

**REVIEW AVENUE DEVELOPMENT (RAD) I
QUEENS COUNTY
LONG ISLAND CITY, NEW YORK**

SITE MANAGEMENT PLAN

NYSDEC Site Number: RAD I - BCP #C241089

Prepared by:

MACTEC Engineering & Geology, P.C. (MACTEC)
511 Congress Street, Suite 200
Portland, Maine 04112

and

Wood Environment & Infrastructure Solutions, Inc.
(formerly Amec Foster Wheeler)
200 American Metro Boulevard, Suite 113
Hamilton, New Jersey 08619


Revisions to Final Approved Site Management Plan:

| Revision No. | Date Submitted | Summary of Revision | NYSDEC Approval Date |
|---------------------|-----------------------|---|-----------------------------|
| 001 | December 2020 | Substitution Amendment changes, contact name changes and updates to system operations | |
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| | | | |

DECEMBER 2015

CERTIFICATION STATEMENT

I, BRENT O'DELL certify that I am currently a New York State (NYS) registered professional engineer as in defined in 6 NYCRR Part 375 and that this Site Management Plan was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the DER Technical Guidance for Site Investigation and Remediation (DER-10).

 P.E.

12/07/2020 DATE



**RAD I SITE
QUEENS COUNTY
LONG ISLAND CITY, NEW YORK**

SITE MANAGEMENT PLAN

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List of Acronyms

| | |
|--------|---|
| BCA | Brownfield Cleanup Agreement |
| BCP | Brownfield Cleanup Program |
| CAMP | Community Air Monitoring Plan |
| CFR | Code of Federal Regulation |
| COC | Certificate of Completion |
| DER | Division of Environmental Remediation |
| DOT | Department of Transportation |
| EC | Engineering Control |
| ECL | Environmental Conservation Law |
| ERM | Environmental Resource Management |
| ESA | Environmental Site Assessment |
| GAC | Granular Activated Carbon |
| HASP | Health and Safety Plan |
| HMI | Human Machine Interface |
| IC | Institutional Control |
| IRM | Interim Remedial Measure |
| LNAPL | Light Non-Aqueous Phase Liquid |
| LRGTB | LNAPL Recovery and Groundwater Treatment Building |
| NYSDEC | New York State Department of Environmental Conservation |
| NYSDOH | New York State Department of Health |
| NYCRR | New York Codes, Rules and Regulations |
| O&M | Operation and Maintenance |
| OM&M | Operation, Maintenance and Monitoring |
| OSHA | Occupational Safety and Health Administration |
| OWS | Oil/Water Separator |
| PAH | Polycyclic Aromatic Hydrocarbons |
| PCB | Polychlorinated Biphenyls |
| PRR | Periodic Review Report |
| QAPP | Quality Assurance Project Plan |
| RAD I | Review Avenue Development I Property |
| RAD II | Review Avenue Development II Property |
| RAO | Remedial Action Objective |
| RAWP | Remedial Action Work Plan |
| RI/FS | Remedial Investigation/Feasibility Study |
| RIR | Remedial Investigation Report |
| ROD | Record of Decision |
| ROW | Right of Way |
| RP | Remedial Party |
| RSO | Remedial System Optimization |
| SMP | Site Management Plan |
| SVE | Soil Vapor Extraction |
| TF | Total Fluids |
| TOGS | Technical and Operational Guidance Series |
| USEPA | United States Environmental Protection Agency |
| UST | Underground Storage Tank |
| VER | Vacuum Enhanced Recovery |

ES EXECUTIVE SUMMARY

The following provides a brief summary of the controls implemented for the Site, as well as the inspections, monitoring, maintenance and reporting activities required by this Site Management Plan:

The below table should reflect the site-specific items listed in Sections 3, 4 and 5.

Site Identification: RAD I - BCP # C241089, Long Island City, Queens, NY

| | |
|-------------------------|--|
| Institutional Controls: | The property may be used for commercial use; |
| | <ul style="list-style-type: none"> • The RAD I Site may only be used for restricted use. • All ECs must be operated and maintained as specified in this SMP. All ECs must be inspected at a frequency and in a manner defined in this SMP. • The use of groundwater underlying the property is prohibited without necessary water quality treatment as determined by the NYSDOH or the Queens County Department of Health to render it safe for use as drinking water or for industrial purposes, and the user must first notify and obtain written approval to do so from the NYSDEC. Groundwater monitoring must be performed as defined in this SMP; • Data and information pertinent to site management must be reported at the frequency and in a manner as defined in this SMP; • All future activities that will disturb remaining contaminated material must be conducted in accordance with this SMP; • Monitoring to assess the performance and effectiveness of the remedy must be performed as defined in this SMP; • Operation, maintenance, monitoring, inspection, and reporting of any mechanical or physical component of the remedy shall be performed as defined in this SMP; • Access to the RAD I Site must be provided to agents, employees or other representatives of the State of New York with reasonable prior notice to the property owner to assure compliance with the restrictions identified by the Environmental Easement. • The potential for vapor intrusion must be evaluated for any buildings developed in the area within the IC boundaries noted on Figure 2, and any potential impacts that are identified must be monitored or mitigated. |
| | All ECs must be inspected at a frequency and in a manner defined in the SMP. |

Site Identification:

RAD I - BCP # C241089, Long Island City, Queens, NY

| | |
|---|---|
| Engineering Controls: | Cover system – 6-inch asphalt paving system |
| | LNAPL Recovery and Treatment System <ul style="list-style-type: none"> • Two 6,000-gallon LNAPL Storage Tanks • Two 8’ X 40’ Equipment Enclosures • 38 Skimmer well pumps and piping • 30 VER Well pumps, SVE blower air treatment and piping, liquid treatment equipment and discharge piping. |
| Inspections: | Frequency |
| Cover inspection | Annually |
| Treatment System and Equipment Inspections per OM&M Manual | Monthly, Quarterly and Semi-Annual Per OM&M Manual |
| Monitoring: | |
| Presence and Absence of LNAPL in Wells Identified on Table 3 of SMP for RAD I | Monthly, Quarterly and Semi-Annual as indicated on Table 3 of SMP for RAD I |
| Maintenance: | |
| Equipment maintenance per Table of SMP | Per Table 4 of SMP |
| Reporting: | |
| LNAPL Monitoring | Per Table 3 of SMP |
| Treated Water Discharge Sampling and Reporting | Quarterly |
| Periodic Review Report | Annually |

Further descriptions of the above requirements are provided in detail in the latter sections of this Site Management Plan.

1.0 INTRODUCTION

1.1 General

A Site Management Plan (SMP) is a required element of the remedial program for the properties located at 37-30 and 37-80 Review Avenue Long Island City, New York. These properties are in the New York State (NYS) Brownfield Cleanup Program (BCP) and identified as Review Avenue Development Site I (RAD I) Brownfield Cleanup Agreement (BCA) #C241089 and Review Avenue Development Site II (RAD II) #C241005, which is administered by New York State Department of Environmental Conservation (NYSDEC). This SMP is for the RAD I Site, which is located at 37-30 Review Avenue, a separate SMP was prepared for the RAD II Site and covers the applicable portions of the remedy put in place for RAD II. Figure 1 presents the location of both the RAD I and RAD II Sites.

DMJ Associates, LLC, 37-80 Review Railroad, LLC and Cresswood Environmental Consultants, LLC (collectively referred to as the Volunteer) entered into a Brownfield Cleanup Agreement (BCA) dated June 6, 2005 with the NYSDEC to participate in the Brownfield's Cleanup Program for the RAD I Site. A figure showing the RAD I Site's layout and boundaries is provided in Figure 2. The boundaries of the RAD I Site are more fully described in the metes and bounds site description, which is part of the Environmental Easement provided in Appendix D.

In 2020, a Substitution Amendment was filed due to the transfer of the Site to Review Holdings LLC and Review Properties, LLC. The amendment was approved by NYSDEC on October 28, 2020, whereby Review Holdings LLC and Review Properties, LLC were substituted as Volunteers for DMJ Associates, LLC, Review Railroad, LLC and Cresswood Environmental, LLC.

After completion of the remedial work, some contamination was left at the RAD I Site, which is hereafter referred to as "remaining contamination". Institutional and Engineering Controls (ICs and ECs) have been incorporated into the Site's remedy. The ICs and ECs will control exposure to remaining contamination and ensure protection of public health and the environment. An Environmental Easement granted to the NYSDEC, and recorded with the Queens County, County Clerk, requires compliance with this SMP and all ECs and ICs placed on the Site.

This SMP was prepared to manage remaining contamination at the RAD I Site until the Environmental Easement is extinguished in accordance with ECL Article 71, Title 36. This plan has been approved by the NYSDEC, and compliance with this plan is required by the grantor of the Environmental Easement and the grantor's successors and assigns. This SMP may only be revised with the approval of the NYSDEC.

It is important to note that:

- This SMP details the site-specific implementation procedures that are required by the Environmental Easement. Failure to properly implement the SMP is a violation of the

Environmental Easement, which is grounds for revocation of the Certificate of Completion (COC);

- Failure to comply with this SMP is also a violation of Environmental Conservation Law, 6NYCRR Part 375 and the BCA, Index #W2-1076-05-09; RAD I Site Number C241089 and thereby subject to applicable penalties.

All reports associated with the RAD I Site can be viewed by contacting the NYSDEC or its successor agency managing environmental issues in New York State. A list of contacts for persons involved with the site is provided in Appendix A of this SMP. This list has been updated to be consistent with the Substitution Amendment.

This SMP was prepared by MACTEC Engineering and Consulting, P.C. (MACTEC) and Wood Environment & Infrastructure Solutions, Inc. (Wood), on behalf of Cresswood Environmental Consultants, LLC and Review Ave. System, LLC, in accordance with the requirements of the NYSDEC's DER-10 ("Technical Guidance for Site Investigation and Remediation"), dated February 2013, and the guidelines provided by the NYSDEC. This SMP addresses the means for implementing the ICs and ECs that are required by the Environmental Easement for the RAD I Site.

1.2 Revisions

Revisions to this plan will be proposed in writing to the NYSDEC's project manager. Revisions will be necessary upon, but not limited to, the following occurring: a change in media monitoring requirements, upgrades to or shut-down of a remedial system, post-remedial removal of contaminated sediment or soil, or other significant change to the RAD I Site conditions. In accordance with the Environmental Easement for the RAD I Site, the NYSDEC will provide a notice of any approved changes to the SMP and append these notices to the SMP that is retained in its files.

1.3 Notifications

Notifications will be submitted by the property owner to the NYSDEC, as needed, in accordance with NYSDEC's DER-10 for the following reasons:

- 60-day advance notice of any proposed changes in the RAD I Site's use that are required under the terms of the BCA, 6NYCRR Part 375, and/or Environmental Conservation Law.
- 7-day advance notice of any field activity associated with the remedial program.
- 15-day advance notice of any proposed ground-intrusive activity pursuant to the Excavation Work Plan.

- Notice within 48-hours of any damage or defect to the foundation, structures or ECs that reduces or has the potential to reduce the effectiveness of an EC, and likewise, any action to be taken to mitigate the damage or defect.
- Verbal notice by noon of the following day of any emergency, such as a fire; flood; or earthquake that reduces or has the potential to reduce the effectiveness of ECs in place at the RAD I Site, with written confirmation within 7 days that includes a summary of actions taken, or to be taken, and the potential impact to the environment and the public.
- Follow-up status reports on actions taken to respond to any emergency event requiring ongoing responsive action submitted to the NYSDEC, within 45 days of the emergency event, describing and documenting actions taken to restore the effectiveness of the EC.

Any change in the ownership of the RAD I Site or the responsibility for implementing this SMP will include the following notifications:

- At least 60 days prior to the change, the NYSDEC will be notified in writing of the proposed change. This will include a certification that the prospective purchaser/Remedial Party has been provided with a copy of the SMP and all approved work plans and reports.
- Within 15 days prior to the transfer of all or part of the RAD I Site, the new owner’s name, contact representative, and contact information will be confirmed in writing to the NYSDEC.

Table 1 below includes contact information for the above notification. The information on this table will be updated as necessary to provide accurate contact information. A full listing of site-related contact information is provided in Appendix A.

Table 1: Notifications*

| Name | Contact Information |
|-----------------------------------|---|
| Sarah Quandt, Program Manager | 518-402-9116 sarah.quandt@dec.ny.gov |
| Kyle Forster, Remediation Manager | 518-402-8644 kyle.forster@dec.ny.gov |

* Note: Notifications are subject to change and will be updated as necessary.

2.0 SUMMARY OF PREVIOUS INVESTIGATIONS AND REMEDIAL ACTIONS

The RAD I Site and the RAD II Site are adjacent to each other and have the same physical setting. The sites have been investigated and remediated, at times concurrently, since the early 1980s, but were entered into separate BCA and assigned different BCP numbers. The remedy selected by the NYSDEC for the RAD I Site is in the Record of Decision (ROD) issued by the NYSDEC in February 2007. A Decision Document was issued by the NYSDEC for the RAD I Site in December 2015. However, the remedy selected by the NYSDEC for the RAD II Site will, for the most part, be implemented on the RAD I Site because of their adjacent location and their history of investigation and remediation. Much of the information presented in the following sections is shared by both sites because of their adjacent location and their history of investigation and remediation.

2.1 Site Location and Description

The RAD I Site is approximately 2.7 acres in size and located in a highly industrialized part of Long Island City, County of Queens, New York. Figure 1 presents a site location map. Zoning in this area is designated as heavy manufacturing. The RAD I Site has one five-story building, (Building No.2) and one three-story building, (Building No. 1). The majority of the RAD I Site is paved. Figure 2 presents a site layout map for the RAD I Site.

The RAD I Site is identified as Block 312 and Lot 41 on the Long Island City Tax Map and includes Preston Street that borders the RAD II property and runs from Review Avenue to the Long Island Railroad. The address of the RAD I Site is 37 – 30 Review Avenue.

The RAD I Site is bounded by Review Avenue to the northeast, the Southern Line of the Long Island Railroad to the southwest, and the RAD II Site to the southeast (see Figure 2). To the northeast of Review Avenue is the Calvary Cemetery and to the southwest of the Long Island Railroad is the South Capasso property and the Former Peerless Oil property. The boundaries of the RAD I Site are more fully described in Appendix D.

2.2 Physical Setting

2.2.1 Land Use

The RAD I Site was previously used for commercial and industrial purposes since the late 19th century. More recently, a portion of the RAD I Site has been used for commercial vehicle and equipment maintenance. Four underground storage tanks (USTs), a concrete trench, and a sump were removed in May 2006. Currently, RAD I is paved and contains two buildings (Building 1 and Building 2). Toll Booth Maintenance Services Inc. manages various tenants on the RAD I property. This includes both buildings and the parking lots. Building #2 is three stories primarily used for office space on the street level and second floors. The basement level (which is below grade along Review Avenue but at ground level in the back of the property) is primarily used for warehouse and maintenance services. Building #1 is primarily used for garage/storage and warehousing.

2.2.2 Geology

The surficial geology of western Long Island is characterized by Pleistocene deposits of glacial origin and a thin mantle of Holocene soil. The stratigraphy of the RAD I Site and the adjacent properties, consists of urban fill overlying glacial deposits, which in turn overlies a clay layer that has been identified as the lower Cretaceous Raritan Formation. The urban fill generally consists of heterogeneous soil ranging from sub angular, loose and compact, silty, fine sand and gravel. Intermixed with the urban fill are debris such as brick fragments, asphalt, wire, and plastic. Soil borings at SB-05 and GAWG-04 indicate that the urban fill ranges in thickness from 3 feet to 16 feet. The glacial deposits consist of two units distinguishable in color, but not in hydraulic characteristics. The upper section of the glacial deposits is gray to dark gray, fine to coarse sand and fine to coarse gravel. There are local horizontal units of silt interbedded in the upper section of the glacial deposit. The upper section extends to approximately 30 feet below MSL.

The lower section of the glacial deposits is comprised of yellowish-brown, fine to coarse sand and gravel. This unit extends to 71 to 85 feet below mean sea level (MSL). Underlying the coarse sand and gravel is a clay unit referred to as the Lower Clay Unit. The Lower Clay Unit was identified as the Raritan Clay. The Raritan Clay or Lower Clay Unit has been described as a dark gray, finely laminated to thin bedded silty clay, silt and clay layer, and white to light gray clay. The clay unit appears to be laterally continuous beneath the Site and adjacent surrounding area. Geologic/Hydrogeologic cross sections are presented in Figures 7 through 9 (Golder, 2005a) in Appendix K.

2.2.3 Hydrogeology

The RAD I Site is located between a local topographic high to the northeast and Newtown Creek, which is a tidally influenced regional groundwater discharge area. Monitoring wells screened in the upper section of the glacial deposits (where LNAPL occurs) and monitoring wells screened in the lower section of the glacial deposits (and cased off from the upper section) have been installed on the RAD I Site and offsite (including the RAD II Site). The location of the wells is depicted on Figure 2. Historically, the depth to groundwater beneath the RAD I Site has ranged from approximately 15 ft bgs to 20 ft bgs. Groundwater contour maps prepared from the groundwater levels measured in groundwater wells installed in the upper and lower sections of the glacial deposits have indicated a general groundwater flow direction to the south - southwest towards Newtown Creek. A localized groundwater mound, presumably a result of the discontinuous silt and clay layers in the upper section of the glacial deposits has also been observed beneath the southwest of the Site, between the LIRR tracks and Newtown Creek. The mounding does not appear to influence the direction of groundwater flow. Groundwater fluctuations of approximately 0.05 to 0.1 feet have been observed beneath the Site as a result of tidal influence in Newtown Creek. Overall, the horizontal hydraulic gradient beneath the Site is flat, at approximately 0.0015. Vertical gradients are minimal and localized. Slug test data indicates a range of hydraulic conductivity values for the glacial deposits above the Lower Clay Unit of 62.5 feet per day (ft/d) to 0.5 ft/d. A viscous light non-aqueous phase liquid (LNAPL) is present on the groundwater table across most of the Site (Golder 2005a). Groundwater elevation measurements collected in Site monitoring wells during the 2004 and 2005 sampling event are

provided in Table 4 (Golder, 2005a) and contour maps are presented in Figures 11 and 12 (Golder, 2005a) in Appendix K. Groundwater monitoring well construction logs are provided in Appendix E.

2.3 Investigation and Remedial History

The following narrative provides a chronology and brief summary of the investigations and remediation conducted at the Site. Some of the activities summarized below were conducted on RAD I and II concurrently. Therefore, some reports (including the RAWP for the site) include discussions for both sites together.

- A Phase I Environmental Site Assessment (ESA) of both the North Capasso (RAD I) and South Capasso properties was conducted by Environmental Resources Management, Inc. (ERM) in December 1989 (ERM, 1990).
- In 2005, Golder submitted a Feasibility Study (FS) to provide additional information on the characteristics and mobility of the LNAPL, as well as the results of a pilot test of a single phase LNAPL removal at two locations, one of the locations was on the RAD I property. The FS also presented the results of human health and environmental exposure assessments that were the basis of the remediation objectives.
- Golder submitted a Remedial Investigation Report (RIR) in 2005 that summarized the results of the Phase I and Phase II remedial investigations conducted by Golder in 2003 and 2004
- A Supplemental RIR was submitted by Golder in 2005 that confirmed the conclusions in the 2005 RIR, e.g. the LNAPL observed beneath the Site has only minimally impacted the groundwater quality downgradient of the Site and will not adversely affect downgradient human or ecological receptors. Golder concluded the LNAPL will not affect receptors because of the low solubility of the compounds composing it and the natural attenuation mechanisms at work on it within the groundwater.
- A BCA was signed for the RAD I Site in 2005.
- An Interim Remedial Measure (IRM) consisting of an underground storage tank UST removal was conducted on site in May 2006. The IRM consisted of excavation and removal of four USTs, a concrete trench and sump. This work was documented by ELM in the Final Report for Underground Storage Tank (UST) and Sump Removal IRM dated January 2007.
- NYSDEC approved the Decision Document for the RAD I Site on December 2, 2015.
- A vapor intrusion (VI) investigation for soil vapor conditions on the RAD I property was conducted to assess the potential for soil vapor intrusion concerns within buildings existing on the RAD I property. Building #1 was (and continues) to be used as open

warehouse and a diesel truck mechanics shop. Building #2 is primarily office space with lower level storage and maintenance. The results of the sub-slab sampling conducted in building #2 indicate the presence of several compounds above guidance thresholds. No further investigations or actions were required at this time based on the use of the building, which includes using chemicals during daily activities.

- A Remedial Action Work Plan (RAWP) was prepared by Golder in accordance with DER-10 Technical Guidance for Site Investigation and Remediation (NYSDEC, 2010) and Subpart 375.3 Brownfield Cleanup Program Regulations (NYSDEC, 2005a) to satisfy the requirements of the ROD for the Site. The RAWP presented the approach to implementing the selected remedy for both the RAD II Site and RAD I Site in the ROD.
- In 2013, AMEC (now Wood) submitted a RAWP Addendum #1, Pre-Design Investigation (PDI) Report for the RAD II Site and RAD I Site to confirm assumptions related to improving soil capping and LNAPL recovery.

Full titles for each of the work plans or reports referenced above are provided in Section 8.0 - References.

2.3.1 Soil

This section describes the original site conditions prior to the remedy, contaminant classes and major compounds or elements identified in soil/fill, and ranges of contaminant concentrations for primary contaminants and comparison. Soil samples collected as part of the Remedial Investigation (RI) investigation were analyzed for VOCs, SVOCs, including polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs) and metals.

Soil sampling results were compared during the RI to the NYSDEC recommended soil objectives outlined in the New York Technical Assistance and Guidance Memorandum (TAGM) 4046 as summarized below.

However, after the ROD in 2007, NYSDEC issued new soil cleanup guidance in 6 NYCRR Part 375-6.8(b) and CP-51 (October 21, 2010), which replaced TAGM 4046. The new soil cleanup guidance does not require changing remedies selected on the basis comparisons with TAGM 4046, except as required by DER-2. DER-2 contains provisions for revising a remedy if compliance with updated/new cleanup objectives would cause a fundamental change to the scope, performance or cost of the remedy as required to protect public health and the environment. For some compounds of concern in the soil at the RAD I Site, the more recent soil cleanup objectives impose quantitative objectives that did not exist in TAGM 4046. For other compounds, the more recent objectives are less stringent or more stringent than TAGM 4046. Despite these changes, the interpreted extent of soil at RAD I exceeding the more recent soil cleanup objectives is not different than the extents presented in Figures 6 through 9 (Golder, 2011) in Appendix K, and summarized below relative to the TAGM 4046 objectives. This SMP has retained reference to TAGM 4046 objectives consistent with the ROD and the selected remedy.

Eleven VOCs were detected in subsurface soil samples above soil objectives values are based on protection of groundwater as shown in Figure 7 (Golder, 2011) in Appendix K. None of these VOCs exceeded guidance values based on the United States Environmental Protection Agency (USEPA) human health based criteria. Five PAHs in surface soil samples and eleven SVOCs in subsurface samples were detected above the soil objectives as presented in Figures 6 and 8 (Golder, 2011) in Appendix K.

Total PCB exceeded the soil objective in one surface sample and one subsurface soil sample. The PCB concentrations do not pose a significant threat to human health or the environment, and do not prohibit commercial use of the Site as allowed by federal PCB regulations provided that institutional controls and a protective cover is utilized.

Seven metals in surface soil samples and thirteen metals in subsurface soil samples exceeded the soil objectives as presented in Figures 6 and 9 (Golder, 2011) in Appendix K.

The exceedances above do not interfere with development plans for the RAD I Site, based on the following rationale for the following reasons:

- The RIR soil objectives are based on restoration of site conditions to background, and not directly based on groundwater or human health protections. As stated in the ROD and Decision Document for RAD I, urban fill is distributed ubiquitously across the RAD I Site and adjacent properties and so the objective of restoration of background is unrealistic.
- The RAD I Site is designated for commercial use, not residential use, and a protective soil cover is included as part of the Site's redevelopment plan. The cover will be protective of human health by restricting direct contact with compounds that exceed the soil objectives. The SMP will identify provisions for the handling and management of the covered soil and will allow subsurface excavations for utility or foundation construction, without exposing construction workers or site occupants to unacceptable levels of compounds of concern.
- Although the concentrations of several compounds of concern in the urban fill/soil were above the soil objectives (based on groundwater protection), the urban fill/soil to groundwater leaching pathway is not expected to pose a significant threat to groundwater due to the presence of LNAPL on the groundwater table and within the vadose zone beneath the Site, and the small impacts to groundwater quality observed at the Site prior to any remediation.

2.3.2 Groundwater

Groundwater samples were collected during the RI and in April 2011 from the groundwater monitoring well GAGW-04D, a background well installed in the lower glacial deposits and located upgradient of the RAD I Site near Calvary Cemetery. These samples were analyzed for VOCs,

SVOCs, PCBs, metals and general chemistry parameters. The results were compared to the (Technical and Operational Guidance Series) TOGS 1.1.1 Groundwater (Class GA) standards for drinking water, and the TOGS 1.1.1 SD standards for saline water.

Groundwater sampling results from August 2004 and April 2011 are summarized in Tables 2A through 2E and Figure 5 (Golder, 2011) in Appendix K. Iron, magnesium, sodium and benzo (a) anthracene were detected in GAGW-04D above the TOGS 1.1.1 Class GA standard. Copper, and hexachlorobenzene were detected above the TOGS 1.1.1 SD standard for saline water in GAGW-04D. Based on these results, groundwater upgradient from the RAD II Site and RAD I Site does not meet drinking water or saline water standards that have been referenced during prior groundwater investigations.

The following summarizes April 2011 groundwater quality compared with the TOGS 1.1.1 GA drinking water standard for reference, and provides a comparison with the 2004 groundwater sampling data:

- A benzo (a) anthracene concentration of 0.031 ppb (above the TOGS 1.1.1 standard of 0.002 ppb) was detected; prior sampling events did not indicate this compound.
- Iron and sodium concentrations were lower than those detected in 2004.
- The concentration of manganese was greater than that detected in 2004.

Detections of the above analytes in background groundwater samples may be local background concentrations. The ROD states that metals detected at the RAD Sites are naturally occurring.

In addition to the above analytes detected in monitoring well GAGW-04D, xylene and MTBE have been detected in upgradient groundwater samples along Review Avenue. The ROD did not attribute MTBE groundwater concentrations at the RAD I Site to the past waste oil recycling activities on the RAD II Site and also stated that MTBE and TCE were detected in groundwater both upgradient and down gradient of the Site.

Because groundwater quality beneath the RAD I Site and RAD II Site has been affected by upgradient sources and background concentrations, and the groundwater at the Site and in the vicinity of the Site will not be used as drinking water, as acknowledged in Section 5.1.2 in the ROD, because it has been affected by upgradient sources. The TOGS 1.1.1 GA standards for drinking water and TOGS 1.1.1 Class SD standards criteria have been a comparison reference for the Site.

In August 2004, as part of the RI of the RAD I Site, and in April 2011, groundwater samples were collected from groundwater monitoring wells GAGW-07 and GAGW-08, which are installed in the lower glacial deposits. The groundwater samples were analyzed for VOC, SVOC, PCB, metals and natural attenuation parameters. No compounds of concern, with the exception of copper and hexachlorobenzene, were detected on RAD I above the applicable TOGS 1.1.1 Class SD standards

during the RI or the April 2011 sampling event. The concentration of copper detected above the TOGS 1.1.1 SD standard at GAGW-08 in April 2011 was lower than the upgradient concentration of copper detected in GAGW-04D. Also, the concentrations of hexachlorobenzene detected at GAGW-07 and GAGW-08 in April 2011 were lower than the upgradient concentration detected in GAGW-04D. The LNAPL beneath the RAD I Site is not a source of copper or hexachlorobenzene.

Two VOCs, and three metals (iron, magnesium and sodium) were detected at concentrations that exceeded the TOGS 1.1.1 Class GA standards for drinking water. Groundwater sampling results from both the RI investigation and the April 2011 groundwater sampling event are summarized in Tables 2A through 2E, and Figure 5.

The analytical results of groundwater samples collected in April 2011 from monitoring wells GAGW-07 and GAGW-08 indicated some improvements in groundwater quality for some constituents since the RI as described below:

- In monitoring well GAGW-08, MTBE was detected at a concentration of 33 µg/L, a decrease from the 240 µg/L of MTBE previously detected in this well in 2004.
- Benzo (a) anthracene was detected in monitoring wells GAGW-07 and GAGW-08 at concentrations of 0.026 µg/L and 0.032 µg/L, respectively. These concentrations exceeded the TOGS 1.1.1 GA standard of 0.002 µg/L. Benzo (a) anthracene was not detected in groundwater samples collected in 2004 and prior sampling did not detect this compound. In April 2011, this compound was also detected in background monitoring well GAGW-04D.
- During the RI and in April 2011, iron was detected at concentrations lower than those detected in 2004.
- Magnesium and sodium were detected at concentrations that exceeded the TOGS 1.1.1 GA standard. The concentrations in 2011 were greater than those detected in 2004. The concentrations of magnesium and sodium also increased in background groundwater monitoring well GAGW-04D.
- TCE was not detected at concentrations that exceeded the TOGS 1.1.1 GA standard in 2011 but had exceeded the standard in samples collected in 2004.

2.3.3 LNAPL

LNAPL samples were collected throughout the RAD I Site and RAD II Site during RI activities, and analyzed for various parameters as summarized in Table 3 (Golder, 2011) in Appendix K. The viscosity and specific volume of the LNAPL differ in different areas of the RAD I and RAD II Sites. Because the remediation systems were designed to address LNAPL across both the RAD I and RAD II sites, the discussion of the LNAPL includes both sites.

Three LNAPL zones of viscosity (Zone 1 through Zone 3) were identified. LNAPL viscosity decreases from Zone 1 to Zone 3 as presented in Figure 10 (Golder, 2011) in Appendix K. The specific volume (the total volume of LNAPL per unit area, both mobile and recoverable and residual, immobile, and unrecoverable) of the LNAPL at each monitoring well was calculated in the RI and FS, Figure 16 (Golder, 2005b) in Appendix K. The specific volume of LNAPL volume was a factor considered during the selection of the LNAPL extraction technology. LNAPL modeling of mobility calculated that at least 25 percent of the total LNAPL volume is residual and unrecoverable using any of the technologies. However, areas with larger specific volumes of LNAPL generally contain larger amounts of recoverable LNAPL, with LNAPL of higher viscosity needing greater effort to recover LNAPL from soil pore spaces.

Concentrations of PCBs above 50 mg/kg were detected in LNAPL samples collected from GAL 01/01R, GAL-02 and GAL-03) within Zone 1. The occurrence of PCBs above 50 mg/kg was conservatively extrapolated to occur in Zone 2 on the RAD I and RAD II within approximately 50 feet of Zone 1. Upon extraction well installation wells were sampled for PCB content. One well had a concentration of greater than 50 mg/L PCBs (54mg/l). This well designated TF-6D will be managed separately from the rest of the system until such time that PCB concentrations are shown to be below 50 mg/l for three consecutive sampling events. Other wells in the vicinity of TF-6D contained LNAPL with less than 50 mg/l but greater than 25 mg/l will be sampled following system start up to ensure PCB concentrations greater than 50 ppm are not present. As discussed wells that contain PCBs that are greater than 50 mg/L, LNAPL will require separate extraction (manually), handling, storage and disposal for treatment. The LNAPL with a PCB concentration less than 50 mg/kg will not require special handling, however wells that had PCB concentrations greater than 25 but less than 50 mg/l will be sampled twice after start –up but during the first year of operation to ensure PCB concentrations remain below 50 mg/l and don't require special handling.

2.3.4 Soil Vapor

In December 2010, baseline soil vapor conditions on the RAD I Site were investigated to assess the potential for soil vapor intrusion within buildings on the RAD I Site. It was concluded from this assessment that concentrations of compounds of concern along the boundary of the RAD I Site were substantially lower than concentrations previously measured on the RAD II Site. They also concluded that elevated concentrations of compounds of concern in soil vapor on the RAD II Site are not migrating to the RAD I Site. Methane was also detected at elevated concentrations in soil vapor samples, but was not detected in indoor air during a screening study, with the exception of methane detected at levels below concern associated with the sewer system in Building No. 2. The conclusion of this investigation indicated that as long as no change in occupancy occurred with on-site buildings, no further investigations were required.

2.4 Remedial Action Objectives

The Remedial Action Objectives (RAOs) for the RAD I Site are the same as those listed in the December 2015 Decision Document. The RAOs are as follows:

2.4.1 Groundwater

RAOs for Public Health Protection

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

RAOs for Environmental Protection

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

2.4.2 Soil

RAOs for Public Health Protection

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

RAOs for Environmental Protection

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

2.4.3 Soil Vapor

RAOs for Public Health Protection

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

Other components, including the preparation of the Environmental Easement and periodic submittals are addressed in this SMP. The remedies selected for the RAD I site are listed below by media:

LNAPL

The remedy for LNAPL beneath the RAD I Site is recovery using single-phase skimmer pumps and Vacuum Enhanced Recovery (VER) methods. A long term monitoring program to monitor the effectiveness of the LNAPL recovery system will be implemented. Table 3 in this SMP provides to schedule for monitoring.

Soil

Since the majority of the RAD I Site is currently paved, installation of a cover on the RAD I Site as a remedy is not needed, although the restoration of any disturbances to the existing asphalt on the RAD I Site will be part of the remedial activities. Refer to the Excavation Work Plan, Appendix B to this Plan for specifics regarding excavation procedures and restoration requirements for existing asphalt pavement.

Groundwater

The remedy for groundwater is the establishment of an institutional control that restricts the use of untreated groundwater beneath the RAD I Site as a source of potable water.

Soil Vapor

The results of soil vapor investigations on the RAD I Site have not identified a threat for migration of soil vapor laterally from the limits of the LNAPL beneath the RAD II Site.

2.5 Remaining Contamination

2.5.1 LNAPL

Most of the contamination associated with the RAD I Site is contained in the LNAPL, which occurs on the groundwater table and the vadose zone throughout much of the RAD I Site. The Decision Document for the RAD I Site, requires that the LNAPL recovery system operate until the remedial action objectives have been achieved or until the Department determines that continued operation is technically impracticable or not feasible. During the operation of the LNAPL recovery system, the performance of the system will be evaluated periodically to determine if the remedial objectives of the system have been achieved or if the system has reached asymptotic conditions (i.e. its practical limits) for sustainable and effective recovery of LNAPL. When LNAPL recovery has been terminated, sorbed LNAPL will remain as residual contamination within the soil of the vadose zone.

2.5.2 Groundwater

As with the urban fill/soil, most of the contamination associated with the RAD I Site is contained in the LNAPL, which occurs on the groundwater table and the vadose zone throughout much of the Site. The Decision Document requires that the LNAPL recovery system operate until the remedial action objectives have been achieved or until it is determined that the continued operation of the LNAPL recovery system is technically infeasible or impracticable. When LNAPL recovery has been terminated, LNAPL will remain on the groundwater table. The remaining LNAPL should not affect groundwater quality. Groundwater sampling has generally indicated the concentrations of LNAPL constituents in groundwater beneath the RAD I Site do not exceed the groundwater quality standards applicable to ambient groundwater. The need for continuing groundwater monitoring after substantial completion of LNAPL recovery will be evaluated during the recovery period. See prior Section 2.3

for the Tables and Figures that summarize the results of the groundwater samples collected beneath the RAD I Site.

2.5.3 Soil Vapor

The results of soil vapor investigations on the RAD I Site have not identified a threat for migration of soil vapor laterally from the limits of the LNAPL.

3.0 INSTITUTIONAL AND ENGINEERING CONTROL PLAN

3.1 General

Since remaining contaminated soil and groundwater exists beneath the RAD I Site, ECs and ICs are required to protect human health and the environment. This Engineering and Institutional Control Plan describes the procedures for the implementation and management of all ECs and ICs at the RAD I Site. The EC and IC Plan is one component of the SMP and is subject to revision by NYSDEC.

This plan provides:

- A description of all ECs and ICs on the RAD I Site;
- The basic implementation and intended role of each EC and IC;
- A description of the key components of the ICs set forth in the Environmental Easement;
- A description of the features to be evaluated during each required inspection and periodic review;
- A description of plans and procedures to be followed for implementation of ECs and ICs, such as the implementation of the Excavation Work Plan for the proper handling of remaining contamination that may be disturbed during maintenance or redevelopment work on the RAD I Site; and
- Any other provisions necessary to identify or establish methods for implementing the ECs and ICs required by the site remedy, as determined by the NYSDEC.

3.2 Institutional Controls

A series of ICs are required by the Decision Document to: (1) implement, maintain and monitor EC systems; (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 Track 4 restricted uses only. Adherence to these ICs on the RAD I Site is required by the Environmental Easement and will be implemented under this SMP. These ICs are as follows:

- The RAD I Site may only be used for restricted use as specified by this SMP;
- All ECs must be operated and maintained as specified in this SMP;
- All ECs must be inspected at a frequency and in a manner defined in this SMP.
- The use of groundwater underlying the property is prohibited without necessary water quality treatment as determined by the NYSDOH or the Queens County Department of

Health to render it safe for use as drinking water or for industrial purposes, and the user must first notify and obtain written approval to do so from the NYSDEC.

- Groundwater monitoring must be performed as defined in this SMP;
- Data and information pertinent to site management must be reported at the frequency and in a manner as defined in this SMP;
- All future activities that will disturb remaining contaminated material must be conducted in accordance with this SMP;
- Monitoring to assess the performance and effectiveness of the remedy must be performed as defined in this SMP;
- Operation, maintenance, monitoring, inspection, and reporting of any mechanical or physical component of the remedy shall be performed as defined in this SMP;
- Access to the RAD I Site must be provided to agents, employees or other representatives of the State of New York with reasonable prior notice to the property owner to assure compliance with the restrictions identified by the Environmental Easement.
- The potential for vapor intrusion must be evaluated for any buildings developed in the area within the IC boundaries noted on Figure 2, and any potential impacts that are identified must be monitored or mitigated.

3.3 Engineering Controls

3.3.1 Soil Cover

The majority of the RAD I Site is paved with asphalt to serve as a soil cover system to prevent exposure to possible near surface remaining contamination in urban fill/soil. Asphalt on the RAD I Site that was disturbed during the installation of the LNAPL recovery system was paved and restored to existing equivalent condition. The Excavation Work Plan, Appendix B to this Plan, 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. Procedures for the inspection and maintenance of this cover are provided in the Monitoring Plan included in Section 4 of this SMP.

3.3.2 LNAPL Recovery System

LNAPL recovery on the RAD I property is being conducted via single-phase skimmer pump and VER subsystems as part of the larger extraction and treatment system located on the RAD II Property. The primary purposes of using the skimmer pump and VER subsystems is to recover LNAPL to the extent practical and support the achievement of the remediation goals of the Site. The use of the VER and the skimmer pump subsystems on the Site is based on the recoverability of the LNAPL, such as LNAPL viscosity and the specific LNAPL volume. The area selected for VER recovery represents

that part of the Site with the highest viscosities and moderate to high volumes of LNAPL. This area may also contain LNAPL with PCB concentrations above 50 mg/kg that require segregation, special handling, and disposal from the LNAPL recovered. Wells that are determined to contain LNAPL with PCBs above 50 mg/kg will be handled on a case by case basis. Generally, the wells will be operated manually and LNAPL will be collected directly from the extraction point into a discrete container. After a determined amount of LNAPL is removed from the well the LNAPL will be resampled to determine if the well can be reconnected to the full system (refer to the OM&M manual for the full procedures).

The area selected for skimmer pump recovery represents those parts of the Site where the LNAPL has low to moderate viscosities and specific LNAPL volumes, and the recovered LNAPL is known to contain PCB concentrations less than 50 mg/kg. VER is installed in a small part of the RAD I Site adjacent to the lower southwestern part of the RAD II Site.

3.3.2.1 VER Recovery System Description

The vacuum enhanced pumping creates a reduced pressure around the VER well and induces a pressure gradient from the relatively higher pressure in the surrounding subsurface to the lower pressure in the well. VER applies a vacuum and air flow rates through subsurface extraction wells to enhance the recovery of LNAPL. Thirty (30) VER wells were installed and associated control systems on RAD I and RAD II. A full system description is contained in the OM&M manual provided in Appendix I.

The use of VER for LNAPL recovery creates a wider radius of influence and allows a larger extraction well spacing (relative to single phase LNAPL recovery wells) in the areas where higher viscosity LNAPL occurs. The spacing of the VER wells is approximately 50 feet, which allows overlapping of the radii of influence (Golder Associates 2011).

Ten (10) VER wells are installed on RAD I and twenty (20) VER wells are installed on the RAD II Site. The well heads are protected with manways that are mounted flush with the ground surface. The wells are constructed to a depth of approximately 28 feet bgs with Schedule 40 V-wire 0.010-slot screen and solid PVC riser pipe. The screens extend from below the LNAPL/groundwater interface to above the LNAPL capillary fringe) about 15 to 20 feet below ground surface (bgs). A 2-foot thick bentonite seal is emplaced above the filter packs and the remainder of the annulus is grouted with a bentonite and cement grout to just below the top of casing.

The VER subsystem extracts a mixture of vapor, groundwater, and LNAPL from 30 wells on the RAD I Site and the RAD II Site properties using a high vacuum blower and total fluids pumping wells. The mixture is conveyed in the same piping to the LNAPL Recovery and Groundwater Treatment Building (LRGTB), which is located in the eastern part of the RAD II. In the treatment building, the piping connects to the VER control system where LNAPL is separated from a mixture of LNAPL and groundwater. The layout and depths of the piping are presented in the record drawings in Appendix I, the OM&M manual.

The groundwater and LNAPL extracted by the VER subsystem are initially treated in an equalization tank to allow agglomeration of the LNAPL followed by treatment with a 25 gallons per minute (gpm) oil/water separator to remove LNAPL from the groundwater. The agglomeration of the LNAPL will improve the removal efficiency of the oil and water separator. A biocide and an emulsification breaker are fed into the equalization tank to improve agglomeration and improve reparability of LNAPL.

Groundwater and LNAPL pumped from RAD I will flow through the LRGTB located on RAD II, and LNAPL will be collected and stored in one of two 6,000-gallon steel aboveground storage tanks located in a secondary containment area outside of the LRGTB on RAD II. One tank is connected to the PCB containing area (<50 ppm or VER System area), the second tank is anticipated to store oil with PCBs at concentrations of less than 1 ppm (the Skimmer area). Tanks will be registered to store LNAPL and are constructed, installed, and tested in conformance with the New York City building codes. Each storage tank is equipped with a level gauge, high and high-high level conditions, vents, and connections for transferring the contents of the tank to a Department of Transportation- (DOT) - approved tanker truck to an approved disposal facility. The level sensors are integrated into the VER and skimmer pump control system to notify the operator of a high or high-high level condition. The high-high level condition will shut down the VER recovery system to prevent an overflow condition.

The groundwater from the oil/water separator is then filtered with bag filters and treated using liquid phase granular activated carbon (GAC) adsorption to remove the VOCs, SVOCs and PCBs from the groundwater. The treated groundwater will be sampled in accordance with the site discharge permit and discharged to the New York City Bowery Bay Publicly owned Treatment Works (POTW). The soil vapor is treated with vapor phase GAC vessels, with the option of potassium permanganate impregnated ionization media treatment, if vinyl chloride is detected during operations above criteria. The process drawing of the VER system is presented in the OM&M manual

To restrict the amount of extracted groundwater and optimize the performance of the system, the VER subsystem will be pulsed. The pulsing will be automatically controlled, with one third of the 30 VER wells (10 wells) in operation every 4 to 6 hours. Pulsing frequency, in addition to readjustment of vacuum applications, within the flexibility of the VER subsystem, are to be made during the operation of the system.

3.3.2.2 Skimmer Pump System Description

Pneumatically driven specific gravity single phase LNAPL skimmer pumps are a well-accepted and conventional technology for recovering intermediate and lower viscosity LNAPL through extraction wells. LNAPL flow into the skimmer pumps is induced by the local gradient between the lowered LNAPL levels in the extraction wells and the higher LNAPL levels in the subsurface adjacent to the wells' screens. The cone of depression created by the skimmer pumps draw LNAPL toward the extraction wells within the radius of influence of the skimmer pump extraction wells. The spacing of the skimmer pump extraction wells is 30 feet, which reflects the LNAPL skimmer pump radius of influence is about 20 to 30 feet that is predicted based on the dynamic effects of multiple skimming wells collecting product in the same vicinity.

The skimmer pump subsystem will recover LNAPL from a total of 38 wells located on the RAD I and RAD II Sites. 23 skimmer pump wells are installed on RAD I and 15 skimmer pump wells are installed on the RAD II Site. The wells are constructed to a depth of approximately 28 feet bgs with Schedule 40 0.010-slot V-wire screen and solid PVC riser pipe. The screens extend from below the LNAPL/groundwater interface to above the LNAPL capillary fringe) about 15 to 20 feet bgs. A two-foot thick bentonite seal is emplaced above the filter pack and the remainder of the annulus is grouted with a bentonite and cement grout to just below the top of casing.

A single line supplies air to the skimmer pumps from a compressor located in the LRGTB. The LNAPL is conveyed from the skimmer pumps in the same product return piping to a second LNAPL aboveground steel storage tank. This tank is also located in the secondary containment area outside of the LNAPL recovery and groundwater treatment building. Like the PCB containing (<50 ppm) LNAPL storage tank, the <1 ppm PCB storage tank is constructed, installed, and tested in conformance with the New York City building codes. This storage tank is equipped with a level gauge, high and high-high level conditions, vents, and connections for transferring the contents of the tank to a DOT-approved tanker truck to an approved disposal or recycling facility. The level sensors are integrated into the VER and skimmer pump control system to notify the operator of a high or high-high level condition. The high-high level condition will shut down the skimmer pump recovery system to prevent an overflow condition.

Procedures for operating and maintaining the LNAPL recovery system are documented in the OM & M Plan (Section 4 of this SMP). Procedures for monitoring the system are included in the Monitoring Plan (Section 3 of this SMP). The Monitoring Plan also addresses severe condition inspections in the event that a severe condition, which may affect controls at the site, occurs. In addition, the OM&M Manual for the complete LNAPL extraction and treatment system is provided as Appendix I to this Plan.

3.3.3 Criteria for Completion of Remediation/Termination of LNAPL Recovery

Construction and operation of the LNAPL recovery and treatment system on the RAD I Site is based on the RAD II Site ROD and Decision Document for RAD I, which requires that the LNAPL recovery system operate until the remedial action objectives have been achieved, or until NYSDEC determines that continued operation is technically impracticable or not feasible. The framework for determining when remedial processes are complete is provided in Section 6.6 of NYSDEC DER-10.

During the operation of the LNAPL recovery system, the performance of the system will be evaluated and adjusted to optimize recovery. Periodically, the performance metrics of the LNAPL recovery system will be evaluated to determine if the remedial objectives of the system have been achieved or if the system has reached asymptotic conditions (i.e. its practical limits) for sustainable and effective recovery of LNAPL. The performance metrics to be tracked are as follows:

- Vacuum pressures and air flow rates in the VER wells
- Pump intake and skimmer depths and adjustments

- Total amount of LNAPL (in gallons) recovered for the skimmer pump systems and for the VER system
- Total of groundwater (gallons) extracted and the rates of extraction
- Recovery ratio of recovered LNAPL to groundwater
- Vapor recovery rates
- Curve analysis of the trend of recovered LNAPL over time
- Trend analysis of recovery ratio of recovered LNAPL to groundwater over time
- Analysis of unit cost per gallon of LNAPL recovered
- Electrical power consumption per gallon of LNAPL recovered
- LNAPL and properties of the LNAPL obtained from monitoring

It is expected that the LNAPL recovery rates measured during the first months of operation of the VER and skimmer pump systems will decrease during the progress of the recovery. The decrease in recovery rate will occur because the most mobile LNAPL will be extracted initially and the less mobile LNAPL will not be extracted as efficiently. An asymptotic extraction rate (the practical limits of the LNAPL recovery system) that will signal the termination of the LNAPL recovery systems may occur after two years, but the actual occurrence of an asymptotic rate of recovery cannot be predicted with any accuracy until the systems have been in operation for some period of time, perhaps several months or a year or more. Therefore, the asymptotic rate will be during LNAPL recovery operation. The asymptotic rate will be the rate at which further operation of the LNAPL recovery system will no longer be considered practical and further operation will be terminated.

3.3.3.1 Soil Cover

The soil cover is a permanent control and the quality and integrity of this cover will be inspected at defined, regular intervals in perpetuity as described in more detail in the OM&M Plan for the Site.

3.3.3.2 Monitored Natural Attenuation

A full monitoring natural attenuation program is not been selected for the Site. However, a long term monitoring is conducted and provided as described in Section 4.0.

4.0 MONITORING AND SAMPLING PLAN

4.1 General

A draft Monitoring Plan was prepared and included in the NYSDEC-approved RAWP (Golder Associates 2011) but has been adjusted herein to reflect variations required for the final constructed remedy. The Monitoring Plan describes the measures for evaluating the overall performance and effectiveness of the LNAPL recovery to reduce or mitigate LNAPL contamination beneath the RAD I Site and RAD II Site, the Sites' cover system, and all affected media identified below. This Monitoring and Sampling Plan for the RAD I Site and RAD II Site may only be revised with the approval of the NYSDEC. Details regarding the sampling procedures, data quality usability objectives, analytical methods, etc. for samples collected as part of site management for the RAD I Site I and RAD II Site are included in the same Quality Assurance Project Plan (QAPP) provided in Appendix F. This Monitoring Plan is incorporated into the RAD I and RAD II Sites' OM&M manual in Appendix I.

This Monitoring and Sampling Plan describes the methods to be used for:

- Sampling and analysis of all appropriate media (e.g., groundwater, LNAPL, treatment system water and vapor influent and effluent, etc.);
- Assessing compliance with applicable NYSDEC standards, criteria and guidance, particularly ambient groundwater standards;
- Assessing achievement of the RAOs.
- Evaluating site information periodically to confirm that the LNAPL recovery system continues to be effective in protecting public health and the environment; and
- Preparing the necessary reports for the various monitoring activities.

To adequately address these issues, this Monitoring and Sampling Plan provides information on:

- Sampling locations, protocol, and frequency;
- Information on all designed monitoring systems (e.g., well logs, process flow diagrams, installation specification drawings, etc.);
- Analytical sampling program requirements;
- Reporting requirements;
- Quality Assurance/Quality Control (QA/QC) requirements;

- Inspection and maintenance requirements for monitoring wells;
- Monitoring well decommissioning procedures; and
- Annual inspection and periodic certification as required by the BCP.

Monthly and semi-annual monitoring of the performance of the LNAPL recovery system and overall reduction in LNAPL contamination on-site will be conducted for the first year of LNAPL recovery. Annual monitoring of the performance of the LNAPL recovery system and overall reduction in LNAPL contamination on-site will be conducted after the first year until termination of LNAPL recovery. The frequency of monitoring or need for continued monitoring after termination of LNAPL recovery will be evaluated from the trends of previously collected LNAPL thickness and recovery data. The monitoring program is summarized in Tables 2, 3, and 4, and outlined in detail in Sections 4.2 and 4.3 below.

Reporting requirements are provided in Section 7.0 of this SMP.

4.2 Site Inspection

Site inspections of the RAD I and RAD II Sites will be performed on a regular schedule. Site inspections will also be performed after all severe weather conditions that may affect the Engineering Controls at the Site. The inspections for the LNAPL recovery system are discussed in the RAD II SMP under separate cover. During these inspections, an inspection form will be completed (see Appendix H, Site Inspection Form). The form will compile sufficient information to assess the following:

- Compliance with all IC, including usage of the RAD I Site and RAD II Site;
- General conditions at the time of the inspection;
- The site management activities being conducted including, where appropriate, a health and safety inspection;
- Compliance with schedules included in the OM&M manual; and
- Confirmation that the RAD I Sites' records are up to date.

A comprehensive site wide inspection will be conducted and documented according to the SMP schedule, regardless of the frequency of the Periodic Review Report. The inspections will determine and document the following:

- Whether the controls continue to be protective of human health and the environment;
- Compliance with requirements of this SMP and the Environmental Easement;

- Achievement of remedial performance criteria; and
- If site records are complete and up to date.

Table 2 outlines the Inspection requirements and frequency.

Table 2: Summary of Inspection Tasks and Schedule

| Inspection Task | Frequency |
|--|------------------|
| Monitoring Wells | Annually |
| LNAPL Recovery System Wells and Piping | Monthly |
| Cover System | Annually |

Reporting requirements are outlined in Section 7.0 of this plan.

Inspections will also be performed in the event of an emergency. If an emergency, such as a natural disaster or an unforeseen failure of any of the ECs occurs that reduces or has the potential to reduce the effectiveness of the ECs at the RAD I Site, verbal notice to the NYSDEC will be given by noon of the following day. In addition, an inspection of the RAD I Site will be conducted within 5 days of the event to verify the effectiveness of the ICs and ECs implemented at the RAD I Sites by a qualified environmental professional or Professional Engineer, as determined by the NYSDEC. Written confirmation will be provided to the NYSDEC within 7 days of the event. The written confirmation will include a summary of actions taken, or to be taken, and the potential impact to the environment and the public.

4.3 Groundwater and LNAPL Monitoring and Sampling

Groundwater and LNAPL monitoring is conducted on a monthly, quarterly, and semi-annual basis, with measuring apparent LNAPL thickness and depth to groundwater. Table 3 provides monitoring well LNAPL and groundwater identification information. Figure 3 shows well locations. Groundwater samples shall be collected on a routine basis. Modification to the frequency or sampling requirements will require approval from the NYSDEC.

Table 3 – Remedial System Well Monitoring Locations and Schedule

| Monitoring Point ID | Location | Schedule | Rationale | Notes |
|---|---------------|----------------------------|----------------------------------|--|
| Baseline LNAPL Monitoring | | | | |
| AML-01, AML-04, GAL-10, GAL-11R, GAL-13, GAL-18R, GAL-21, GAL-22, GAL-23, GAL-24, GAL-32 ₁ and MW-4RR, MW-2 | RAD I | 2 Events prior to Start-Up | Measure apparent LNAPL thickness | AML-01 and AML-04 are new wells |
| AML-03, AML-06, GAL-01RR ₁ , GAL-02R, GAL-03R ₁ , GAL-04R, GAL-05R ₁ , GAL-06, GAL-07, GAL-08, GAL-09, GAL-16R, GAL-29, GAL-30 and GAL-31 | RAD II | 2 Events prior to Start-Up | Measure apparent LNAPL thickness | GAGW-04 is located on Review Avenue |
| VER and Single Phase LNAPL Recovery Wells | RAD I & II | 2 Events prior to Start-Up | Measure apparent LNAPL thickness | |
| Remediation LNAPL Monitoring/Groundwater Monitoring - Year 1 | | | | |
| AML-01, AML-04, GAL-10, GAL-11R, GAL-13, GAL-18R, GAL-21, GAL-22, GAL-23, GAL-24, and MW-4RR, MW-2 | RAD I | Monthly | Measure apparent LNAPL thickness | |
| AML-02, AML-03, AML-06, GAL-01RR ₁ , GAL-02R, GAL-03R ₁ , GAL-04R, GAL-05R ₁ , GAL-06, GAL-07, GAL-08, GAL-09, GAL-16R, GAL-29, GAL-30 and GAL-31, GAGW-04 | RAD II | Monthly | Measure apparent LNAPL thickness | GAGW-04 is located on Review Avenue |
| GAGW-02, GAGW-05R, and GAGW-6I | RAD II | Semi-Annual | Groundwater Monitoring | |
| GAGW-08R, AMGW-10D | RAD I | Semi-Annual | Groundwater Monitoring | AMGW-10D is a new well, required by DEC (approval of RAWP) |
| GAGW-09S, GAGW-09D | South Capasso | Semi-Annual | Groundwater Monitoring | If Accessible |
| GAGW-04D | Review Ave | Semi-Annual | Groundwater Monitoring | |
| Subset (6 wells) of the Single Phase LNAPL Recovery Wells ₂ | RAD I & II | Semi-Annual | Measure apparent LNAPL thickness | |
| Remediation LNAPL Monitoring/Groundwater Monitoring - Year 2 and beyond | | | | |
| AML-01, AML-04, GAL-10, GAL-11R, GAL-13, GAL-18R, GAL-21, GAL-22, GAL-23, GAL-24, and MW-4RR, MW-2 | RAD I | Quarterly | Measure apparent LNAPL thickness | |
| AML-02, AML-03, AML-06, GAL-01RR ₁ , GAL-02R, GAL-03R ₁ , GAL-04R, GAL-05R ₁ , GAL-06, GAL-07, GAL-08, GAL-09, GAL-16R, GAL-29, GAL-30 and GAL-31, GAGW-04 | RAD II | Quarterly | Measure apparent LNAPL thickness | GAGW-04 is located along Review Avenue |
| GAGW-09S, GAGW-09D | South Capasso | Semi-Annual | Groundwater Monitoring | If Accessible |

| Monitoring Point ID | Location | Schedule | Rationale | Notes |
|--|------------|-------------|----------------------------------|-------|
| GAGW-04D | Review Ave | Semi-Annual | Groundwater Monitoring | |
| Subset (6 wells) of the Single Phase LNAPL Recovery Wells ² | RAD I & II | Annual | Measure apparent LNAPL thickness | |

Notes:

¹ monitoring wells designated GAL -#R indicates that the well was installed by Golder Associates (GA), L indicates LNAPL, # is the well number and R means replacement. Wells with an AML-# indicate that it is an LNAPL well installed by AMEC. GAGW-# or AMGW-# indicates a monitoring well installed by Golder Associates (GA) or AMEC (AM). GAGW-04 is the exception to this rule. GAGW-04 was screened through the LNAPL zone and not re-designated.

² Six single phase LNAPL wells will be shut down for one week two times to measure the apparent LNAPL thickness. One week is required to allow for the wells to reach equilibrium.

Detailed sample collection and analytical procedures and protocols are provided in the RAD I and RAD II Sites' QAPP in Appendix F.

4.4 Post-Remediation Media Monitoring and Sampling

The need for continuing groundwater monitoring after termination of area-wide LNAPL recovery, and any sampling proposed thereafter, will be addressed in the proposal to terminate area-wide LNAPL recovery based on previously collected data. Sampling locations, required analytical parameters and schedule to assess the performance of the LNAPL recovery will be submitted to the NYSDEC for approval. Modification to the frequency or sampling requirements will require approval from the NYSDEC. This SMP will be modified to reflect changes in sampling plans approved by the NYSDEC. Deliverables for the post remediation groundwater monitoring program are specified in Section 7.0 – Reporting Requirements.

On-site and/or off-site monitoring wells selected for post remediation monitoring will be physically agitated/surged and redeveloped if biofouling or silt accumulation occurs. Additionally, monitoring wells will be properly decommissioned and replaced if an event renders the wells unusable. Repairs and/or replacement of wells in the monitoring well network will be performed based on assessments of structural integrity and overall performance.

The NYSDEC will be notified prior to any repair or decommissioning of any monitoring well for the purpose of replacement, and the repair or decommissioning and replacement process will be documented in the subsequent Periodic Review Report. Well decommissioning without replacement will be done only with the prior approval of the NYSDEC. Well abandonment will be performed in accordance with NYSDEC's guidance entitled "CP-43: Groundwater Monitoring Well Decommissioning Procedures." Monitoring wells that are decommissioned because they have been rendered unusable will be replaced in kind in the nearest available location, unless otherwise approved by the NYSDEC.

All post remediation groundwater sampling activities will be recorded in a field book and associated sampling log as provided in Appendix H - Site Management Forms. Other observations (e.g., groundwater monitoring well integrity, etc.) will be noted on the sampling log. The sampling log will

serve as the inspection form for the monitoring network. Additional detail regarding monitoring and sampling protocols are provided in the in the QAPP in Appendix F of this document.

Monitoring well construction logs are included in Appendix E of this document.

The sampling frequency may only be modified with the approval of the NYSDEC. This SMP will be modified to reflect changes in sampling plans approved by the NYSDEC.

Deliverables for the groundwater monitoring program are specified in Section 7.0 – Reporting Requirements.

5.0 OPERATION, MAINTENANCE, AND MONITORING PLAN

5.1 General

This OM&M Plan provides a brief description of the measures necessary to operate, maintain, and monitor the remedy selected for the RAD I. Further detail regarding the OM&M of the LNAPL recovery system is in the OM&M manual provided in Appendix I. A copy of the OM&M manual, along with the complete SMP, is maintained at the Site.

5.2 LNAPL Recovery System Performance Criteria

During the operation of the LNAPL recovery system, the performance of the system will be evaluated and adjusted to optimize recovery. Periodically, the performance metrics of the LNAPL recovery system will be evaluated to determine if the remedial objectives of the system have been achieved or if the system has reached asymptotic conditions (i.e. its practical limits) for sustainable and effective recovery of LNAPL. The performance metrics to be tracked are as follows:

- Casing Vacuum pressures for each VER well (10 RAD I wells)
- Extracted soil vapor flow rates for each VER extraction well zone (2 RAD I zones)
- Total Fluids Pumping Level Settings and adjustments at each VER well
- Current VER Zone pulsing schedule (operational hours per day/week per VER zone)
- LNAPL cumulative recovery volume (gallons) and recovery rate (gallons per day) vs. time and trend analysis from the skimmer well system
- LNAPL cumulative recovery volume (gallons) recovery rate (gallons per day) vs. time and trend analysis from the VER well system
- Cumulative extracted groundwater volume (gallons) and the rates of extraction
- Recovery ratio of recovered LNAPL to groundwater vs. time and trend analysis
- Cumulative extracted soil vapor and average flow rate
- Electrical power demand versus time
- Cumulative Electrical power consumption
- Electrical power consumption per gallon of LNAPL recovered
- Depth to Product, LNAPL thickness and viscosity obtained from monitoring wells and Product Storage Tanks.

- Product Disposal/Recycling hauler bill of lading/manifests and cumulative disposal/recycling volume tracking

It is expected that the LNAPL recovery rates measured during the first months of operation of the VER and skimmer pump systems will decrease during the progress of the recovery. The decrease in recovery rate will occur because the nearest and most mobile LNAPL will be extracted initially and the furthest less mobile LNAPL will not be extracted as efficiently. An asymptotic extraction rate (the practical limits of the LNAPL recovery system) will signal the termination of the current LNAPL recovery system mode of operation and ultimate usefulness after exhausting all practical modes of operation. The actual occurrence of an asymptotic rate of recovery cannot be predicted with any accuracy until the systems have been in operation for some period of time, perhaps several months or a year or more. The asymptotic rate will be the rate at which further operation of the LNAPL recovery system (while configured in its most aggressive mode of operation) will no longer be considered practical and further operation will be terminated.

All discharge permits or permit equivalencies are included as Appendix J.

5.3 Operation and Maintenance of LNAPL Recovery

The following sections provide a description of the operations and maintenance of the LNAPL recovery system. Cut-sheets and as-built drawings for the LNAPL recovery system are provided in the OM&M manual in Appendix I.

5.3.1 System Start-Up Phasing Plan

- **VER Wells** - The 30 VER recovery wells (10 on Rad I) will be operated in multiple modes of operation in order to maximize product recovery, minimize energy consumption and to avoid exceeding the limitations of the oil/water separation and groundwater treatment processes. The modes of operation are summarized as follows:
 - **Skimmer Mode** – skimmer pumps will be initially operated in the VER wells until initial product thicknesses in recovery wells have been reduced from multiple feet to ≤ 1 ft and/or LNAPL production rate (gallons per day or week) has diminished by $\geq 75\%$.
 - **Hydraulic Enhancement mode** – Pneumatic Total Fluids (TF) pumps will be installed in the VER wells and set at a pumping level configured for approximately 6” to 12” of piezometric draw-down (or as required to keep total extracted groundwater production ≤ 25 gpm). This mode of operation will continue until product thicknesses in recovery wells have been reduced from multiple feet to < 1 ft and/or LNAPL production rate (gallons per day or week) has diminished by $\geq 75\%$. As compared to the prior mode of operation.
 - **Vacuum and Hydraulic Enhancement (VER) mode** – While operating the TF pumps, the vacuum blower will also be operated to achieve approximately 1-inch Hg casing vacuum at each of the VER wells. Upon further significant

diminishment of product thicknesses and LNAPL production rate, additional operational variables can be adjusted, including zone pulsing schedules, piezometric draw down and applied casing vacuum levels as required to maximize LNAPL production rates and minimize energy consumption and operational costs per gallon of LNAPL recovered. Operation will continue until such time that maximum extent practical recovery goals can be achieved as outlined in the approved RAWP.

- **Skimmer Wells** - Product will be recovered from the 38 Skimmer Wells (23 on RAD I) using pneumatically operated skimmer pumps complete with specific gravity skimmer intakes and cycle timers that will control the pumping rate of each skimmer pump. The operator will adjust the pumping rate of each skimmer pump over time to avoid significantly exceeding the LNAPL recovery yield from each of the skimmer wells. By doing this, the rate of LNAPL recovery will be maximized while avoiding unnecessary pump wear and wasting compressed air and energy.

5.3.2 System Start-Up and Testing

Procedure

1. Verify that flow paths are clear (e.g. TF lines from VER wells to the Oil/Water Separator (OWS); OWS to final treatment and sewer connection (water) and Product Storage Tank (product); SVE lines VER Wells to Vacuum Blower; Vacuum Blower to vapor phase treatment and discharge stack;
2. Verify that there is water in the Pre-Separation Tank and OWS to proper level – if not, fill with clean water from on-site or offsite source and bring to required level.
3. Verify Chemical Feed Pumps operational in hand mode and chemical supply adequate – correct as required.
4. Verify no alarm conditions present – if present, resolve alarm condition, clear and
5. Activate compressed air supply to skimmer pumps (AUTO Position on HMI) and verify product flow to Tank via flow meter, (T1). Verify via site glass or sample tap to confirm if only product flowing without water. If no flow or water present, check skimmer pumps, identify problem (mechanical issue or incorrect pump setting) and correct as required.
6. Activate compressed air supply (Auto Position on Human Machine Interface (HMI) to active VER well zone or zones and verify flow to pre-separation tank. Verify via inflow to pre-separation tank if oil/water flow obtained or water only. If no flow or only water flowing check TF pumps in active zone(s), identify problem (mechanical issue or incorrect pump setting) and correct as required.
7. Verify that the effluent transfer pump turns on and off at the appropriate action levels. Collect data readings to ensure that all valves are in their proper position and that iron has not clogged any components of the system.

The system testing described above will be conducted if, in the course of the LNAPL recovery system lifetime, it goes down or significant changes are made to the system and the system must be restarted.

5.3.3 Routine & Non-Routine System Operation and Maintenance

A summary of routine LNAPL recovery system OM&M is presented below in Table 4. A complete list of components to be inspected is provided in the Inspection Checklist, provided in Appendix H - Site Management Forms. If any equipment readings are not within their specified operation range, any equipment is observed to be malfunctioning or the system is not performing within specifications; maintenance and repair, in accordance with the OM&M manual, is required immediately.

Table 4: Summary of Routine LNAPL Recovery System OM&M

| Inspection, Maintenance, or Reporting Item | As-Needed | Each Visit | Bi-Weekly | Monthly | Quarterly | Semiannual | Annual |
|--|-----------|------------|-----------|---------|-----------|------------|--------|
| Site Inspection | | X | | | | | X |
| Collect Totalizer Information, Hour Meters, Operating Data, Tank Levels | | X | | | | | |
| Fill out Daily Log Book | | X | | | | | |
| Change Bag Filters, Clean Strainers | | X | | | | | |
| Inspect Air Compressor and Drain Valve, Transfer Pumps, OWS, Extraction Manifolds for flow, leaks and operation sounds | | X | | | | | |
| Clean Flow Meters, Totalizers | | | | X | | | |
| Backwash LGAC Filters | | X | | | | | |
| Clean Pre-separation Tank and OWS | | | | | X | | |
| Collect Compliance Permit Samples | | | | | X | | |
| Inspect Tanks and Piping Integrity | | | | X | | | |
| Check Chemical Metering Pump | | X | | | | | |
| Inspect Flush Mount Vaults (VER, Skimmer, and Mechanical) | | | | | X | | |
| Pull, Inspect and Clean TF Pumps | X | | | | | | |
| Pull, Inspect and Clean Skimmer Pumps | X | | | | | | |
| Critical Safety Device Check, Maintenance & Motor Lubrication | | | | | | X | |
| Change KO Tank Inlet Particulate Filter | | | | | | X | |
| Product Storage Tank Overfill Prevention System Test | X | | | | | X | |

| Inspection, Maintenance, or Reporting Item | As-Needed | Each Visit | Bi-Weekly | Monthly | Quarterly | Semiannual | Annual |
|---|-----------|------------|-----------|---------|-----------|------------|--------|
| Check Operation of Emergency Lighting, Exit Signs, Fire Extinguishers, Eyewash, Roof, Siding, Doors, Insulation, Heat Trace | | | | | | X | |

5.3.4 System Monitoring Devices and Alarms

The LNAPL recovery system has local and remote alarm indication devices to indicate that the system is not operating properly. When an operator is present at the site, alarm conditions are viewed on an HMI Screen located in the control room of Equipment Enclosure (TE1). Visual and audible alarms are also activated during alarm conditions to gain the operator’s attention. When the system is unmanned, alarms notifications are transmitted to the operator, O&M Manager and other authorized stakeholders via text messages and emails sent by the cellular remote access system via internet connection. In addition, the operator, OM&M Manager and other stakeholders can view the HMI graphical interface screens from a remote computer, smart phone or tablet via internet connection. In the event an alarm condition is activated which indicates a system problem requiring physical repair or other on-site attention, applicable maintenance and repairs will be conducted, as specified in the OM&M manual, and the LNAPL recovery system will be restarted. Operational problems will be noted in the Periodic Review Report (PRR) to be prepared for that reporting period. Depending on the severity of the alarm condition, designated operational personnel (Operator and OM&M Manager) can also initiate control commands and alarm re-set procedures remotely via computer, smart phone or tablet. Operational data can also be downloaded from the remotely via the cellular access system for use in analyzing system performance and remedial effectiveness in a streamlined and efficient manner.

6.0 PERIODIC ASSESSMENTS/EVALUATIONS

6.1 Climate Change Vulnerability Assessment

Increases in both the severity and frequency of storms/weather events, an increase in sea level elevations along with accompanying flooding impacts, shifting precipitation patterns and wide temperature fluctuation, resulting from global climactic change and instability, have the potential to significantly impact the performance, effectiveness and protectiveness of a given site and associated remedial systems. Vulnerability assessments provide information so that the site and associated remedial systems are prepared for the impacts of the increasing frequency and intensity of severe storms/weather events and associated flooding.

This section provides a summary of vulnerability assessments that will be conducted for the site during periodic assessments, and briefly summarizes the vulnerability of the site and/or engineering controls to severe storms/weather events and associated flooding.

- Flood Plain: Portions of the RAD I and RAD II Sites are located in a 100-year flood plain.
- Site Drainage and Storm Water Management: Surface ponding can occur along the railroad Right of Way (ROW) adjacent to the southern edge of the RAD I and RAD II Sites, however drainage structures at the Sites have served adequately, and do not dramatically affect the usability of the Sites.
- Electricity: Electric to the RAD I and RAD II Sites is provided by Con Edison, electric service to this area is reliable and not susceptible to outages.
- Spill/Contaminant Release: LNAPL will be stored at the RAD I and RAD II Sites. LNAPL will be stored in accordance with all applicable federal, state and local regulations.

6.2 Green Remediation Evaluation

NYSDEC's DER-31 Green Remediation requires that green remediation concepts and techniques be considered during all stages of the remedial program, including site management, with the goal of improving the sustainability of the cleanup and summarizing the net environmental benefit of any implemented green technology. This section of the SMP provides a summary of any green remediation evaluations to be completed for the site during site management, and as reported in the PRR.

- Items relating to green remediation strategies that have been considered in the remediation strategy for the site include: Energy usage (electrical usage for operation of remedial systems, site lighting, security systems, etc.), has been significantly reduced (by over 70%)

from what was originally proposed, allowing for more efficient collection of LNAPL. Anticipated electrical cost savings are estimated to be approximately \$250,000/year.

Methods proposed to reduce energy consumption, resource usage, waste generation, water usage, etc. should be included in the PRR.

6.2.1 Timing of Green Remediation Evaluations

For major remedial system components, green remediation evaluations and corresponding modifications will be undertaken as part of a formal Remedial System Optimization (RSO), or at any time that the Project Manager feels appropriate, e.g. during significant maintenance events or in conjunction with storm recovery activities.

Modifications resulting from green remediation evaluations will be routinely implemented and scheduled to occur during planned/routine operation and maintenance activities. Reporting of these modifications will be presented in the PRR.

6.2.2 Remedial Systems

The LNAPL recovery system will be operated to conserve energy, materials and other resources to the greatest extent possible while maintaining remedial effectiveness and process safety. Consideration will be given to operating rates and use of reagents and other consumables. Spent materials will be sent for recycling, as appropriate.

The components of the LNAPL recovery system to be evaluated include, but are not limited to the following:

- ***Process Equipment Loads/Energy Efficiency*** - energy consumption per unit LNAPL recovered (KWh/gal LNAPL recovered) will be continuously data logged and monitored. Periodic (monthly/quarterly) system adjustments will be made to the process treatment equipment and to the extraction well systems (pumps/SVE, etc.) in order to fine tune and continually improve both remedial effectiveness and the KWh/gal LNAPL ratio.
- ***VER wells/Total Fluids*** - (vacuum levels, pumping levels, flow rates, zone pulsing schedule, pump cleaning schedules) to maximize product removal, efficient use of compressed air;
- ***Skimmer pumps*** - (setting, operating rates, pulsing, cleaning schedules) to ensure removal of only LNAPL, maximum product removal, efficient use of compressed air;
- ***GAC treatment*** - of extracted groundwater and separated soil gas VOC vapors. Monitoring and change-out strategy to achieve efficient use of GAC. Spent GAC will be properly disposed or regenerated; and,
- ***LNAPL collection and disposal or recycling*** - Minimize water content in recovered product to achieve the highest level of recyclability.

6.2.3 Building Operations

If modifications to usage or occupancy occur, further VI evaluations will need to be performed to ensure remain effective at protecting Human health. However, since none of the remedial components are part of building operations, analysis of building operations is beyond the scope of this SMP.

6.2.4 Metrics and Reporting

As discussed in Section 7.0 and as presented in Appendix H – Site Management Forms, information on energy usage, solid waste generation, transportation and shipping, and water usage will be recorded to facilitate and document consistent implementation of green remediation during site management and to identify corresponding benefits; a set of metrics has been developed.

6.3 Remedial System Optimization

A Remedial Site Optimization (RSO) study will be conducted any time that the NYSDEC or the remedial party requests in writing that an in-depth evaluation of the LNAPL recovery system is needed. An RSO will be appropriate if any of the following occur:

- The remedial actions have not met or are not expected to meet RAOs in the estimated time frame;
- The management and operation of the LNAPL recovery system is exceeding the estimated costs;
- The LNAPL recovery system is not performing as expected or as designed;
- Previously unidentified LNAPL or other contaminant is suspected;
- Plume shift has potentially occurred;
- Site conditions change due to development, change of use, change in groundwater use, etc.;
- There is an anticipated transfer of the site management to another remedial party or agency; and
- A new and applicable remedial technology becomes available.

An RSO will provide a critique of the Conceptual Site Model, give a summary of past performance, document current cleanup practices, summarize progress made toward the site's cleanup goals, gather additional performance or media specific data and information and provide recommendations for improvements to enhance the ability of the present system to reach RAOs or to provide a basis for changing the remedial strategy.

7.0 REPORTING REQUIREMENTS

7.1 Site Management Reports

All site management inspection, operation, maintenance, monitoring, and sampling activities will be recorded on the appropriate site management forms provided in Appendix H. These forms are subject to NYSDEC revision.

All applicable inspection forms and other records, including media sampling data and system maintenance reports, generated for the site during the reporting period will be provided in electronic format to the NYSDEC in accordance with the requirements of Table 5 and summarized in the PRR.

Table 5 - Schedule of Interim Monitoring/Inspection Reports

| Task/Report | Reporting Frequency* |
|----------------------------------|--|
| Inspection Report | Monthly |
| Treated Water Discharge Sampling | Quarterly |
| Periodic Review Report | Annually, or as otherwise determined by the Department |

* The frequency of events will be conducted as specified until otherwise approved by the NYSDEC.

All interim monitoring/inspections reports will include, at a minimum:

- Date of event or reporting period;
- Name, company, and position of personnel conducting inspection, monitoring, and sampling activities;
- Description of the activities performed;
- Where appropriate, color photographs or sketches showing the approximate location of any problems or incidents noted (included either on the checklist/form or on an attached sheet);
- Type of samples collected (e.g., soil, groundwater, LNAPL, air, soil vapor, etc.);
- Copies of all field forms completed (e.g., well sampling logs, chain-of-custody documentation, etc.);
- Sampling results in comparison to appropriate standards/criteria;
- A figure illustrating sample type and sampling locations;

- Copies of all laboratory data sheets and the laboratory data deliverables required for all points sampled (to be submitted electronically in the NYSDEC-identified format);
- Any observations, conclusions, or recommendations; and
- A determination as to whether contaminant conditions have changed since the last reporting event.

Routine maintenance event reporting forms will include, at a minimum:

- Date of event;
- Name, company, and position of personnel conducting operation and maintenance activities;
- Description of maintenance activities performed;
- Any modifications to the system;
- Where appropriate, color photographs or sketches showing the approximate location of any problems or incidents noted (included either on the checklist/form or on an attached sheet); and,
- Other documentation such as copies of invoices for maintenance work, receipts for replacement equipment, etc., (attached to the checklist/form).

Non-routine maintenance event reporting forms will include, at a minimum:

- Date of event;
- Name, company, and position of personnel conducting non-routine maintenance/repair activities;
- Description of non-routine activities performed;
- Where appropriate, color photographs or sketches showing the approximate location of any problems or incidents (included either on the form or on an attached sheet); and
- Other documentation such as copies of invoices for repair work, receipts for replacement equipment, etc. (attached to the checklist/form).

Data will be reported in digital format as determined by the NYSDEC. Currently, data is to be supplied electronically and submitted to the NYSDEC EQuIS™ database in accordance with the requirements found at this link: <http://www.dec.ny.gov/chemical/62440.html>.

7.2 Periodic Review Report

A Periodic Review Report (PRR) will be submitted to the NYSDEC after eighteen months of operation after the Certificate of Completion is issued. The next PRR shall be submitted annually or, as appropriate, to the NYSDEC or at another frequency as may be required by the NYSDEC. In the event that the site is subdivided into separate parcels with different ownership, a single Periodic Review Report will be prepared that addresses the site described in Appendix D -Environmental Easement. The report will be prepared in accordance with NYSDEC's DER-10 and submitted within 30 days of the end of each certification period. Media sampling results will also be incorporated into the PRR. The PRR will include:

- Identification, assessment and certification of all ECs/ICs required by the remedy for the RAD Sites.
- Results of the required annual site inspections and severe condition inspections, if applicable.
- All applicable site management forms and other records generated for the RAD I and RAD II Sites during the reporting period in the NYSDEC-approved electronic format, if not previously submitted.
- A summary of discharge monitoring data and/or information generated during the reporting period, with comments and conclusions.
- Data summary tables and graphical representations of contaminants of concern by media (groundwater, soil, air, vapor, etc.), which include a listing of all compounds analyzed, along with the applicable standards, with all exceedances highlighted. These will include a presentation of past data as part of an evaluation of contaminant concentration trends.
- Results of all analyses, copies of all laboratory data sheets, and the required laboratory data deliverables for all samples collected during the reporting period will be submitted in digital format as determined by the NYSDEC. Currently, data is supplied electronically and submitted to the NYSDEC EQuISTM database in accordance with the requirements found at this link: <http://www.dec.ny.gov/chemical/62440.html>.
- A site evaluation, which includes the following:
 - The compliance of the remedy with the requirements of the site-specific RAWP or Decision Document;

- The operation and the effectiveness of the LNAPL recovery system and soil cover, including identification of any needed repairs or modifications;
 - Any new conclusions or observations regarding site contamination based on inspections or data generated by the Monitoring and Sampling Plan for the LNAPL being monitored;
 - Recommendations regarding any necessary changes to the remedy and/or Monitoring and Sampling Plan; and
 - Trends in contaminant levels in the LNAPL will be evaluated to determine if the remedy continues to be effective in achieving remedial goals as specified by the Decision Document
 - The overall performance and effectiveness of the remedy.
- A performance summary for the LNAPL recovery system at the RAD I and RAD II Sites during the calendar year, including information such as:
 - The number of days the LNAPL recovery system operated for the reporting period;
 - The average, high, and low flows per day;
 - The contaminant mass removed;
 - A description of breakdowns and repairs, with an explanation for any significant downtime;
 - A description of the resolution of performance problems;
 - Alarm conditions;
 - Trends in equipment failure;
 - A summary of the performance, effluent and/or effectiveness monitoring; and,
 - Comments, conclusions, and recommendations based on data evaluation.

7.2.1 Certification of IC and EC

Following the last inspection of the reporting period, a Professional Engineer licensed to practice in New York State will prepare, and include in the PRR, the following certification as per the requirements of NYSDEC DER-10:

“For each institutional or engineering control identified for the site, I certify that all of the following statements are true:

- *The inspection of the site to confirm the effectiveness of the institutional and engineering controls required by the remedial program was performed under my direction;*
- *The institutional control and/or engineering control employed at this site is unchanged from the date the control was put in place, or last approved by the Department;*
- *Nothing has occurred that would impair the ability of the control to protect the public health and environment;*
- *Nothing has occurred that would constitute a violation or failure to comply with any site management plan for this control;*
- *Access to the site will continue to be provided to the Department to evaluate the remedy, including access to evaluate the continued maintenance of this control;*
- *If a financial assurance mechanism is required under the oversight document for the site, the mechanism remains valid and sufficient for the intended purpose under the document;*
- *Use of the site is compliant with the environmental easement;*
- *The engineering control systems are performing as designed and are effective;*
- *To the best of my knowledge and belief, the work and conclusions described in this certification are in accordance with the requirements of the site remedial program and generally accepted engineering practices; and*
- *The information presented in this report is accurate and complete.*
- *No new information has come to my attention, including groundwater monitoring data from wells located at the site boundary, if any, to indicate that the assumptions made in the qualitative exposure assessment of off-site contamination are no longer valid; and*
- *The assumptions made in the qualitative exposure assessment remain valid.*

*“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, **Brent O’Dell of MACTEC Engineering and Consulting, P.C.** am certifying as the **Designated Site Representative**: I have been authorized and designated by all site owners/remedial parties to sign this certification] for the site.”*

The signed certification will be included in the PRR.

The PRR will be submitted, in electronic format, to the NYSDEC Central Office, Regional Office in which the site is located and the NYCDOH Bureau of Environmental Exposure Investigation. The PRR may need to be submitted in hard-copy format, as requested by the NYSDEC project manager.

7.3 Corrective Measures Work Plan

If any component of the remedy is found to have failed, or if the periodic certification cannot be provided due to the failure of an IC or EC, a Corrective Measures Work Plan will be submitted to the NYSDEC for approval. This plan will explain the failure and provide the details and schedule for performing work necessary to correct the failure. Unless an emergency condition exists, no work will be performed pursuant to the Corrective Measures Work Plan until it has been approved by the NYSDEC.

7.4 Remedial Site Optimization Report

In the event that an RSO is to be performed (see Section 6.3, upon completion of an RSO, an RSO report must be submitted to the NYSDEC for approval. A general outline for the RSO report is provided in Appendix H – Site Management Forms. The RSO report will document the research/ investigation and data gathering that was conducted, evaluate the results and facts obtained, present a revised conceptual site model and present recommendations. RSO recommendations are to be implemented upon approval from the NYSDEC. Additional work plans, design documents, HASPs etc., may still be required to implement the recommendations, based upon the actions that need to be taken. A final engineering report and update to the SMP may also be required.

The RSO report will be submitted, in electronic format, to the NYSDEC Central Office, Regional Office in which the site is located, Site Control and the NYCDOH Bureau of Environmental Exposure Investigation.

8.0 REFERENCES

Site-specific reports utilized for preparation of the SMP are listed below.

AMEC Environment & Infrastructure, Inc. 2013. *Remedial Action Work Plan Addendum #1, Pre-Design Investigation Report, Review Avenue Sites, RAD I and RAD II, Long Island City, Queens, New York., BCA #C241089 and BCA # C24005, July 2013.*

CH2M Hill, 1982. Engineering Services Report, Quanta Resources Site Cleanup, prepared for the NYCDEP, December 29, 1982.

de maximis, inc. (de maximis, 2011). *Construction Completion Report, Progress Summary, Demolition Submittal*, September 2011.

Environmental Liability Management of New York, L.L.C. (ELM), 2007. *Final Report for Underground Storage Tank (UST) and Sump Removal Interim Remedial Measure (IRM), Review Avenue Development I, 37-30 Review Avenue, Long Island City, New York, BCA #C241089, January 12, 2007.*

Environmental Resources Management-Northeast (ERM), 1990. *Phase I Environmental Assessment, 37-30 Review Avenue, Long Island City, New York, 1990.*

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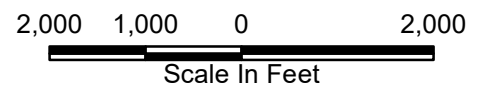
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FIGURES



Site Location
 Northing - 206078.14
 Easting - 1001715.60

Coordinate System: NAD 1983 StatePlane New York Long Island Units: Foot US



Legend

 Site Boundary

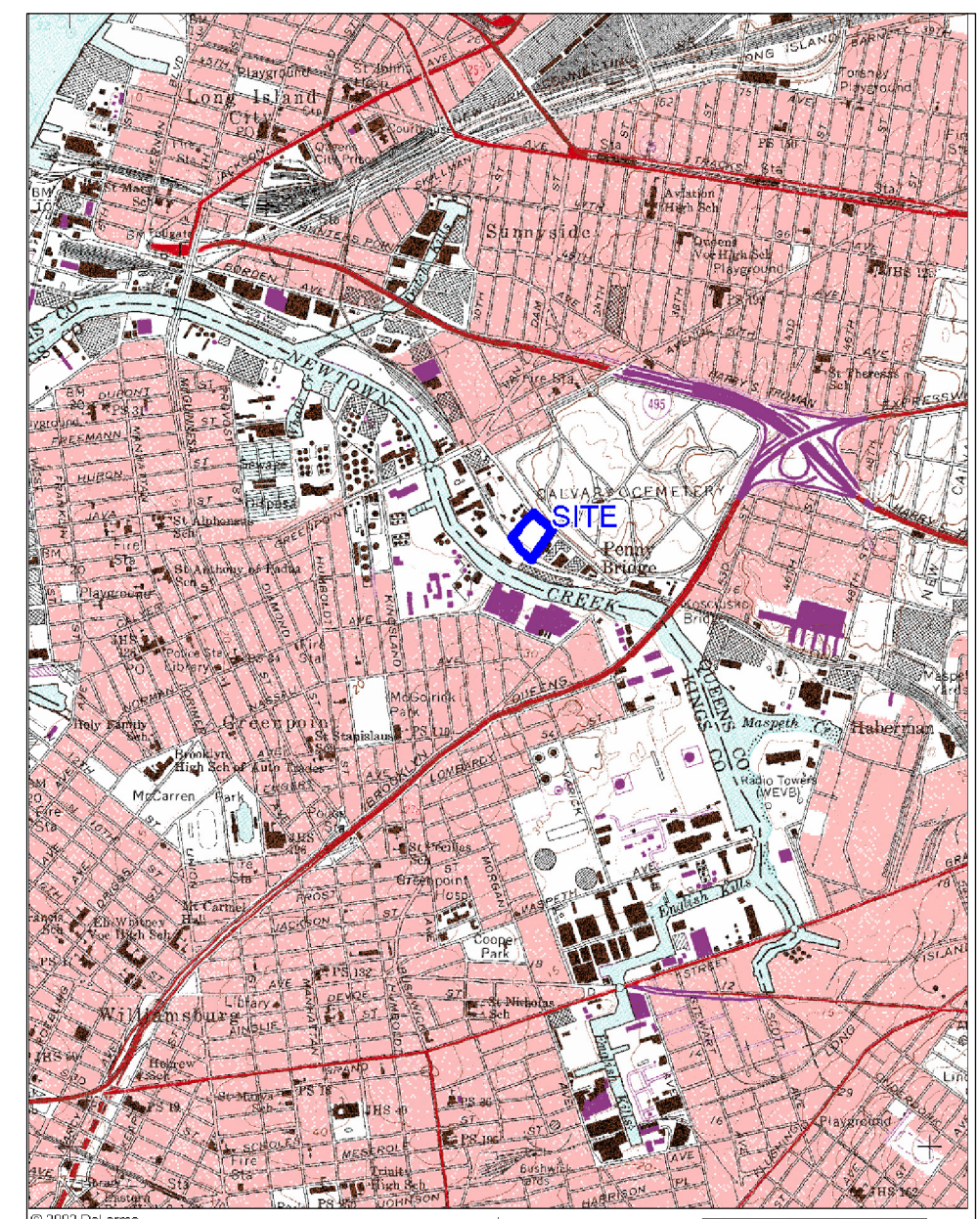


ENVIRONMENT & INFRASTRUCTURE
 200 AMERICAN METRO BLVD, SUITE 113
 HAMILTON, NEW JERSEY 08619

Figure 1
 Site Location Map
 Review Avenue Development Sites
 Rad I and Rad II
 Long Island City, Queens, New York

| | | | |
|-----------|------------|------------|------|
| PROJ. NO. | 3480120337 | 03/06/2014 | REV. |
| DWN. BY. | WSL | CHKD BY. | NS |

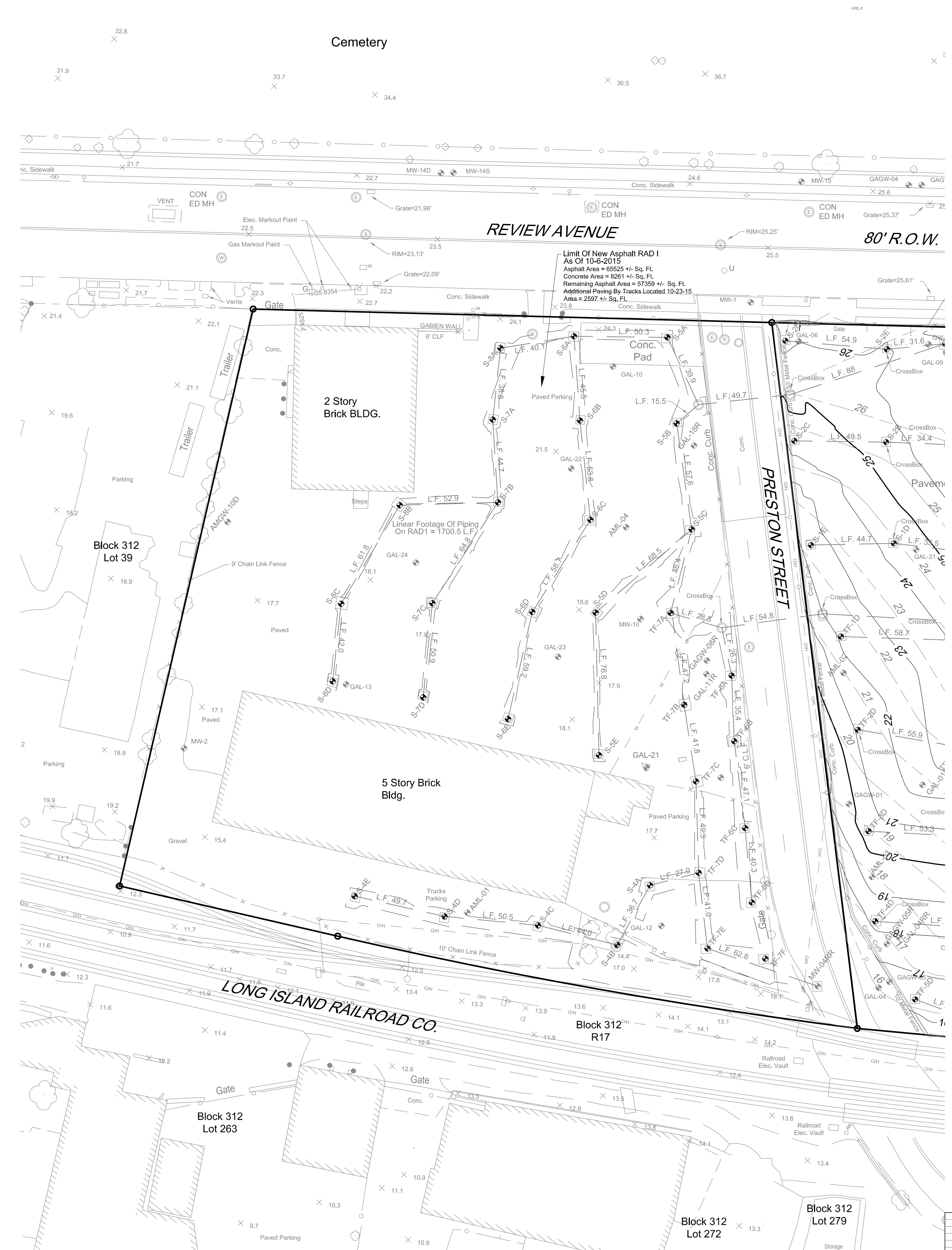
NAD 83-96 N.Y.L.I. 3104



Key Map
Not To Scale

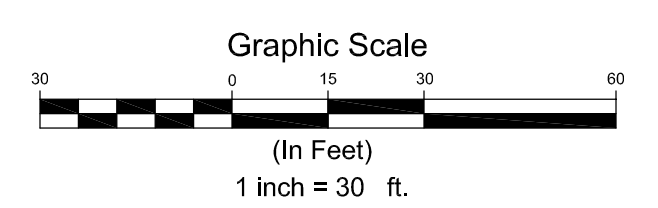
- EXISTING**
- FIRE HYDRANT
 - UNKNOWN VALVE
 - LIGHT POLE
 - UTILITY POLE
 - CATCHBASIN
 - ROUND CATCHBASIN
 - MONITORING WELL
 - PROTECTIVE POST
 - LARGE TREE
 - SMALL TREE
 - GAS VALVE
 - WATER VALVE
 - WATER BOX
 - ELECTRIC MANHOLE
 - RAILROAD SIGNAL
 - SANITARY MANHOLE
 - WATER MANHOLE
 - TELEPHONE MANHOLE
 - UNKNOWN MANHOLE
 - REMEDIATION SYSTEM PIPING VAULT (TYP)
 - Conc. Vault For Monitor Well

- LINE LEGEND**
- | | |
|------------------------|------------------|
| EXISTING | PROPOSED |
| CONTOUR MAJOR | CONTOUR MINOR |
| RAIL ROAD TRACKS | PROPERTY LINE |
| ADJOINER PROPERTY LINE | CHAIN LINK FENCE |
| OVERHEAD WIRES | |



- NOTES:**
- HORIZONTAL DATUM IS NORTH AMERICAN DATUM OF 1983 (NAD83 NEW YORK STATE PLANE COORDINATES, LONG ISLAND ZONE 3104). VERTICAL DATUM NORTH AMERICAN VERTICAL DATUM OF 1988; NAVD88.
 - ANYTHING SHOWN OUTSIDE THE DEFINED BOUNDARY OF THIS MAP IS FOR DESCRIPTIVE PURPOSES ONLY. THIS IS NOT A VALID, TRUE COPY OF THIS DOCUMENT UNLESS IT BEARS THE ORIGINAL SIGNATURE AND THE RAISED, EMBOSSED SEAL OF THE SURVEYOR NOTED HEREON.
 - THIS SURVEY IS SUBJECT TO ANY EASEMENTS, RESTRICTIONS, OR COVENANTS THAT MAY EXIST. THIS PROPERTY MAY ALSO BE SUBJECT TO VARIOUS UTILITY EASEMENTS (I.E. POWER, TELEPHONE, SANITARY & OR STORM SEWER, WATER, GAS, ETC.) THAT WERE NOT NOTED EITHER IN THE REFERENCE DEED OR REFERENCE PLATS ASSOCIATED WITH THIS PROPERTY. ANY UTILITIES SHOWN HEREON ARE BASED ON FIELD SURFACE LOCATIONS, AND WERE NOT VERIFIED AS TO SIZE, DEPTH, MATERIAL, &/OR CONDITION.
 - DUE TO LACK OF PHYSICAL EVIDENCE (I.E. PROPERTY CORNERS, BOROUGH MONUMENTS) FOUND DURING FIELD SURVEY, PROPERTY BOUNDARY LINES WERE ESTABLISHED BY SETTING EXISTING RIGHTS-OF-WAY AS DEPICTED ON BOROUGH SECTIONS MAPS BASED UPON PHYSICAL CENTERLINE OF EXISTING ROADWAY
 - SURVEY IS BASED UPON GPS, RAPID STATIC APPLICATIONS, ALONG WITH CONVENTIONAL SURVEY METHODS. ALL SURVEYING WAS PERFORMED BETWEEN APRIL AND JULY 2011, DECEMBER 2014 AND UPDATED JULY, AUGUST, SEPTEMBER, AND NOVEMBER 2015.
 - UNAUTHORIZED ALTERATION OR ADDITION TO A SURVEY MAP BEARING A LICENSED LAND SURVEYOR'S SEAL IS A VIOLATION OF SECTION 7209, SUB-DIVISION 2, OF THE NEW YORK STATE EDUCATION LAW.
 - MONITORING WELLS SHOWN ARE FROM PLANS, CURRENT FIELD MEASUREMENTS AND/OR HISTORICAL FIELD MEASUREMENTS.
 - ALL DISTANCES SHOWN ARE IN U.S. SURVEY FEET.

FIGURE 2
SITE MANAGEMENT PLAN RAD I

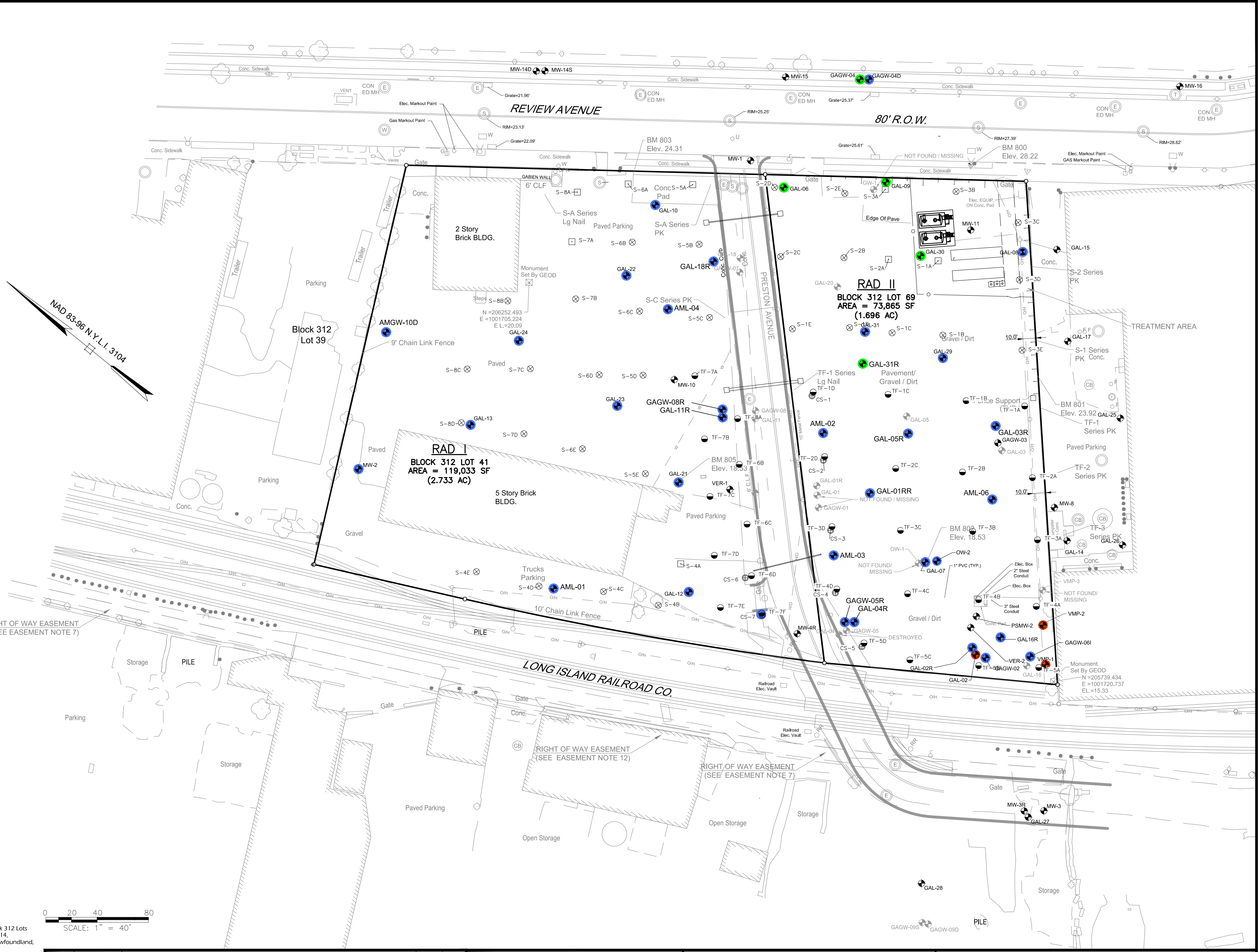


| | |
|--|------------------|
| <p>PHOTOGRAMMETRIC SCIENCES - SURVEY TECHNOLOGIES CORPORATE OFFICE: 24 Karouse Rd., Newkirk, N.J. 07455 - (973) 697-2122 FAX: (973) 836-6433</p> | Drawn By: S.B.M. |
| | Checked: R.J. |
| Scale: 1" = 30' | Date: 11-25-15 |
| Proj. No. 3523 | Page: 1 of 1 |
| As-Built Survey RAD I Block 312 Lot 41 37-30 Review Avenue Long Island City, Queens, N.Y. 11101 | |
| PAUL J. EMILIUS JR. <small>N.Y. Professional Land Surveyor Lic. No. 56203</small> | |

| Date | By | Description |
|------|----|-------------|
| | | |
| | | |

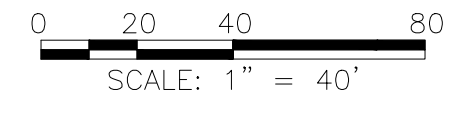
UNLESS OTHERWISE AGREED IN A WRITTEN CONTRACT BETWEEN MACTEC AND ITS CLIENT, (1) THIS DOCUMENT CONTAINS INFORMATION, DATA AND DESIGN THAT IS CONFIDENTIAL AND NOT TO BE COPIED OR REPRODUCED IN ANY MANNER WITHOUT THE WRITTEN CONSENT OF MACTEC, (2) THIS DOCUMENT IS THE PROPERTY OF MACTEC AND IS TO BE RETURNED TO MACTEC UPON COMPLETION OF THE PROJECT, AND (3) MACTEC SHALL NOT BE HELD RESPONSIBLE FOR ANY DAMAGE TO PERSONS OR PROPERTY CAUSED BY THE USE OF THIS DOCUMENT IN ANY MANNER.

| LEGEND | LINE LEGEND |
|---|------------------------|
| FIRE HYDRANT | RAIL ROAD TRACKS |
| UNKNOWN VALVE | PROPERTY LINE |
| LIGHT POLE | ADJOINER PROPERTY LINE |
| UTILITY POLE | JERSEY BARRIER |
| CATCHBASIN | EASEMENT LINE |
| ROUND CATCHBASIN | CHAIN LINK FENCE |
| EXISTING MONITORING WELL (INCLUDED IN GROUNDWATER MONITORING PROGRAM) | OVERHEAD WIRES |
| EXISTING MONITORING WELL (BELIEVED ACTIVE, BUT NOT INCLUDED IN THESE TWO MONITORING PROGRAMS) | PRESTON AVE |
| EXISTING MONITORING WELL (NOT FOUND IN FIELD OR NOT SHOWN ON THIS MAP) | |
| MONITORING WELLS THAT WERE ABANDONED | |
| PROTECTIVE POST | |
| LARGE TREE | |
| SMALL TREE | |
| GAS VALVE | |
| WATER VALVE | |
| WATER BOX | |
| ELECTRIC MANHOLE | |
| RAILROAD Elec. VAULT | |
| RAILROAD SIGNAL | |
| SANITARY MANHOLE | |
| WATER MANHOLE | |
| TELEPHONE MANHOLE | |
| UNKNOWN MANHOLE | |
| SKIMMER OR TOTAL FLUIDS WELL | |



- MONITORING WELL NOTES:**
- 1) Suffixes:
 - Where a well is designated with the suffix 'R', that well is a replacement for a previous well at that location.
 - Where a well is designated with the suffix 'RR', that well is a replacement for a previous replacement well at that location.
 - 2) MW-# are monitoring wells that were installed prior to the Remedial Investigation.
 - 3) The designation GAGW-# indicates a groundwater monitoring well was originally located and installed by Goldier Associates. The one exception is GAGW-04 which is screened across the LNAPL zone.
 - 4) The designation GAL-# indicates a LNAPL monitoring well that was screened across the top of the water table.
 - 5) Well GAGW-06 is a smear zone monitoring well.
 - 6) The designation AMGW-# represents a GW monitoring well that was located and installed by AMEC.
 - 7) The designation AML-# is a LNAPL monitoring well located and installed by AMEC.
 - 8) GAL-04R, GAL-11R, GAL-18R, GAGW-05R, AND GAGW-08R are to be installed by Waste Management.

- NOTES:**
- 1) This drawing references the 'Topographic Plan - Block 312 Lots 41, 69 & 79 - 37-80 Review Avenue', dated 12/22/2014, prepared by GEOD Corporation, 24 Kanouse Rd., Newfoundland, NJ 07435.
 - 2) Recovery well locations (except where noted) are per survey drawings named 'Property Survey, Block 312 Lot 41, 37-80 Review Avenue' and 'Property Survey, Block 312 Lot 69, 37-80 Review Avenue', by GEOD Corporation, dated January 29, 2015. Recovery Wells TF-3A and TF-7C were not surveyed due to obstructions.
 - 3) Horizontal datum is North American Datum of 1983 (NAD83 New York State Plane coordinates, Long Island zone 3104). Vertical datum is North American Vertical Datum of 1988 (NAVD88).



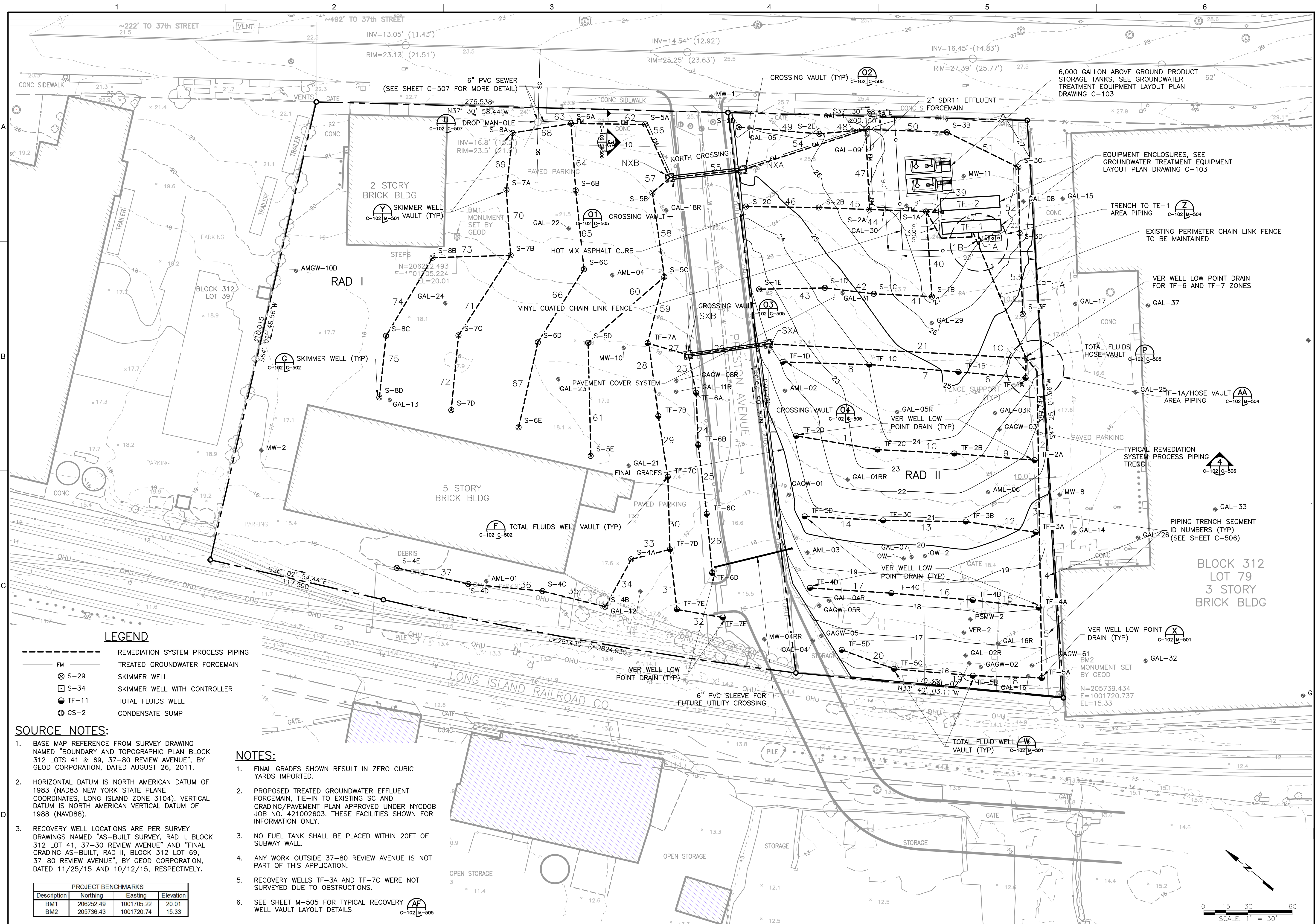
| REV. | DATE | STATUS | PRPD BY | CHKD BY |
|------|------|--------|---------|---------|
| | | | | |

MACTEC PROJECT No. 3480130369
DRAWING: FIGURE 3 - MONITORING WELL LOCATIONS

PREPARED/DATE: SPM 6/22/2015
CHECKED/DATE: NS 6/22/2015

MACTEC Engineering and Consulting, P.C.
511 Congress Street, Suite 200
Portland, Maine 04112
(207) 775-5401

FIGURE 3
MONITORING WELL LOCATIONS
REVIEW AVENUE DEVELOPMENT SITES,
RAD I AND RAD II
LONG ISLAND CITY, QUEENS, NY 11101



LEGEND

- REMEDIATION SYSTEM PROCESS PIPING
- TREATED GROUNDWATER FORCEMAIN
- ⊗ S-29 SKIMMER WELL
- ⊠ S-34 SKIMMER WELL WITH CONTROLLER
- TF-11 TOTAL FLUIDS WELL
- ⊕ CS-2 CONDENSATE SUMP

SOURCE NOTES:

- BASE MAP REFERENCE FROM SURVEY DRAWING NAMED "BOUNDARY AND TOPOGRAPHIC PLAN BLOCK 312 LOTS 41 & 69, 37-80 REVIEW AVENUE", BY GEOD CORPORATION, DATED AUGUST 26, 2011.
- HORIZONTAL DATUM IS NORTH AMERICAN DATUM OF 1983 (NAD83 NEW YORK STATE PLANE COORDINATES, LONG ISLAND ZONE 3104). VERTICAL DATUM IS NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88).
- RECOVERY WELL LOCATIONS ARE PER SURVEY DRAWINGS NAMED "AS-BUILT SURVEY, RAD I, BLOCK 312 LOT 41, 37-30 REVIEW AVENUE" AND "FINAL GRADING AS-BUILT, RAD II, BLOCK 312 LOT 69, 37-80 REVIEW AVENUE", BY GEOD CORPORATION, DATED 11/25/15 AND 10/12/15, RESPECTIVELY.

NOTES:

- FINAL GRADES SHOWN RESULT IN ZERO CUBIC YARDS IMPORTED.
- PROPOSED TREATED GROUNDWATER EFFLUENT FORCEMAIN, TIE-IN TO EXISTING SC AND GRADING/PAVEMENT PLAN APPROVED UNDER NYDOB JOB NO. 421002603. THESE FACILITIES SHOWN FOR INFORMATION ONLY.
- NO FUEL TANK SHALL BE PLACED WITHIN 20FT OF SUBWAY WALL.
- ANY WORK OUTSIDE 37-80 REVIEW AVENUE IS NOT PART OF THIS APPLICATION.
- RECOVERY WELLS TF-3A AND TF-7C WERE NOT SURVEYED DUE TO OBSTRUCTIONS.
- SEE SHEET M-505 FOR TYPICAL RECOVERY WELL VAULT LAYOUT DETAILS

| PROJECT BENCHMARKS | | | |
|--------------------|-----------|------------|-----------|
| Description | Northing | Easting | Elevation |
| BM1 | 206252.49 | 1001705.22 | 20.01 |
| BM2 | 205736.43 | 1001720.74 | 15.33 |

| NO. | DATE | DSGN | DR | CHK | REVISION | BY | APVD |
|-----|------|------|----|-----|----------|----|------|
| | | | | | | | |
| | | | | | | | |

SITE MANAGEMENT PLAN
 REVIEW AVENUE DEVELOPMENT
 SITES, RAD I AND RAD II
 LONG ISLAND CITY, QUEENS, NY 11101

CIVIL
LNAPL RECOVERY SYSTEM LAYOUT

MACTEC Engineering and Consulting, P.C.
 511 Congress Street, Suite 200
 Portland, Maine 04112
 (207) 775-5401

| | |
|--------------------------------------|-----------------|
| VERIFY SCALE | 12/18/15 |
| BAR IS ONE INCH ON ORIGINAL DRAWING. | 3480140433 |
| DATE | FIGURE 4 |
| PROJ NO: | |

APPENDICES

APPENDIX A
LIST of SITE CONTACTS

APPENDIX A – LIST OF SITE CONTACTS

This Appendix should include a listing of all site contacts. The below table should be edited as necessary to include all site contacts necessary for implementation of the SMP.

| Name | Phone/Email Address |
|---|--|
| Craig Coslett Review Avenue System, LLC c/o de maximis inc. | 610-435-1151 ccoslett@demaximis.com |
| Brent O’Dell, P.E. Engineer of Record | 609-631-2915 brent.odell@woodplc.com |
| Kyle Forster, Remediation Manager NYSDEC | 518-402-8644 kyle.forster@dec.ny.gov |
| Sarah Quandt, Program Manager NYSDEC | 518-402-9116 sarah.quandt@dec.ny.gov |
| Alan Dern Review Holdings LLC and Review Properties, LLC | 718-786-8400 alan@onestopllc.com |

APPENDIX B
EXCAVATION WORK PLAN



Excavation Work Plan

Prepared for:

**Review Avenue Development Properties
Long Island City, Queens, New York**

**Review Avenue Development I
37-30 Review Avenue
(BCA # 241089)**

and

**Review Avenue Development II
37-80 Review Avenue
(BCA # 241005)**

Prepared by:

MACTEC Engineering & Geology, P.C. (MACTEC)
453 Route 146 – Suite 201
Clifton Park, NY 12065

and

Wood Environment & Infrastructure Solutions, Inc. (formerly Amec Foster Wheeler)
200 American Metro Boulevard, Suite 113
Hamilton, NJ 08619

Project Number 3480140433

October 2020

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| 1.2 | Soil Screening Methods | 2 |
| 1.3 | Stockpile Methods | 2 |
| 1.4 | Materials Excavation and Load Out..... | 2 |
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| 1.6 | Materials Disposal Off-Site | 4 |
| 1.7 | Materials Reuse On-Site | 4 |
| 1.8 | Cover System Restoration..... | 4 |
| 1.9 | Backfill from Off-Site Sources | 5 |
| 1.10 | Stormwater Pollution Prevention..... | 5 |
| 1.11 | Contingency Plan..... | 6 |

1.0 INTRODUCTION

1.1 Overview

This Excavation Work Plan (EWP) is for the Review Avenue Development (RAD) Sites RAD I and RAD II, located on Review Avenue, Long Island City, Queens County, New York (Site).

At least 15 days prior to the start of any excavation/soil disturbance activity on either the RAD I and/or RAD II sites, including grading, trenching and/or drilling, where potential remaining contamination might be encountered, the Site owner or their representative will notify the NYSDEC. The exception to this period of notification is emergency excavation, such as an emergency utility excavation. In the event of an emergency excavation, the Site owner or their representative will notify the NYSDEC as soon as practicable. Currently, this notification will be made to:

Kyle Forster

NYS Department of Environmental Conservation
Division of Environmental Remediation
625 Broadway, 12th Floor
Albany, NY 12233

This notification should include:

- A detailed description of the work to be performed, including the location and areal extent, plans for site re-grading, intrusive elements or utilities to be installed below the soil cover, estimated volumes of contaminated soil to be excavated and any work that may impact an engineering control (EC),
- A summary of environmental conditions anticipated in the work areas, including the nature and concentration levels of contaminants of concern, potential presence of grossly contaminated media, and plans for any pre-construction sampling,
- A schedule for the work, detailing the start and completion of all intrusive work,
- A summary of the applicable components of this EWP,
- A statement that the work will be performed in compliance with this EWP and 29 Code of Federal Regulations (CFR) 1910.120,
- A copy of the contractor's health and safety plan (HASP), in electronic format, if it differs from the HASP provided for the Site,
- Identification of disposal facilities for potential waste streams,
- Identification of sources of any anticipated backfill,
- Details regarding the restoration of any disturbed ECs.

1.2 Soil Screening Methods

Visual and instrument-based soil screening (photo-ionization detector and/or flame ionization detector) will be performed by a qualified environmental professional (QEP) during any excavations/soil disturbance activities within known or potentially contaminated material (potential remaining contamination). Soil screening will be performed regardless of when the invasive work is done and will include all excavation and invasive work performed during remediation, development, or utility installation and repair in or immediately adjacent to the Site, such as excavations for foundations and utility work, after issuance of the Certificate of Completion (COC). Personnel who may be exposed to contaminated soil will be required to have personal protective equipment and the appropriate Hazardous Waste Operations and Emergency Response (HAZWOPER) training under CFR 1910.120.

Soil from drill cuttings, excavation, or grading will be segregated based on previous environmental data and screening results into soil that requires off-site disposal, soil that requires testing and soil that can be returned to the subsurface. Soil Impacted with LNAPL will be characterized and disposed of in accordance with the disposal facility sampling requirements. Absent characterization, soil impacted with LNAPL or from a depth of 15 feet below ground surface (bgs) or greater may be segregated and managed as PCB bulk remediation waste ≥ 50 mg/kg and NYS hazardous waste and disposed off-site at a hazardous waste or Toxic Substance Control Act (TSCA) –permitted landfill.

1.3 Stockpile Methods

Any soil stockpiles will be placed on plastic and fully encircled with erosion and sediment controls, such as a berm and/or silt fence. Hay bales and other erosion and sediment controls will be used as needed near catch basins, surface waters and other discharge points.

Stockpiles will be kept covered at all times with appropriately anchored tarps. Stockpiles will be routinely inspected and damaged tarp covers will be promptly replaced.

Stockpiles will be inspected at a minimum once each week and after any storm event. The results of inspections will be recorded in a logbook and maintained at the Site and available for inspection by the NYSDEC.

1.4 Materials Excavation and Load Out

A QEP or person under their supervision will oversee all invasive work and the excavation and load-out of all excavated material.

The owner of the property and its contractors are solely responsible for safe execution of all invasive and other work performed under this EWP.

The presence of utilities and easements on the Site will be investigated by the QEP. It will be determined whether a risk or impediment to the planned work is posed by utilities or easements on the Site.

Loaded vehicles leaving the Site will be appropriately lined, tarped, securely covered, manifested, and placarded in accordance with appropriate Federal, State, local, and NYSDOT requirements (and all other applicable transportation requirements).

A truck wash will be operated onsite, if needed. If a truck wash is needed, the QEP will be responsible for ensuring that all outbound trucks will be washed at the truck wash before leaving the Site until the activities performed under this section are complete.

Locations where vehicles enter or exit the site shall be inspected daily for evidence of off-site soil tracking.

The QEP will be responsible for ensuring that all egress points for truck and equipment transport from the Site are clean of soil and other materials derived from the Site during intrusive excavation activities. Cleaning of the adjacent streets will be performed as needed to maintain a clean condition, with respect to soil and other materials derived from the Site.

1.5 Materials Transport Off-Site

All transport of materials, if contaminated, will be performed by licensed haulers in accordance with appropriate local, State, and Federal regulations, including 6 NYCRR Part 364. Haulers will be appropriately licensed and trucks properly placarded.

Soil and other material transported by trucks exiting the Site will be secured with the appropriate covers. If loads contain wet soil and other material capable of producing free liquid, truck liners will be used.

All trucks will be washed, if needed, prior to leaving the Site. Truck wash waters will be collected and disposed of off-site, if needed, in an appropriate manner.

Truck transport routes will be determined once the soil and other excavated material has been classified as to its waste type and the proper disposal facility has been identified. The truck transport routes will be submitted to the NYSDEC for approval prior to any transport, if excavated material classification requires transport route approval by the NYSDEC. If transport route approval is needed, all trucks loaded with site materials will exit the vicinity of the Site using only these approved truck routes. The routes will be the most appropriate route and take into account: (a) limiting transport through residential areas and sensitive sites; (b) the use of city mapped truck routes; (c) prohibiting off-site queuing of trucks entering the facility; (d) limiting total distance to major highways; (e) promoting safety in access to highways; (f) overall safety in transport, and; (g) community input, when necessary.

Trucks will be prohibited from stopping and idling in the neighborhood outside the Site.

Egress points for truck and equipment transport from the Site will be kept clean of soil and other materials during any development of the Site.

Queuing of trucks will be performed onsite in order to minimize off-site disturbance. Off-site queuing will be prohibited.

1.6 Materials Disposal Off-Site

Soil/fill/solid waste excavated and removed from the Site will be treated as contaminated material and will be sampled characterized and disposed of in accordance with the permit requirements of the disposal facility.

Off-site disposal locations for excavated soil will be identified in the pre-excavation notification. This will include estimated quantities and a breakdown by class of disposal facility if appropriate, i.e. hazardous waste disposal facility, solid waste landfill, petroleum treatment facility, C/D recycling facility, etc. Actual disposal quantities and associated documentation will be reported to the NYSDEC in the Periodic Review Report (PRR). This documentation will include: waste profiles, test results, facility acceptance letters, manifests, bills of lading and facility receipts.

Non-hazardous historic fill and contaminated soil taken off-site will be handled, at minimum, as a Municipal Solid Waste per 6NYCRR Part 360-1.2. Material that does not meet Track 1 unrestricted SCOs is prohibited from being taken to a New York State recycling facility (6NYCRR Part 360-16 Registration Facility).

1.7 Materials Reuse On-Site

Chemical criteria for onsite reuse of soil and other material are based on the soil reuse requirements provided in the RAWP which allows the reuse of soils that meet restricted residential or commercial standards. The QEP will ensure that procedures defined for soil and other material reuse in this SMP are followed and that unacceptable soil and other material does not remain onsite. Contaminated onsite material, including historic fill and contaminated soil, that is acceptable for re-use onsite will be placed below the demarcation layer or impervious surface, and will not be reused within a cover soil layer, within landscaping berms, or as backfill for subsurface utility lines.

1.8 Cover System Restoration

After the completion of soil removal and any other invasive activities of potential remaining contamination, any cover system will be restored. A demarcation layer, consisting of orange snow fencing material or equivalent material, will be placed as a visual reference above the top of the potential remaining contamination zone, the zone that requires adherence to special conditions for disturbance of remaining contaminated soils defined in this SMP. If the type of cover system changes from that which exists prior to the excavation a modification of the cover element above the potential

remaining contamination may be needed. A figure showing the modified surface will be included in the subsequent PRR and in any updates to the Site Management Plan.

1.9 Backfill from Off-Site Sources

All soil and other material proposed for import onto the Site will be approved by the QEP and will be in compliance with provisions in this SMP prior to receipt at the Site.

Soil and other material from industrial sites, spill sites, or other environmental remediation sites or potentially contaminated sites will not be imported to the Site.

All imported soil will meet the backfill and cover soil quality standards established in 6NYCRR 375-6.7(d). Based on an evaluation of the land use, protection of groundwater and protection of ecological resources criteria. Soils that meet 'exempt' fill requirements under 6 NYCRR Part 360, but do not meet backfill or cover soil objectives for the Site, will not be imported onto the Site without prior approval by NYSDEC. Solid waste will not be imported onto the Site.

Trucks entering the Site with imported soil will be securely covered with the appropriate covers. Imported soil will be stockpiled separately from excavated soil and other material and covered to prevent dust releases.

1.9 Stormwater Pollution Prevention

Barriers and hay bale checks will be installed and inspected once a week and after every storm event. The results of inspections will be recorded in a logbook and maintained at the Site and available for inspection by NYSDEC. All necessary repairs shall be made immediately.

Accumulated sediments will be removed as required to keep the barrier and hay bale check functional.

All undercutting or erosion of the silt fence toe anchor shall be repaired immediately with appropriate backfill material.

Manufacturer's recommendations will be followed for replacing silt fencing damaged due to weathering.

Erosion and sediment control measures identified in the SMP shall be observed to ensure that they are operating correctly. Where discharge locations or points are accessible, they will be inspected to ascertain whether erosion control measures are effective in preventing significant impacts to receiving waters

Silt fencing or hay bales will be installed around the entire perimeter of the construction area.

1.10 Contingency Plan

If underground tanks or other previously unidentified contaminant sources are found during development related construction, excavation activities will be suspended until sufficient equipment is mobilized to address the condition.

Sampling will be performed on product, sediment and surrounding soil, etc. as necessary to determine the nature of the material and proper disposal method. Chemical analysis will be performed for TCL volatiles and semi-volatiles since the site history and previous sampling results provide a sufficient justification to limit sampling to these analytes.

Identification of unknown or unexpected contaminated media identified by screening during invasive site work will be promptly communicated by phone to NYSDEC's Project Manager. Reportable quantities of petroleum product will also be reported to the NYSDEC spills hotline. These findings will be also included in the PRR prepared pursuant to Section 7.2 of the SMP.

APPENDIX C
RESPONSIBILITIES of
OWNER and REMEDIAL PARTY

Responsibilities

The responsibilities for implementing the Site Management Plan (“SMP”) for the [**Review Avenue Development Site RAD I**] site (the “site”), number [**BCP #C241089**], and are divided between the site owner and a Remedial Party, as defined below. The owner(s) is/are currently listed as: Review Holdings LLC and Review Properties, LLC (the “owner”).

Solely for the purposes of this document and based upon the facts related to a particular site and the remedial program being carried out, the term Remedial Party (“RP”) refers to any of the following: certificate of completion holder, volunteer, applicant, responsible party, and, in the event the New York State Department of Environmental Conservation (“NYSDEC”) is carrying out remediation or site management, the NYSDEC and/or an agent acting on its behalf. The RP is: **Review Holdings LLC and Review Properties, LLC.**

Nothing on this page shall supersede the provisions of an Environmental Easement, Consent Order, Consent Decree, agreement, or other legally binding document that affects rights and obligations relating to the site.

Site Owner’s Responsibilities:

1. The owner shall follow the provisions of the SMP as they relate to future construction and excavation at the site.
2. In accordance with a periodic time frame determined by the NYSDEC, the owner shall periodically certify, in writing, that all Institutional Controls set forth in a (n) **Environmental Easement** to remain in place and continue to be complied with. The owner shall provide a written certification to the RP, upon the RP’s request, in order to allow the RP to include the certification in the site’s Periodic Review Report (PRR) certification to the NYSDEC.
3. In the event the site is delisted, the owner remains bound by the **Environmental Easement** and shall submit, upon request by the NYSDEC, a written certification that the **Environmental Easement** is still in place and has been complied with.
4. The owner shall grant access to the site to the RP and the NYSDEC and its agents for the purposes of performing activities required under the SMP and assuring compliance with the SMP.
5. The owner is responsible for assuring the security of the remedial components located on its property to the best of its ability. In the event that damage to the remedial components or vandalism is evident, the owner shall notify the site’s RP and the NYSDEC in accordance with the timeframes indicated in **Section 1.3-Notifications**.

6. In the event some action or inaction by the owner adversely impacts the site, the owner must notify the site's RP and the NYSDEC in accordance with the time frame indicated in **Section 1.3-** Notifications and (ii) coordinate the performance of necessary corrective actions with the RP.
7. The owner must notify the RP and the NYSDEC of any change in ownership of the site property (identifying the tax map numbers in any correspondence) and provide contact information for the new owner of the site property/ies. 6 NYCRR Part contains notification requirements applicable to any construction or activity changes and changes in ownership. Among the notification requirements is the following: Sixty days prior written notification must be made to the NYSDEC. Notification is to be submitted to the NYSDEC Division of Environmental Remediation's Site Control Section. Notification requirements for a change in use are detailed in Section 1.3 of the SMP. A 60-Day Advance Notification Form and Instructions are found at <http://www.dec.ny.gov/chemical/76250.html>.
8. If an owner has a written agreement to perform work for the RP, a description of the activities may be inserted here. (The corresponding agreement should also be included in the SMP.) The owner will [**maintain fences, maintain accessibility to remedy components and monitoring wells; comply with Environmental Easement conditions; comply with SMP conditions**] on behalf of the RP. The RP remains ultimately responsible for maintaining the engineering controls.
9. If the site remedy requires the installation, operation, and/or maintenance of an on-site vapor intrusion mitigation system insert the following: **Not Applicable**. Until such time as the NYSDEC deems the vapor mitigation system unnecessary, the owner shall operate the system, pay for the utilities for the system's operation, and report any maintenance issues to the RP and the NYSDEC.
10. If the site remedy requires the installation, operation, and/or maintenance of a drinking water treatment system, insert the following: **Not Applicable**. Until such time as the NYSDEC deems the drinking water treatment system unnecessary, the owner shall operate the drinking water treatment system, pay for the utilities and report any maintenance issues to the RP and the NYSDEC.
11. In accordance with the tenant notification law, within 15 days of receipt, the owner must supply a copy of any vapor intrusion data, that is produced with respect to structures and that exceeds NYSDOH or OSHA guidelines on the site, whether produced by the NYSDEC, RP, or owner, to the tenants on the property. The owner must otherwise comply with the tenant and occupant notification provisions of Environmental Conservation Law Article 27, Title 24.

Remedial Party Responsibilities

1. The RP must follow the SMP provisions regarding any construction and/or excavation it undertakes at the site.
2. The RP shall report to the NYSDEC all activities required for remediation, operation, maintenance, monitoring, and reporting. Such reporting includes, but is not limited to, periodic review reports and certifications, electronic data deliverables, corrective action work plans and reports, and updated SMPs.
3. Before accessing the site property to undertake a specific activity, the RP shall provide the owner advance notification that shall include an explanation of the work expected to be completed. The RP shall provide to (i) the owner, upon the owner's request, (ii) the NYSDEC, and (iii) other entities, if required by the SMP, a copy of any data generated during the site visit and/or any final report produced.
4. If the NYSDEC determines that an update of the SMP is necessary, the RP shall update the SMP and obtain final approval from the NYSDEC. Within 5 business days after NYSDEC approval, the RP shall submit a copy of the approved SMP to the owner(s).
5. The RP shall notify the NYSDEC and the owner of any changes in RP ownership and/or control and of any changes in the party/entity responsible for the operation, maintenance, and monitoring of and reporting with respect to any remedial system (Engineering Controls). The RP shall provide contact information for the new party/entity. Such activity constitutes a Change of Use pursuant to 375-1.11(d) and requires 60-days prior notice to the NYSDEC. A 60-Day Advance Notification Form and Instructions are found at <http://www.dec.ny.gov/chemical/76250.html> .
6. The RP shall notify the NYSDEC of any damage to or modification of the systems as required under Section 1.3 - Notifications] of the SMP.
7. **Not Applicable.** The RP is responsible for the proper maintenance of any installed vapor intrusion mitigation systems associated with the site, as required in Section [X] or Appendix[X] (Operation, Monitoring and Maintenance Manual) of the SMP.
8. **Not Applicable.** The RP is responsible for the proper monitoring and maintenance of any installed drinking water treatment system associated with the site, as required in Section [X] or Appendix [X] (Operation, Monitoring and Maintenance Manual).
9. Prior to a change in use that impacts the remedial system or requirements and/or responsibilities for implementing the SMP, the RP shall submit to the NYSDEC for approval an amended SMP.
10. Any change in use, change in ownership, change in site classification (*e.g.*, delisting), reduction or expansion of remediation, and other significant changes related to the site may

result in a change in responsibilities and, therefore, necessitate an update to the SMP and/or updated legal documents. The RP shall contact the Department to discuss the need to update such documents.

Change in RP ownership and/or control and/or site ownership does not affect the RP's obligations with respect to the site unless a legally binding document executed by the NYSDEC releases the RP of its obligations.

Future site owners and RPs and their successors and assigns are required to carry out the activities set forth above.