the presence of buildings at the property boundary on the adjacent property.

Pesticides

A review of the post-excavation soil data indicates no sample result exceeded the SSCO. An overview of the soil data is provided below.

SUMMARY OF POST-EXCAVATION PESTICIDE SOIL CONCENTRATIONS				
Parameter	**SSCO (ppm)**	**Total # of Samples**	**# Samples > SSCO**	**Maximum Concentration (ppm)**
PESTICDES (ppm)				
4,4'-DDE	8.9	73	0	0.247
4,4'-DDD	13	73	0	7.81
4,4'-DDT	7.9	73	0	0.405
Alpha-Chlordane	4.2	73	0	0.046
Gamma-Chlordane	NA	73	0	0.197

PPM = parts per million

PCBs

A review of the end point soil data indicates two isolated detection of PCBs aroclor 1254 and 1260 at concentrations marginally above the SSCO of 1 ppm. An overview of the soil data is provided below.

SUMMARY OF POST-EXCAVATION PCB SOIL CONCENTRATIONS				
Parameter	**SSCO (ppm)**	**Total # of Samples**	**# Samples > SSCO**	**Maximum Concentration (ppm)**
PCBS (ppm)				
Aroclor-1260	1	73	2	1.18

ppm = parts per million

Tables 4 through 10 and **Figures 6 through 9** summarize the results of all soil samples remaining at the Site after completion of Remedial Action that exceed the Track 4 SSCO.

As previously mentioned, a total of 13 soil samples were collected from below the water table (depth greater than 7' bsg) and are presented on Table 7. A review of these data indicates only isolated exceedances of the SSCO for select SVOC's and selenium, which are summarized below.

Parameter	SSCO (ppm)	Total # of Endpoint Samples	# of Samples > SSCO	Maximum Concentrations
Target VOCs				
Isopropylbenzene	2.3*	13	3	28.1
Targeted SVOCs				
Benzo[a]anthracene	1	8	2	2.1
Chrysene	1	8	2	5.57
Benzo[b]fluoranthene	1.7	8	2	2.25
Benzo[k]fluoranthene	1.7	8	1	2.24
Metals				
Selenium	4	8	1	4.81

SSCO = Protection of Groundwater SCO

*** = There is no Protection of Groundater SCO for isopropylbenzene. The value shown is the TAGM RSCO.**

Table 11 provides a summary of all soil samples that have been excavated as part of additional remedial actions performed to remediate soil to Track 4 SSCO requirements.

Tables and figures summarizing all end-point sampling are included in **Table 4 through 11** and **Figures 6 through 9**, respectively, and exceedances of Track 4 SSCOs are highlighted.

Data Usability Summary Reports (DUSRs) were prepared for all data generated in this remedial performance evaluation program. These DUSRs associated raw data are provided electronically in **Appendix 12.** As indicated in the DUSR, the laboratory analytical data contained herein are deemed usable and in compliance with the NYSDEC ASP Category B Data Deliverable Format.

4.5 IMPORTED BACKFILL

A total of 8,795.15 tons of virgin, quarry supplied QP was obtained from Tilcon New York Inc., 162 Old Mill Road, West Nyack, New York 10994 to backfill the Site after the conclusion of remedial excavation activities. The QP originated from Tilcon's 209 West Nyack Quarry. The QP was evenly placed throughout the entirety of the excavated BCP from approximately 5-7' bsg to create a 2' clean fill buffer above the demarcation barrier.

A summary of imported virgin quarry fill used at the BCP and Tilcon's bill of lading fill tickets are provided in **Appendix 10. Figure 5** provides cut and fill cross sections of the BCP Site. Refer to figure entitled **Survey No. 26627-8** for a survey of the top of backfill.

4.6 CONTAMINATION REMAINING AT THE SITE

A Mirafi orange geotechnical fabric barrier was installed at 7' bsg as a demarcation layer between unexcavated fill materials remaining on-Site and the approximate 2' thick layer of imported, virgin QP installed to an approximate depth of 5' bsg. Where the remedial excavation was extended below 7' bsg, imported virgin QP was

utilized to raise the excavated area to the 7' bsg elevation, the demarcation barrier was installed, and an additional 2' of imported, virgin QP was added.

Tables 4 through 10 and **Figures 7 through 10** summarize the quality of the soil remaining at the Site after completion of Remedial Action.

Groundwater contamination remains in a limited area at the Site in the perched unit in the form of LNAPL in the vicinity of TW-4. As referenced in Section 4.3.2, delineation of this LNAPL has been completed and the remedy implemented. A series of 24 four-inch extraction/monitoring wells have been installed in the vicinity of TW-4 to allow for recovery of the NAPL. A series of 14 one-inch contingent injection/monitoring wells have also been installed. Refer to Figure 13 for as as-built of the perched unit LNAPL remedial locations. Recovery activities have been initiated in the form of weekly vacuum extraction events. Refer to **Table 14 and Table 15** for a summary of the perched unit LNAPL well information and NAPL recovery information. Continued operation, monitoring and optimization of the LNAPL recovery activities will be completed under the SMP. Refer to Appendix 16 of the SMP.

In addition, lower sand unit groundwater contamination remains in the form of LNAPL migrating onto the Site. This is being addressed through the remedial system described in Section 4.7.3.

Since contaminated soil, groundwater and soil vapor remains beneath the Site after completion of the Remedial Action, Institutional and Engineering Controls are required to protect human health and the environment. These Engineering and Institutional Controls (ECs/ICs) are described in the following sections. Long-term management of these EC/ICs and residual contamination will be performed under the Site Management Plan (SMP) approved by the NYSDEC.

4.7 ENGINEERING CONTROLS

Due to the presence of remaining contamination, Engineering Controls (EC) are required to protect human health and/or the environment at the Site. The Site has the following primary Engineering Controls:

4.7.1 Composite Cover System

Exposure to remaining contamination in soil/fill at the site prior to development is currently prevented by 2 feet of clean, imported fill material placed over an orange fabric demarcation barrier that resides on unremediated sub-grade soils. Upon completion of development construction, exposure to remaining contamination in soil/fill will be prevented by a composite cover system across the Site. The composite cover system will be comprised of a minimum of 2 feet of clean fill or asphalt covered roads, concrete covered sidewalks, and concrete building slabs. In all cases, these materials will be underlain by the demarcation barrier. The Excavation Work Plan that appears in Appendix 1 of the SMP outlines the procedures required to be implemented in the event the cover system is breached, penetrated or temporarily removed, and any underlying remaining contamination is disturbed.

Refer to **Figure 12** for the existing cover details on the Site as of the preparation of this FER. Refer to Figure 11 in the SMP for the planned location and detail of each type of cover at the Site after development.

4.7.2 Vapor Intrusion Control

As indicated in the SMP, future development plans include buildings with ground floor concrete slabs (building slabs on grade - SOG) constructed near or below the seasonal high water table, and buildings with ground floor slabs constructed above the seasonal high water table. In accordance with the requirements of the SMP, vapor intrusion control features will be installed during the construction of all buildings and will be operated subsequently to the completion of construction. The vapor intrusion control features will be: 1) permitted, installed and inspected in compliance with governing state and city codes, rules and ordinances; 2) installed in compliance with the provisions of the SMP, manufacturer's installation recommendations, and good construction practices; and 3) installed in accordance with the requirements of the Building Design Engineers and Architects (BDEA). Refer to **Figure 14,** Vapor Intrusion Control Plan. Detailed vapor intrusion engineering control information is provided in Appendix 14 of the SMP.

4.7.3 Lower Sand Unit LNAPL Remediation System

In accordance with the NYSDEC-approved RDR dated May 2010, and as depicted in **Figures LN-1** and **LN-2**, an LNAPL remediation system has been installed and is operating in the lower sand unit. This system is intended to intercept and recover LNAPL on the eastern side of the Site and to address NYSDEC's concerns regarding possible re-contamination and need for future monitoring and/or mitigation of LNAPL migrating onto the site from an off-site source(s).

Lower sand unit LNAPL contamination was addressed via the installation of a capture wall, collection and recovery wells, and down-well skimming equipment to collect and remove the LNAPL. Successful recovery of LNAPL with this system has already begun and will be continued under the SMP. Five recovery wells were installed directly upgradient of the wall for product removal and four monitoring and recovery wells were installed downgradient of the wall. A network of 10 monitoring and recovery wells was installed directly into the LNAPL plume area for recovery of LNAPL from the plume area. A network of 10 monitoring and treatment wells was installed directly under the plume area as requested by NYSDEC. Finally, nine perimeter monitoring and recovery wells were installed in the sidewalk of 46th Road, 5th Street and 47th Avenue to monitor ground water quality and ensure that LNAPL did not migrate beyond the LNAPL capture system. All totaled, 38 wells were installed as part of the LNAPL recovery and monitoring system. Refer to **Table 16**, Lower Sand Unit LNAPL Well Summary. The existing well location plan with capture wall is included as **LN-1**. Refer to figure entitled **Survey No. 26627-11** for a survey of the locations of these remedial components.

The Lower Sand Unit LNAPL remediation system has been tested and is operational and is performing as anticipated. It will continue to be operated in accordance with the provisions of the SMP. The field testing, initial recovery, and initial operating results are set forth in **Table 17**. Based on the recovery data obtained, the recovery volumes are gradually being reduced by the system operations, with an achieved reduction of about 10%. Based on the operations findings, an automated recovery is not needed; instead, a small spill containment facility with four DOT rated storage drums will provide sufficient storage, and the storage vault will not be installed.

Procedures for monitoring the performance of the lower sand unit LNAPL remediation system are presented in the Appendix 15 of the SMP.

4.7.4 Perched Unit NAPL Remediation System

In accordance with and under the RAWP, and as depicted in **Figure 13,** an LNAPL remediation system has been implemented and is recovering LNAPL in the perched unit in the northwest quadrant of the site.

Perched unit LNAPL contamination was addressed by delineation of the LNAPL plume, establishment of a staggered 10-foot on center grid across the approximate 2,500 square foot LNAPL plume area, installation of twenty-four 4-inch diameter extraction/monitoring wells, and installation of fourteen 1-inch diameter contingent injection/monitoring wells. Extraction pump testing and vacuum enhanced fluid extraction testing was performed, and demonstrated satisfactory hydraulic impacts and satisfactory extraction of LNAPL/water mixtures within the established gridded extraction well network. Refer to **Table 14** and **Table 15** for a summary of perched unit LNAPL well information and LNAPL recovery information. Initial extraction events were conducted daily for durations of 6-hours, and then weekly for durations of 6-hours. During the extraction work, a mixture of LNAPL and water is removed and conveyed to a vacuum tanker for off-site disposal in accordance with the rules for that activity.

The perched unit LNAPL remediation system is operational and is performing as anticipated. It will continue to be operated and subjected to measurement and optimization under the SMP, and detailed system operating and maintenance information is provided within Appendix 16 of the SMP.

4.8 Institutional Controls

The Site remedy requires that an environmental easement be placed on the property to (1) implement, maintain and monitor the Engineering Controls; (2) prevent future exposure to remaining contamination by controlling disturbances of the subsurface contamination; and, (3) limit the use and development of the Site to restricted residential and commercial uses only.

The environmental easement for the Site was executed by the Department on September 1, 2010 and recorded with the Queens County Clerk on October 26, 2010 The County Recording Identifier number for this filing is CRFN 2010000358498. A copy of the easement and proof of filing is provided in **Appendix 13.**

4.9 DEVIATIONS FROM THE REMEDIAL ACTION WORK PLAN

The Volunteer has implemented the approved RAWP with several field changes, none of which involved material changes to the approved remedy:

1) A RAWP Addendum, dated July 16, 2010, was submitted and approved on July 30, 2010. The RAWP Addendum required minor excavation of three soil areas where lead was detected in an end point sample at concentrations above the SSCO of 1,000 ppm. The areas were excavated and soil disposed of off-Site. Refer to details provided previously in Section 4.4 of this FER. In addition, since a modification to the SCO for the Site for lead was obtained, a Fact Sheet (No. 7) was distributed to the CPP contact list on August 6, 2010. Refer to **Appendix 6** for a copy of this Fact Sheet.

2) An approved Interim Remedial Measure Workplan consisting of registration and removal of on-Site underground storage tanks (USTs) in accordance with NYSDEC requirements was approved by NYSDEC on July 30, 2010 However, the USTs were closed and removed in conjunction with soil remediation and was not performed as an interim measure;

3) Additional excavation to deeper depths was conducted in the varnoline vault area and other areas of the Site due to post-ex results exceeding the SSCOs; Refer to details provided previously in Section 4.4;

4) NAPL was discovered in a localized area at depth in the perched unit and is being remediated via a series of recovery wells and injection points as detailed in Section 4.7.4;

5) Due to the presence of historic fill material (as defined in 6 NYCRR Part 375-1.2(x)) across the Site, the SSCOs for certain SVOCs and metals that are typically associated with historic fill material have not been met in all end point samples

collected at depth (i.e., generally below 7 ft bsg, and beneath the demarcation layer at the Site). As summarized in Section 4.4 of this FER, specific SVOCs, including benzo[a]anthracene, chrysene, benzo[b]fluoranthene, benzo[k]fluoranthene, benzo[a]pyrene, indeno[1,2,3-c,d]pyrene, and dibenz[a,h]anthracene are present in soil at concentrations above the SSCOs. In addition, certain metals, including arsenic, barium, copper, lead, and mercury are present in soil at concentrations above the SSCOs. These compounds are not associated with contamination resulting from historic site operation; instead, they are due to the presence of historic fill materials which are well documented to exist throughout the five boroughs of New York City.

In accordance with 6 NYCRR 375-3.8, Track 4 cleanups require the top two feet of exposed surface soils which are not otherwise covered by buildings or pavement to meet the residential use Soil Cleanup Objectives (RUSCOs), providing all source areas have been addressed. The source areas at this site have all been addressed by the remedy, including continued compliance with the operation and maintenance requirements of the LNAPL remedial systems. As described above, the SSCOs for certain SVOCs and metal have not been met at depth, but these remaining contaminants are not in sufficient concentrations to migrate in soil or to release significant levels of contaminants to another environmental media which might result in a threat to public health or the environment. Because this site is a mixed-use commercial and residential development (with no single family residential use), application of the RUSCOs in the top two feet of exposed soil is appropriate. In accordance with 6 NYCRR Part 375 regulations, engineering controls and institutional controls will be implemented to ensure protection of public health and the environment. The engineering controls, as detailed in Section 4.7 of this FER, include a composite cover system and a vapor intrusion control system. The composite cover system is currently comprised of a minimum of 2 feet of soil that complies with the use-based SCOs in 6 NYCRR Table 375-6.8(b). Following completion of the redevelopment, the composite cover system will also include asphalt covered roads, concrete covered sidewalks, and concrete building slabs.

The institutional controls include an environmental easement and a site management plan (SMP).

Accordingly, the presence of historic fill related compounds above the RAWP-approved SSCOs at depth and beneath the demarcation layer does not pose a risk to public health and the environment.

6) The approved RDR included a storage vault to support automated LNAPL recovery in the lower sand unit, if needed. Based on the operations findings, an automated recovery is not needed; instead, a small spill containment facility with four DOT rated storage drums will provide sufficient storage, and the storage vault will not be installed.