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REMEDIAL INVESTIGATION AND ALTERNATIVES ANALYSIS REPORT

BCP Site No. C905042
291 & 299 Homer Street
Olean, New York

Prepared for:

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CERTIFICATION

I, Joseph R. Taormina, Jr., certify that I am currently a Qualified Environmental Professional as defined in 6 NYCRR Part 375 and that this Remedial Investigation Report was prepared in accordance with all applicable statuses and regulations and in substantial conformance with the DER Technical Guidance for Site Investigation and Remediation (DER-10) and that all activities were performed in full accordance with the DER-approved work plan and any DER-approved modifications.

Joseph R. Taormina, Jr.
Principal Engineer

4/8/15
Date

Signature

I, Omar Ramotar, certify that I am currently a NYS registered professional engineer as defined in 6 NYCRR Part 375 and that this Remedial Investigation and Alternatives Analysis Report was prepared in accordance with all applicable statuses and regulations and in substantial conformance with the DER Technical Guidance for Site Investigation and Remediation (DER-10) and that all activities were performed in full accordance with the DER-approved work plan and any DER-approved modifications.

Omar Ramotar, P.E.
NYS Professional Engineer #077995

4/8/15
Date

Signature

STATE OF NEW YORK
OMAR RAMOTAR
No. 077995
LICENSED PROFESSIONAL ENGINEER

1.0 INTRODUCTION

MJ Painting Contractor Corp. (MJ Painting), has elected to pursue cleanup and redevelopment of the property located at 291 and 299 Homer Street, Olean, New York (the Site, see **Figures 1 and 2**), under the New York State Department of Environmental Conservation (NYSDEC) Brownfield Cleanup Program (BCP or Program). The Site is identified as BCP Site No. C905042. MJ Painting entered into a Brownfield Cleanup Agreement (BCA) with NYSDEC as a "volunteer" for the Site on February 19, 2014.

Roux Associates, Inc. (Roux Associates) and Remedial Engineering, P.C. (Remedial Engineering), on behalf of MJ Painting, have prepared the following *Remedial Investigation and Alternatives Analysis Report* (RI/AAR) for the Site. This RI/AAR provides the findings from remedial investigation activities conducted at the Site from February 25 through February 27, 2014, from May 27 through May 30, 2014, and from June 2 through June 4, 2014 in accordance with the NYSDEC approved October 14, 2013 *Remedial Investigation Work Plan* (RIWP)[1] and January 29, 2014 *RIWP Addendum*, and additional findings of delineation and remedial activities associated with the Interim Remedial Measures (IRM) conducted in accordance with the NYSDEC approved *IRM Work Plan* (IRMWP).[2] The conclusions of the Remedial Investigation (RI) are:

- Approximately 9,000 cubic yards (cy) of soil containing tar-like material, petroleum saturated soil, and/or separate phase hydrocarbons (SPH) are present at the Site. This soil is defined as grossly contaminated media (GCM),[3] as it is the source of strong odor and elevated contaminant vapor levels, and is readily detectable via visual observation;

- Surface soil and subsurface soil contamination exceeding Unrestricted Use and Commercial Use Soil Cleanup Objectives (SCO) is present at the Site;

- Groundwater contamination exceeding Ambient Water Quality Standards and Guidance Values (AWQSGV) is present beneath the Site;

- Groundwater contamination exceeding AWQSGV may be migrating off-Site to the east;

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[1] Revised October 31, 2013.

[2] September 5, 2014 *Interim Remedial Measures Work Plan* and October 14, 2014 *Addendum to Interim Remedial Measures Work Plan*, approved by the NYSDEC via email correspondence on October 24, 2014.

[3] Grossly contaminated media (GCM) is defined in NYSDEC DER-10 Technical Guidance for Site Investigation and Remediation, dated May 3, 2010, as "soil, sediment, surface water or groundwater which contains sources or substantial quantities of mobile contamination in the form of LNAPL that is identifiable either visually, through strong odor, by elevated contaminant vapor levels or is otherwise readily detectable without laboratory analysis."

- LNAPL is present in groundwater at the Site;
- An elevated leachable lead “hot spot” exists at the Site; and
- Contaminated soil vapors are not migrating off-Site.

An Alternatives Analysis (AA) was conducted following the completion of the RI to evaluate and compare potential remedial approaches for the Site. Note that DER-10 Section 4.4(d)(2) requires a minimum of two cleanup alternatives to be developed. This AA includes three cleanup alternatives that were developed and considered for the Site, a Track 1, Track 2, and a Track 4 cleanup. Also not that, a Track 3 cleanup was also considered, but a full analysis of this alternative was not performed; whereas modification of contaminant-specific SCOs as set forth in 6 NYCRR Part 375 Table 6.8(b) was not supported by Site-specific data, rendering a Track 3 cleanup analogous to a Track 2 cleanup. The AA evaluated a Track 1 cleanup of Site contamination to Unrestricted Use SCOs, a Track 2 cleanup of Site contamination to Restricted Use SCOs, and a Track 4 cleanup of Site contamination to soil cleanup levels protective of current, intended, or reasonably anticipated use through a combination of cleanup to Restricted Use SCOs to the greatest extent practicable and the use of long-term institutional and engineering controls. A Track 4 cleanup of Site contamination was selected due to its overall protectiveness of public health and the environment, its conformance with standards, criteria and guidance (SCGs), its long-term effectiveness, its short-term impact and effectiveness, its implementability, its cost effectiveness, and its consistency with current and intended land use (i.e., commercial use). A Track 1 and Track 2 cleanup of Site contamination was determined to be infeasible due to the relative cost and disruption to MJ Painting’s commercial operations, compared to a Track 4 cleanup, while providing little or no additional protection for public health or the environment. The NYSDEC Division of Environmental Remediation (DER) has not made a determination of significant threat implications for the Site. The selected remedial approach removes or controls source areas (i.e., GCM) to the greatest extent feasible, reduces exposure of any remaining GCM, reduces soil vapor migration, and reduces the potential for off-Site migration of contaminated groundwater.

The selected remedial approach includes:

- Excavation and off-Site disposal of approximately 9,000 cy of soil containing GCM pending confirmation by the collection of post-excavation soil samples;

- Groundwater contamination source removal, including GCM excavation and LNAPL removal and disposal;

- Excavation and disposal of the leachable lead impacted soil "hot spot". Leachable lead soil will be stabilized prior to off-Site disposal as non-hazardous soil;[4]

- Analytical confirmation of the existing top one foot of all surface soil or installation of one foot of clean off-Site soil to create a continuous cover system to prevent exposed surface soils from exceeding the Site background values for arsenic or any residual subsurface contamination, if any, in areas that are not covered by components of Site development (e.g. buildings and pavement);

- Installation of vapor barriers and Sub-Slab Depressurization System (SSDS) beneath newly constructed buildings;

- Installation of a SSDS beneath the existing office;

- Replacement of groundwater monitoring wells destroyed during Site excavation activities; and

- Implementation of institutional controls including an environmental easement and Site Management Plan (SMP) to restrict the Site to commercial or industrial use, to prevent disturbance of contaminated soil remaining at the Site, to restrict use of groundwater at the Site, to maintain the cover system, to operate and monitor the SSDS, and to monitor groundwater to confirm that groundwater source removal prevents off-Site migration of contaminated groundwater.

The remainder of this RI/AAR document is divided into the following sections:

- **Section 2.0** provides a description of the Site, its historical uses, and project organization and responsibilities;

- **Section 3.0** provides a description of environmental conditions based on previous environmental investigations;

- **Section 4.0** provides a description of RI activities conducted at the Site, including collection of surface soil samples, advancement of test pits and soil borings to evaluate extent of GCM, collection of subsurface soil samples, completion of four soil borings as monitoring wells, collection of groundwater samples from six monitoring

[4] Any soil with leachable lead concentrations that still exceed 5 milligrams per liter following stabilization will be disposed off-Site as hazardous soil.

wells, evaluation of the extent of LNAPL in groundwater and the groundwater flow direction, installation of soil vapor monitoring points and collection of soil vapor and ambient air samples, and a description of delineation and remedial activities recently associated with the IRM;

- **Section 5.0** provides a description of the RI results and additional IRM results which contribute to the characterization of the Site;

- **Section 6.0** provides a discussion of the nature and extent of contamination at the Site, including Site geology, Site hydrogeology, soil contamination, groundwater contamination and soil vapor contamination;

- **Section 7.0** provides a qualitative exposure assessment and a fish and wildlife impact assessment;

- **Section 8.0** provides an AA, including a discussion of the Remedial Action Objectives (RAOs), General Response Actions (GRAs), derivation of Site background levels for arsenic, applicable SCGs, a comparison to Commercial Use SCOs, identification and evaluation of three remedial alternatives, and a remedial approach recommendation; and

- **Section 9.0** provides a list of principal personnel and the anticipated work schedule.

2.0 SITE DESCRIPTION AND HISTORY

2.1 Site Description

The Site is located in the City of Olean, Cattaraugus County, New York, at 291 and 299 Homer Street (see **Figures 1 and 2**). The property is currently occupied by MJ Painting, a commercial and industrial painting contractor. According to the City of Olean Assessor's Office on-line property information database, the Site property consists of two parcels:

- 291 Homer Street (0.9 acres; S.B.L. #94.040-1-31); and
- 299 Homer Street (1.6 acres; S.B.L. #94.040-1-32).

The 291 Homer Street portion of the Site includes one metal building which contains offices and a warehouse. The warehouse portion of the building is used to store commercial/industrial painting products and equipment. All portions of the building (office and warehouse) are constructed on concrete piers with slab-on-grade concrete floors (the building does not contain a basement). The 299 Homer Street portion of the Site is currently undeveloped. A gravel road and equipment laydown area is present at the southern portion of the 299 Homer Street property. MJ Painting is currently constructing a new office and warehouse on the 299 Homer Street property in the locations illustrated on **Figure 2** under the currently ongoing NYSDEC-approved Interim Remedial Measures (IRM).

The areas surrounding the building consist mainly of asphalt pavement/concrete and landscaped terrain (see **Figure 2**). According to the property owner (Mr. Mike John) several hundred truck-loads of clean fill material were used to raise the grade of the 291 Homer Street portion of the Site prior to construction of the on-Site building and landscaping. Based on discussions with Mr. John and observations recorded during previous subsurface investigations, portions of the Site include up to 6 feet of clean fill material.

Properties immediately adjacent to the Site include a highway right-of-way (located southeast of the Site) and a vacant industrial property (located northeast of the Site). The highway right-of-way is owned by the New York State Department of Transportation and serves as an embankment supporting Interstate 86 (I-86) or the "Southern Tier Expressway". The vacant industrial property to the northeast is owned by Homer Street Properties LLC, and is undergoing environmental investigation, remediation and redevelopment by Benson

Construction & Development, LLC. Properties on the opposite sides of Homer Street and Johnson Street from the Site include residential properties. Properties in the vicinity (approximately a 0.5-mile radius) of the Site are primarily developed as mixed use and include residential, municipal, commercial, manufacturing and/or industrial properties.

Twomile Creek is located approximately 50 feet southeast of the Site at its closest point (see **Figure 1**). Twomile Creek flows southwest through Olean, New York and discharges to the Allegheny River. According to the NYSDEC Protection of Waters Program, Twomile Creek is considered a Class C stream (suitable for fisheries support or non-contact activities). According to the U.S. Fish and Wildlife National Wetlands Inventory (FWS Wetland Mapper), no other surface water body, wetland or other ecologically significant areas have been identified on the Site, adjacent to or down-gradient from the Site.

The Site and surrounding areas are located within the Allegheny-Ohio-Mississippi River drainage basin and according to the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) for Olean, New York, the Site straddles Zone B and Zone C floodplain areas. Zone B areas are located between the limits of the 100-year floodplain and the 500-year floodplain, which indicate potential for significant flooding every 100 to 500 years. Zone C areas are considered areas of minimal flooding.

2.2 Historical Vicinity Land Use

Historically, according to the April 2006 *Historic and Current Site Conditions Report* prepared by AMEC Earth & Environmental (AMEC), the area in the vicinity of the Site was utilized for industrial operations including, but not limited to: petroleum storage and refining; leather tanning; heavy and light manufacturing; chrome plating; fertilizer manufacturing; and railroad facilities. Properties located to the south and east of the Site were primarily used for petroleum storage/refining by Socony-Vacuum Oil Company, Inc. (Socony) and predecessor companies between 1876 and approximately 1954. The Socony refinery was purchased by Mr. C.J. Simpson in 1954, and operated as a grain storage facility by Mr. Simpson and successor companies through 1964. Felmont Oil Corporation owned the Site from 1964 through 1981. Felmont Oil Corporation manufactured anhydrous ammonia and carbon dioxide for use by the neighboring Agway fertilizer plant. The Cattaraugus County Industrial Development Agency (IDA) acquired the Site in 1981. The 291 Homer

Street portion of the Site remained undeveloped from 1981 until its purchase by MJ Painting. MJ Painting acquired 291 Homer Street from Cattaraugus County IDA in 2002. A playground was present on 299 Homer Street until MJ Painting acquired the property from Cattaraugus County IDA in 2013.

2.3 Project Organization and Responsibilities

Remedial Engineering and Roux Associates, on behalf of MJ Painting, have prepared this Remedial Investigation and Alternatives Analysis Report (RI/AAR). Remedial construction specialty contractors (Contractors), under contract to Roux Associates will complete the work described herein. Remedial Engineering, in consultation with the NYSDEC Division of Environmental Remediation (DER) and the New York State Department of Health (NYSDOH), will monitor the activities to verify that work is performed in accordance with the BCA, the approved RAWP, 6 New York Codes, Rules and Regulations (NYCRR) Part 375, and NYSDEC DER-10 guidance.

3.0 PREVIOUS INVESTIGATIONS

This section summarizes previous Site investigation activities conducted by "Benchmark Consultants" (a/k/a Turnkey Environmental Restoration, LLC) of Buffalo, New York (hereafter "Turnkey") and Roux Associates conducted between May 2011 and November 2012.

3.1 Turnkey Investigation (May 2011)

According to the NYSDEC Spill Report Form for Spill Number 1102014, the owner of MJ Painting (Mr. Mike John) contracted "Benchmark Consultants" (a/k/a Turnkey Environmental Restoration, LLC) of Buffalo, New York (hereafter "Turnkey") to investigate an area of "surface petroleum staining." Subsequent test pits conducted by Turnkey revealed "subsurface tar/heavy oil contaminated fill."

According to information provided to Roux Associates by Turnkey on July 6, 2011, four test pits (identified by Turnkey as TP-1 through TP-4) were excavated in May 2011 along the eastern property boundary of the Property in the area of the surface petroleum staining. According to Turnkey's test pit excavation logs, test pit excavation depths ranged from 6 feet below ground surface (ft-bgs) (TP-3) to 12 ft-bgs (TP-2). Subsurface conditions encountered during the test pit excavations predominantly consisted of sandy silt and gravel (fill material including sand, gravel, brick, steel, and coal fragments). Petroleum impacts were noted in all four test pits at depths ranging from the ground surface (TP-2) to 12 ft-bgs (TP-2). In addition, Turnkey noted that "petroleum like LNAPL" was present at TP-1 (6.5 to 9.5 ft-bgs) and TP-2 (surface to 0.5 ft-bgs, 1 to 1.5 ft-bgs, and 5 to 12 ft-bgs). Turnkey test pit logs are provided as Appendix A.

3.2 Roux Associates Investigation (September 2011 – November 2012)

In September 2011, Roux Associates performed a subsurface investigation associated with NYSDEC Spills Number 1102014 to evaluate the nature and extent of petroleum-impacted soil at 291 Homer Street. Roux Associates installed 17 soil borings, six of which were completed as temporary monitoring wells and three temporary soil vapor points.[5] The 2011 soil boring, monitoring well, and soil vapor point logs are presented in Appendix B. Soil and groundwater

[5] Soil vapor points were installed according to the October 2006 NYSDOH *Guidance for Evaluating Soil Vapor Intrusion in the State of New York.*

samples were collected to evaluate the extent of petroleum impacts in the subsurface, shown on **Figures 3a** and **3b**, respectively. The three soil vapor points were installed under the Site building to facilitate the collection of soil vapor samples to evaluate potential impacts to indoor air and assess potential sub-slab methane concentrations. Soil vapor samples are shown on **Figure 3c**. One soil vapor sample result, SVP-01, exceeds 25% of the lower explosive limit (LEL) for methane. The results of the September 2011 subsurface investigation were reported to NYSDEC in the August 24, 2012 *Revised Subsurface Investigation Summary Report*, included as Appendix O.

In October 2012, Roux Associates performed an additional subsurface investigation associated with NYSDEC Spills Number 102014 to further evaluate the nature and extent of petroleum-impacted soil found along the property boundary between 291 and 299 Homer Street, as well as in the adjacent right-of-way for Interstate 86 (I-86). Roux Associates installed 13 soil borings, seven of which were completed as monitoring wells[6]. The 2012 soil boring and monitoring well logs are presented as Appendix C. These soil boring locations are shown on **Figure 3a.** Soil and groundwater samples were collected to evaluate the extent of petroleum impacts in the subsurface. Additionally, as requested[7] by NYSDEC, in 2012 Roux Associates screened indoor air in the office portion of the 291 Homer Street existing Site building to evaluate if explosive conditions existed within the building based on the soil vapor methane concentrations detected during the 2011 investigation. The 2012 investigation indicated that methane was not present within the 291 Homer Street existing Site building at detectable concentrations. The results of the 2012 investigation were reported to NYSDEC in the March 12, 2013 *Subsurface Investigation Summary Report*, prepared by Roux Associates, provided as Appendix P.

[6] Monitoring wells RXMW-04, RXMW-12, RXMW-13 and RXMW-14 were installed at the locations of September 2011 soil borings RX-04, RX-12, RX-13 and RX-14, respectively.
[7] This request was made verbally from NYSDEC to Roux Associates.

On November 5, 2012 through November 7, 2012, excavation activities were conducted at the Site by Construction Solutions, Inc. of Amesbury, Massachusetts (CSI), under Roux Associates oversight, to remove the "surface petroleum staining" located along the northeast property boundary[8] (see **Figure 2**). The excavation area measured approximately 22 feet by 33 feet (704 square feet) and extended to approximately 12 ft-bgs. The limits of the excavation were determined by the existing driveway to the west, the property boundary to the east and when no visual presence of petroleum impact (tar-like SPH or material consistent with the "surface petroleum staining") was observed to the north and south. In general, no tar-like SPH was observed below approximately 6 ft-bgs. A total of 242.24 tons of soil was excavated and disposed of using a track-mounted excavator, and transported off Site under a Non-Hazardous Special Waste & Asbestos Manifest to the Allied Waste Niagara Falls Landfill LLC in Niagara Falls, New York. Details of the excavation activities were provided to NYSDEC in the March 12, 2013 *Subsurface Investigation Summary Report* (Appendix P).

Soil boring and monitoring well logs recorded by Roux Associates between September 2011 and November 2012 are presented as Appendices B and C, respectively. For the purposes of this report; soil, groundwater, and soil vapor analytical data collected during the 2011 and 2012 investigations are incorporated in the data summary tables as described herein.

[8] In addition to the area excavated to remove the "surface petroleum staining", an overlapping area adjacent to the property driveway was excavated and backfilled with crushed stone in preparation of future paving activities. This area measuring approximately 22 feet by 137 feet (2,688 square feet) was excavated to a depth of approximately 18 inches (See **Figure 2**). During the excavation of the future paved area, no tar-like SPH or material similar to the "surface petroleum staining" was observed outside of the deeper excavation area.

4.0 REMEDIAL INVESTIGATION ACTIVITIES

The following sections summarize the remedial investigation conducted to further characterize the nature and extent of contamination at the Site. As described above, remedial investigation activities included:

1. Collection of surface soil samples;
2. Advancement of test pits and soil borings to evaluate extent of GCM;
3. Collection of subsurface soil samples;
4. Completion of four soil borings as monitoring wells;
5. Collection of groundwater samples from six monitoring wells;
6. Evaluation of the extent of LNAPL and the groundwater flow direction; and
7. Installation of soil vapor monitoring points and collection of soil vapor and ambient air samples.

Remedial investigation activities were performed in accordance with the October 14, 2013 RIWP[9] and January 29, 2014 RIWP Addendum (collectively referred to hereafter as the "RIWP"). In addition to the remedial investigation activities performed in accordance with the RIWP, delineation and remedial activities conducted under the IRM which refine or expand the conceptual understanding of the nature and extent of contamination present at the Site are summarized below.

4.1 Surface Soil Sampling

As outlined in the RIWP, surface soil samples were collected to assess the nature and extent of contamination in surface soil at the Site.

Roux Associates collected twelve surface soil samples (RXTP-01 through RXTP-12) during test pit activities performed from February 25 through February 27, 2014 at the 299 Homer Street property. Six surface samples (RXSS-01 through RXSS-06) were collected from the 291 Homer Street property on February 24, 2014 and May 27, 2014. Surface sample locations are shown on **Figure 3d**.

[9] RIWP revised October 31, 2013

All surface soil samples were collected from 0 to 0.5 ft-bgs, below the vegetation root zone, using hand tools. Note that the RIWP Addendum proposed that surface soil samples would be collected from 0 to 2 inches below ground surface (in-bgs); however, Roux Associates field personnel observed the vegetation root zone extending up to 4 in-bgs. Therefore, surface soil samples were collected from 0 to 6 in-bgs, from immediately below the vegetative root zone. Surface soil samples were submitted to TestAmerica Laboratories, Inc. of Nashville, Tennessee (TestAmerica) (New York National Environmental Laboratory Accreditation Program (NELAP) certification ID: 11342). A sample analysis summary is provided below:

Surface Sample Designation	Analytical Parameters		
	VOC, SVOC, TAL Metals	Total Cyanide, PCBs, Pesticides and Herbicides	TPH
RXTP-01	X	--	--
RXTP-02	X	X	X
RXTP-03	X	--	--
RXTP-04	X	--	--
RXTP-05	X	--	--
RXTP-06	X	X	X
RXTP-07	X	--	--
RXTP-08	X	--	--
RXTP-09	X	--	--
RXTP-10	X	--	--
RXTP-11	X	X	--
RXTP-12	X	X	--
RXSS-01	X	X	--
RXSS-02	X	X	--
RXSS-03	X	X	--
RXSS-04	X	X	--
RXSS-05	X	X	--
RXSS-06	X	X	--

Notes:
Volatile organic compounds (VOCs) and semi-volatile organic compounds (SVOCs) by EPA Methods 8260B and 8270C, respectively
Total Target Analyte List (TAL) Metals[10] by EPA Methods 6010B/7470A
Total cyanide, polychlorinated biphenyls (PCBs), pesticides and herbicides by EPA Methods 9012B, 8082A, 8081B and 8151A respectively
Total Petroleum Hydrocarbons (TPH) by EPA Method 8015
X indicates sample analyzed for parameters indicated
-- indicates sample was not analyzed for parameters indicated

[10] TAL metals include aluminum, antimony, arsenic, barium, beryllium, cadmium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, mercury, nickel, potassium, selenium, silver, sodium, thallium, vanadium, and zinc.

All tools and equipment used during collection of the surface samples were decontaminated between each location. Field decontamination procedures were conducted in general accordance with Roux Associates' Standard Operating Procedures (SOP) 9.1 for Decontamination of Field Equipment.

4.2 Test Pits and Subsurface Soil Sampling

Lewis Environmental, Inc. (Lewis) excavated twelve test pits under Roux Associates' supervision, from February 25 through February 27, 2014 (**Figure 3a**). The test pits were advanced to delineate the extent of GCM in the subsurface at the 299 Homer Street property. Subsurface soil samples were collected from intervals observed to contain GCM and from beneath the vertical extent of GCM to vertically delineate the extent of soil contamination at the Site.

Test pits were advanced to a final depth determined by the following observations:

1. GCM was no longer encountered; or
2. Subsurface conditions limited further advancement (e.g., sidewall sloughing and/or groundwater infiltration).

Test pit depths ranged from 7 ft-bgs (RXTP-01) to 14 ft-bgs (RXTP-03). All excavation spoils were temporary stockpiled on polyethylene sheeting and backfilled into the corresponding test pit upon completion. All tools and equipment used during test pit activities were decontaminated between each location.

Each soil sample interval was characterized and the soil headspace was screened using a calibrated photoionization detector (PID). Soil descriptions, water content, evidence of petroleum impacts, and soil headspace screening results are documented in the test pit logs included as Appendix D.

Two subsurface soil samples were collected from each test pit with the exception of RXTP-02 (three samples) and RXTP-11 (one sample). Subsurface soil samples were submitted to TestAmerica for laboratory analysis. Test pit subsurface sample collection criteria included:

1. Most likely impact due to soil headspace screening results or visual and/or olfactory evidence of contaminated material; and/or

2. The deepest extent of the test pit.

A total of 24 soil samples were submitted to TestAmerica for the analysis of VOCs, SVOCs, and target analyte list (TAL) metals. In accordance with the RIWP, RXTP-10 (6-8) was also submitted for TPH analysis. Sample intervals are outlined below:

Surface Sample Designation	Sample Interval (ft-bgs)
RXTP-01	2 – 3
	6.5 – 7
RXTP-02	3 – 4
	6 – 7
	8 – 9
RXTP-03	3 – 4
	14
RXTP-04	2 - 4
	12
RXTP-05	3 – 7
	10
RXTP-06	10
	12
RXTP-07	6 – 7
	10
RXTP-08	5 – 7
	11
RXTP-09	7 – 8.5
	9 – 10
RXTP-10	6 – 8
	8 – 9
RXTP-11	11
RXTP-12	7 – 8.5
	12

4.3 Soil Boring Subsurface Soil Sampling

Following completion of test pit activities, additional soil borings were proposed in a letter to NYSDEC dated May 19, 2014, to complete characterization of the nature and extent of contamination at the Site in accordance with the RIWP and RIWP Addendum. NYSDEC verbally approved the locations of the proposed soil borings on May 23, 2014, and approved in writing via email correspondence on May 28, 2014. Parratt-Wolff, Inc. (Parratt-Wolff) of East Syracuse, New York advanced 10 soil borings under the supervision of Roux

Associates' personnel from May 26 through May 29, 2014. The locations of these soil borings are shown on **Figure 3a**. RI boring logs are provided in Appendix E-1.

Soil borings were advanced to 5 ft-bgs using non-mechanical hand tools (pre-clearing). Soil borings were then advanced to 20 ft-bgs via a truck mounted combination direct push and hollow stem auger (HSA) drilling rig operated by Parratt-Wolff. Continuous soil sampling was conducted by collecting grab samples during pre-clearing and by observing 4 foot soil cores collected by the drill rig, respectively. Soil conditions were examined for evidence of potential petroleum impacts (i.e., staining, odor) and screened for the potential presence of VOCs in soil headspace using a PID.

In accordance with the RIWP, soil cuttings were returned to corresponding boreholes with the exception of soil that contained free product, LNAPL, or GCM which was placed in Department of Transportation (DOT) approved 55-gallon steel drums and temporarily stored on-Site. Drummed soil cuttings were sampled as discussed in **Section 4.4** and characterized for preparation of a lead-impacted soil disposal profile. Drummed soil cuttings were transported off-Site by Tonawonda Tank for disposal to CWM Chemical Services, L.L.C. at 1550 Balmer Road, Model City, New York 14107 on July 31, 2014. The final hazardous waste manifest is included as Appendix F.

Soil samples were selected for laboratory analysis based on visual classification of subsurface conditions during soil boring advancement to target areas of potential fill material. One sample (RX-30/18-20) was analyzed for VOCs, SVOCs, and TAL metals to complete vertical delineation of residual contamination present beneath GCM at the location of the previously installed test pit RXTP-05. In accordance with the RIWP, four additional soil samples were submitted to TestAmerica for analysis of total cyanide, PCBs, pesticides and herbicides to characterize subsurface soil conditions in accordance with the RIWP. A summary of sample depth intervals and laboratory analysis are summarized below:

Surface Sample Designation	Depth Interval (ft-bgs)	Analytical Parameters	
		Total Cyanide, PCBs, Pesticides and Herbicides	VOC, SVOC, TAL Metals
RX-29	8-10	X	--
RX-30	18-20	--	X
RX-32	2.5-4.5	X	--
RX-34	5-7	X	--
RX-35	9-11	X	--

4.4 Waste Characterization Sampling

Composite soil samples were collected from three locations to pre-characterize soil conditions to facilitate off-Site disposal during future remedial excavation activities. Composite[11] soil samples were collected from boring locations RX-30 (0 to 10 ft-bgs), RX-35 (0 to 9 ft-bgs), and RX-36 (0 to 8 ft-bgs) and analyzed for VOCs, TCLP VOCs, SVOCs, TCLP SVOCs, TPH, PCBs, pesticides, herbicides, RCRA metals, TCLP RCRA metals and general chemistry. Analytical results from soil sample RX-30 (0 to 10 ft-bgs) were used to characterize lead-impacted soil generated during soil boring advancement as part of the RI. Analytical results from soil samples RX-35 (0 to 9 ft-bgs) and RX-36 (0 to 8 ft-bgs) were used to provide a preliminary indication of the soil waste profile, but will not be used further to characterize soil for disposal.

4.5 Additional Lead Characterization

Per NYSDEC request, two soil samples, RX-30 (11 to 12 ft-bgs) and RX-36 (6 to 8 ft-bgs), were collected from areas of elevated lead concentrations identified in soil during the February 2014 test pit activities. Soil samples were submitted for TCLP metals analysis to determine if metals in soil in these locations are readily leachable.

Further delineation of the RX-30 soil boring was conducted during the IRM as described below in Section 4.8.

4.6 Groundwater Investigation

Four soil borings were completed as monitoring wells (RXMW-27, RXMW-28, RXMW-31, and RXMW-33, see **Figure 3b**) in order to assess the direction of groundwater flow, the extent of LNAPL at the Site, and the nature and extent of groundwater contamination at the Site.

[11] These composite samples were collected in order to increase Roux Associates understanding of the Site soil chemistry conditions. These samples were not used for waste profiling.

Monitoring well locations were selected based on conditions encountered during test pit excavation and soil borings activities to permit characterization of impacts to groundwater along the up-gradient and down-gradient Site boundaries. Monitoring well locations are shown on **Figure 3b**.

4.6.1 Monitoring Well Installation and Development

Monitoring wells were constructed with two-inch diameter, 0.10-inch slotted schedule 40 polyvinyl chloride (SCH 40 PVC) screen (well screen) with an appropriate length of solid SCH 40 PVC riser to extend the monitoring well to approximately surface grade. Each monitoring well was installed so that the well screen intersects the observed water table. Well screen intervals are summarized in the following table:

Monitoring Well ID	Screen Interval (ft-bgs)
RXMW-27	7 - 17
RXMW-29	6 - 16
RXMW-31	3 - 13
RXMW-33	3 - 13

The annulus around each monitoring well was filled with silica sand from the bottom of the monitoring well to approximately one foot above the top of the well screen (filter-pack). Approximately two feet of hydrated bentonite was placed above the filter-pack in each monitoring well to provide a sanitary seal. The remainder of the annular space was filled with drill cuttings generated during soil boring advancement that did not contain free product, LNAPL or GCM. All monitoring wells were fitted with a locking gripper plug and completed with a flush-mounted road box. A summary of RI monitoring well construction details is provided in the monitoring well installation logs included as Appendix E-1.

Following monitoring well installation, Parratt-Wolff developed the four newly installed monitoring wells and seven existing monitoring wells to remove silt from the well screen and to improve gradation of the filter-pack. Well development activities were conducted under Roux Associates' oversight and in accordance with Roux Associates' SOP for developing monitoring wells in unconsolidated formations. During monitoring well development, Roux Associates observed evidence (e.g. steady recharge, clear water) that nine of the eleven monitoring wells are well connected to the surrounding groundwater at the Site. Monitoring wells RXMW-12 and

RXMW-14 exhibited low recharge rates indicating a poor connection to the surrounding groundwater formation.

Groundwater evacuated from monitoring wells during well development was placed in DOT-approved 55-gallon drums and temporarily stored on-Site. Groundwater stored on-Site was removed via vacuum truck by Construction Solutions Inc. on July 19, 2014 for off-Site disposal at Tradebe Treatment and Recycling Northeast, LLC (Tradebe). The remedial contractor transported the groundwater under a general oily water waste profile and the groundwater was tested by Tradebe at the point of disposal, meeting Tradebe's requirements for disposal of oily water. The final non-hazardous waste manifest is included as Appendix G.

4.6.2 Groundwater Gauging and Sampling

Following monitoring well development, monitoring wells at the Site were gauged using an electronic interface probe to measure the depth to groundwater and the presence and thickness, if present, of LNAPL. Groundwater gauging results including LNAPL thicknesses are summarized in **Table 1**.

Groundwater samples were collected on June 3 and June 4, 2014 from six monitoring wells including three monitoring wells on the up-gradient portion of the Site (i.e. adjacent to Homer Street), and three monitoring wells on the down-gradient portion of the Site (i.e. adjacent to or on the NYSDOT right-of-way). Groundwater samples were collected in general accordance with EPA low-flow sampling methodology. Physical and chemical parameters (e.g., temperature, conductivity, pH, dissolved oxygen, turbidity) were monitored in real time. Groundwater samples were collected when these parameters reached a steady-state, indicative of groundwater from the aquifer, as opposed to stagnant water within the well. Real-time monitoring information was documented on field forms included as Appendix H.

Groundwater samples were collected and submitted to TestAmerica for analyses including:

- VOCs and SVOCs by EPA Methods 8260C and 8270D, respectively;
- TAL Metals by EPA Methods SW846 (unfiltered);
- PCBs, pesticides, herbicides, and total cyanide by EPA Methods 8082A, 8081B, 8151A, respectively; and

- TPH by EPA Method 8015D.

One blind field duplicate sample and one matrix spike/matrix spike duplicate (MS/MSD) were collected to evaluate data quality. These data were evaluated in the Data Usability Summary Report (DUSR) prepared by Roux Associates (presented as Appendix M) and described below in **Section 5.5** in accordance with Appendix 2B of DER-10.

4.7 Soil Vapor Point Installation and Sampling

The soil vapor investigation was designed in accordance with Section 2.6.1 of New York State Department of Health's (NYSDOH) October 2006 Final Guidance for Evaluating Soil Vapor Intrusion in the State of New York (NYSDOH Guidance) to identify the presence of soil vapor contamination:

- in the vicinity of the suspected source of soil vapor contamination (i.e. GCM present in soil) to evaluate potential future on-Site exposure;
- near the occupied building at the Site to evaluate current on-Site exposure; and
- along the Site perimeter to evaluate the potential for off-Site migration of soil vapor contamination that could result in an off-Site exposure.

Seven soil vapor points were installed from May 26 through May 29, 2014 at the Site to meet these objectives. Further, soil vapor migration may occur along preferential pathways or through zones of more permeable material, not necessarily in the direction of groundwater flow or surface elevation change. Underground utilities that may pose a preferential migration pathway are present along Homer Street (see **Figure 3c**).

NYSDOH Guidance specifies that soil vapor samples for evaluation of potential on-Site exposure be collected at a depth comparable to the depth of foundation footings (determined on a building-specific or Site-specific basis) or at least one foot above the water table in areas where the groundwater table is less than six feet below grade. Although soil vapor samples collected at a depth shallower than five feet below ground surface may be prone to negative bias due to infiltration of outdoor air, the depth to groundwater at the Site and to the potential source of soil vapor contamination (i.e. GCM present in soil) is generally six feet or less at the Site. Further, the existing and proposed on-Site buildings are or will be constructed with slab-on-grade construction with pillar footings extending approximately 2.5

feet to 4 feet below ground surface. Therefore, soil vapor points were installed to depths between 2.5 feet and 4 feet below ground surface. The 2014 soil vapor point screen intervals and purpose are outlined in the table below and locations are shown in **Figure 3c**.

Soil Vapor Point ID	Screen Interval (ft-bgs)	Purpose
SVP-04	3.5 - 4	Site boundary to evaluate potential for off-Site migration In the vicinity of underground sewer line to evaluate preferential migration pathway
SVP-05	3.5 - 4	Site boundary to evaluate potential for off-Site migration In the vicinity of underground sewer line to evaluate preferential migration pathway
SVP-06	2.5 - 3	Site boundary to evaluate potential for off-Site migration
SVP-07	2.5 - 3	Site boundary to evaluate potential for off-Site migration
SVP-08	3.5 - 4	Site boundary to evaluate potential for off-Site migration
SVP-09	3.5 - 4	Site boundary to evaluate potential for off-Site migration In the vicinity of underground water line to evaluate preferential migration pathway
SVP-10	3 - 3.5	In the vicinity of GCM (i.e., the suspected source of soil vapor contamination Adjacent to existing building to evaluate current on-Site exposure

Soil vapor points were constructed by installing a six-inch long, stainless steel sample screen to the depth indicated above. Teflon-lined polyethylene tubing was attached to each sample screen, and extended to above surface grade. Coarse #2 sand was added around the soil vapor point sample screen to six inches above the top of the screen. A one foot thick layer of bentonite was placed above the sand. The remainder of the boring annulus was filled with a cement-bentonite grout. The soil vapor point was completed to grade with a secure, five-inch diameter, flush-mounted curb box set in a concrete pad.

Following installation, six of seven soil vapor points were sampled on June 4, 2014. SVP-08 could not be sampled due to an elevated water table being above the dedicated sample point depth, resulting in the presence of water in the soil vapor point tubing. An ambient air sample was also collected on June 4, 2014 from approximately 4.5 feet above ground surface in the vicinity of SVP-09 and SVP-10. All soil vapor and ambient air samples were collected in accordance with the NYSDOH Guidance using the following procedure:

1. Each soil vapor point, including sample tubing and the surrounding sand pack, was purged of approximately three volumes of air using a vacuum pump set at a rate of approximately 0.2 liters per minute.

2. Tracer gas testing was conducted on all soil vapor points to verify that ambient air did not dilute the soil vapor sample during collection. Tracer gas testing included:

   a) Isolating the soil vapor point beneath a plastic container (i.e., a five gallon bucket);

   b) Injecting tracer gas (i.e. helium) into the sealed plastic container during purging of the soil vapor point to create a tracer gas enriched environment within the sealed plastic container;

   c) Screening both the air purged from the soil vapor point and air drawn from the tracer gas enriched environment within the sealed plastic container for the tracer gas using a Dielectric MGD-2002 helium detector; and

   d) Comparing the screening results from the soil vapor point to the screening results in the tracer gas enriched environment within the sealed plastic container. If the helium concentration observed in air drawn from the soil vapor point is less than 10% of the helium concentration in the tracer gas enriched environment within the sealed plastic container, the soil vapor point is considered to be free from ambient air impacts (i.e., leaks resulting in sample dilution).

3. Soil vapor samples were collected using a laboratory-supplied, calibrated flow controller to direct soil vapor or ambient air, as applicable, at a rate of 0.2 liters per minute or less, to a 6-liter Summa canister.

Screening results for all six monitoring points showed that the concentration of helium detected within the sample tubing was less than 10% of the helium concentration found in the bucket indicating that ambient air dilution was not occurring. The screening data is provided in the soil vapor sampling forms enclosed as Appendix I. As shown, no leaks were detected during this sampling round.

Additionally on March 24, 2015, pursuant to NYSDEC and NYSDOH comments received on March 2, 2015 in response to the RI/AAR dated January 30, 2015, an additional sub-slab vapor point sample, SVMP-07, was collected for methane analysis. SVMP-07 was collected immediately beneath the existing slab, adjacent to the 2011 Subsurface Investigation sample SVP-01 (**Figure 3c**). Specifically, sample SVMP-07 was collected to evaluate the sub-slab methane soil vapor concentration to confirm that methane is not present at levels above 25% of

the LEL in the vicinity of SVP-01. The sub-slab vapor point sample was collected according to NYSDOH guidance. Field data and screening data are included as Appendix I.

Samples were submitted to Accutest Laboratories of New England (Accutest) in Marlborough, Massachusetts (NY NELAP certification ID: 11791), and analyzed for methane using EPA Method SW846 8015M and for VOCs using EPA Method TO-15.

4.8 IRM Delineation and Remedial Activities Sampling

Roux Associates and Remedial Engineering conducted IRM activities at the Site in accordance with the NYSDEC approved September 5, 2014 IRMWP. The IRM activities were conducted between September 29, 2014 and March 6, 2015 to facilitate Site redevelopment. As part of the IRM, a pre-characterization subsurface soil sampling program was completed at the Site on September 29, 2014 and September 30, 2014. The pre-characterization soil sampling program included advancing 29 soil borings including:

- Eight borings (RX-22A through RX-22H) to further delineate horizontal and vertical extent of elevated PAHs above 500 milligrams per kilogram (mg/kg) in potentially non-GCM impacted soil surrounding RI soil boring RX-22;
- Eight borings (RX-30A through RX-30H) to further delineate horizontal and vertical extent of leachable lead above 5 milligrams per liter (mg/L) surrounding RI soil boring RX-30; and
- Thirteen borings (RU-01 through RU-11, RX-EXP-1, and RX-EXP-2) for the pre-characterization of reuse and disposal soils from within the anticipated IRM excavation footprint.

Two additional borings, RX-101 and RX-102, were advanced adjacent to the existing building and within the utility corridor in an effort to determine the extent of GCM and evaluate the need for sheet piling and/or soft-digging techniques during excavation activities. Boring locations are summarized in **Figure 7** and boring logs are included as **Appendix E-2.**

4.8.1 Delineation of PAH Impacted RI Soil Boring RX-22

Eight soil borings, RX-22A through RX-22H, were advanced to delineate the horizontal and vertical extent of potentially non-GCM impacted overburden soil with total PAHs concentrations above 500 mg/kg in the vicinity of RI soil boring RX-22 as described in Section 4.9 of the IRMWP. The eight delineation borings were advanced to 8 ft-bgs. The IRM soil sampling plan

was designed to collect non-GCM soil samples above GCM at each location and analyze for PAH analysis using EPA Method 8270D.

The locations of soils borings RX-22A through RX-22H are depicted on **Figure 7**.

4.8.2 Delineation of Leachable Lead Impacted RI Soil Boring RX-30

Eight soil borings, RX-30A through RX-30H, were advanced to a depth of 12 ft-bgs in the vicinity of the RI sample RX-30 to horizontally and vertically delineate the extent of soil containing leachable lead above 5 mg/L as described in Section 4.10 of the IRMWP. Discrete samples were collected from within three intervals (0-4 ft-bgs, 4-8 ft-bgs and 8-12 ft-bgs) at each RX-30 delineation boring location and analyzed for TCLP Lead Leachability.

The locations of soil borings RX-30A through RX-30H are depicted on **Figure7**.

4.8.3 Reuse Pre-Characterization

Thirteen soil borings, RU-01 through RU-11, RX-EXP-1, and RX-EXP-2, were advanced to approximately 12 ft-bgs to determine if the material can be reused on-Site as backfill, as described in Section 4.6.2 of the IRMWP. Eleven discrete VOC samples and four composite reuse suite[12] samples were collected from non-GCM impacted intervals, in accordance with characterization requirements outlined in NYSDEC DER-10 Table 5.4(e)10, providing characterization for a total reuse soil volume of 3,000 cubic yards. The eleven discrete VOC samples were collected from soil borings RU-01 through RU-11. The four composite reuse suite samples were collected from soil borings RU-02, RU-04, RU-07, and RU-10. Soil borings RX-EXP-1 and RX-EXP-2 were advanced only to visually delineate the extent of GCM within the footprint of the proposed IRM excavation.

The locations of soil borings RU-01 through RU-11, RX-EXP-1, and RX-EXP-2 are depicted on **Figure 7**.

4.8.4 Waste Disposal Pre-characterization

Waste disposal pre-characterization soil samples were collected prior to excavation activities to facilitate live-loading of GCM for transportation and off-Site disposal. Waste characterization samples were collected from ten soil borings including RU-01 through RU-10. These samples

[12] According to NYSDEC DER-10 Table 5.4(e)10 composite samples are to be analyzed for SVOCs, Inorganics, PCBs, and Pesticides.

were collected at intervals to adequately characterized GCM-impacted soil to be disposed off-Site. A total of ten waste characterization samples were collected. As outlined below, nine of the waste characterization samples collected were composited by Accutest into the three composite waste characterization samples identified as "WC-COMP-A", "WC-COMP-B", and "WC-COMP-C". The tenth waste characterization sample WC-10 was not composited due to an elevated field soil headspace screening result measurement[13] and was analyzed as a discrete sample. The three composited samples and WC-10 were analyzed for TCLP VOCs, TCLP SVOCs, PCBs, TCLP Resource Conservation and Recovery Act (RCRA)-8 metals, ignitability, flashpoint, pH, and percent solids.

Waste Characterization Samples			
Laboratory Composited Sample	Waste Characterization Discrete Sample	Corresponding Reuse Boring Location	Sample Depth Interval (ft-bgs)
WC-COMP-A	WC-01	RU-1	7-8
	WC-02	RU-2	7-10
	WC-03	RU-3	5-8
WC-COMP-B	WC-04	RU-4	5-8
	WC-05	RU-5	6-10
	WC-08	RU-8	5-8
WC-COMP-C	WC-06	RU-6	5-8
	WC-07	RU-7	7-12
	WC-09	RU-9	5-8
--	WC-10	RU-10	6-9

Waste characterization sample locations are illustrated on Figure 7 and identified according to the corresponding re-use boring location as summarized above.

[13] The WC-10 soil headspace screening result was 711.3 ppm and the results for the other nine samples were all less than 200 ppm.

5.0 REMEDIAL INVESTIGATION RESULTS

The following sections describe the validated results of the field investigation activities which were conducted in accordance with the scope of work described in **Section 4.0**. Additionally for reference; soil, groundwater, and soil vapor data collected during the 2011 and 2012 subsurface investigations associated with NYSDEC Spills Number 1102014 are incorporated in the data summary tables as described herein.

5.1 Surface Soil Sampling Results

A total of eighteen surface soil samples were collected during test pitting and soil boring activities in February and May 2014 and were submitted for laboratory analysis to characterize the contaminant concentrations in soil available for direct contact. A summary of surface soil analytical results is presented below including the number of detected compounds, the number of compounds exceeding Commercial Use SCOs and the locations where soil samples exceeded Commercial Use SCOs. Surface soil analytical results for samples collected during the 2014 investigation activities are summarized in **Table 2**. The analytical laboratory reports are provided in Appendix J.

5.1.1 Volatile Organic Compounds

Eighteen soil samples were analyzed for volatile organic compounds (VOCs) by TestAmerica according to EPA Method 8260C. TestAmerica reported that:

- Twelve VOCs were detected above the laboratory reporting limits (RLs) in surface soils; and
- No VOCs were detected in surface soils above the Commercial Use SCOs.

VOC surface soil results are summarized in **Table 2**.

5.1.2 Semi-Volatile Organic Compounds

Eighteen soil samples were analyzed for semi-volatile organic compounds (SVOCs) by TestAmerica according to EPA Method 8270C. TestAmerica reported that:

- Nineteen SVOCs were detected above the laboratory RLs in surface soils; and
- Two SVOCs were detected in surface soils above the Commercial Use SCOs including:

- Benzo(a)pyrene (RXTP-08); and
- Dibenzo(a,h)anthracene (RXTP-08).

SVOC surface soil results are summarized in **Table 2**.

5.1.3 TAL Metals

Eighteen soil samples were analyzed for TAL metals by TestAmerica according to EPA Methods 6010B, 7470A, and 7471B. TestAmerica reported that:

- Twenty-one TAL metals were detected above the laboratory RLs; and
- One TAL metal, arsenic (RXSS-01, RXTP-03, and RXTP-08), was detected in surface soils above the Commercial Use SCOs:

TAL surface soil results are summarized in **Table 2**.

5.1.4 Gasoline and Diesel Range Organics

Two soil samples were analyzed for gasoline and diesel range organics by TestAmerica according to EPA Methods M8015D and 8015V. TestAmerica reports that:

- Diesel range organics were detected above the laboratory RLs at two locations;
- Gasoline range organics were not detected above the laboratory RLs; and
- There are no Commercial Use SCOs for gasoline or diesel range organics.

Gasoline and diesel range organics surface soil results are summarized in **Table 2**.

5.1.5 Organochlorine Pesticides, Herbicides, and Polychlorinated Biphenyls

Ten soil samples were analyzed for organochlorine pesticides, herbicides, and polychlorinated biphenyls (PCBs) by TestAmerica according to EPA Methods 8081B, 8151AB, and 8082A, respectively. TestAmerica reports:

- No organochlorine pesticides were detected above the laboratory RLs;
- No herbicides were detected above laboratory RLs; and
- No PCBs were detected above the laboratory RLs.

Organochlorine pesticides, herbicides, and PCBs surface soil results are summarized in **Table 2**.

5.1.6 General Chemistry

Ten soil samples were analyzed for cyanide by TestAmerica according to EPA Method SW9012. TestAmerica reports that:

- Cyanide was detected above the laboratory RL in one sample, but did not exceed the Commercial Use SCO.

Cyanide surface soil results are summarized in **Table 2**.

5.2 Subsurface Soil Sample Results and GCM Observations

RI subsurface soil samples were collected for analytical laboratory analysis to delineate nature and extent of soil contamination. Subsurface soil samples were collected from multiple discrete depth intervals to facilitate vertical delineation (see **Section 6.0**). In addition three composite subsurface soil samples were collected to characterize soil for disposal. In total, 12 test pits and three soil boring locations were sampled (some locations include multiple depth intervals) during test pitting and soil boring activities. A summary of RI subsurface soil analytical results is presented below including the number of detected compounds, the number of compounds exceeding Commercial Use SCOs and the locations where soil samples exceeded Commercial Use SCOs. RI subsurface analytical results are provided in **Table 3b**. The analytical laboratory reports are provided in Appendix J. NYSDEC Spill Number 1102014 subsurface sample results from the 2011 and 2012 investigations are provided in **Table 3a** and summarized in Appendix O and P, respectively.

5.2.1 Volatile Organic Compounds

Fifteen soil samples were analyzed for VOCs by TestAmerica according to EPA Method 8260C. TestAmerica reports that:

- Nineteen VOCs were detected above the laboratory RLs in subsurface soils; and
- No VOCs were detected in subsurface soils above the Commercial Use SCOs.

VOC subsurface soil results are summarized in **Table 3b**.

5.2.2 Semi-Volatile Organic Compounds

Fifteen soil samples were analyzed for SVOCs by TestAmerica according to EPA Method 8270C. TestAmerica reports that:

- Twenty-nine SVOCs were detected above the laboratory RLs in subsurface soils;
- Five SVOCs were detected in subsurface soils above the Commercial Use SCOs including:
    - Benzo(a)anthracene (RXTP-02, RXTP-05, RXTP-06, RXTP-10);
    - Benzo(a)pyrene (RXTP-02, RXTP-05, RXTP-06, RXTP-10, RXTP-12, RXTP-30, RXTP-35, and RXTP-36);
    - Benzo(b)fluoranthene (RXTP-05, RXTP-06, RXTP-10);
    - Dibenz(a,h)anthracene (RXTP-03, RXTP-05, RXTP-10); and
    - Indeno(1,2,3-c,d)pyrene (RXTP-05, RXTP-10).

SVOC subsurface soil results are summarized in **Table 3b**.

5.2.3 TAL Metals

Fifteen soil samples were analyzed for TAL metals by TestAmerica according to EPA Methods 6010B, 6010C, 7470A, and 7471B. TestAmerica reports that:

- Twenty-one TAL metals were detected above the laboratory RLs in subsurface soil samples;
- Three TAL metals were detected in subsurface soil samples above the Commercial Use SCOs including;
    - Arsenic (RXTP-01, RXTP-02, RXTP-03, RXTP-04, RXTP-05, RXTP-06, RXTP-07, RXTP-08, RXTP-09, RXTP-10. RXTP-11, RXTP-12, and RX-30);
    - Lead (RXTP-02, RXTP-03, RXTP-05, RXTP-08, RXTP-10, RXTP-12); and
    - Mercury (RXTP-04, RXTP-08, RXTP-10).

TAL metals subsurface soil results are summarized in **Table 3b**.

5.2.4 Gasoline and Diesel Range Organics

Three soil samples were analyzed for gasoline and diesel range organics by TestAmerica according to EPA Methods M8015D and 8015V. TestAmerica reports that:

- Gasoline and diesel range organics were detected above the laboratory RLs at one location (RXTP-10).

Gasoline and diesel range organics subsurface soil results are summarized in **Table 3b**.

5.2.5 Organochlorine Pesticides, Herbicides, and PCBs

Four soil samples were analyzed for organochlorine pesticides, herbicides, and PCBs by TestAmerica according to EPA Methods 8081B, 8151AB, and 8082A, respectively. TestAmerica reports that:

- No organochlorine pesticides were detected above the laboratory RLs;
- No herbicides were detected above laboratory RLs; and
- No PCBs were detected above the laboratory RLs.

Organochlorine pesticides, herbicides, and PCBs subsurface soil results are summarized in **Table 3b**.

5.2.6 General Chemistry

Four subsurface soil samples were analyzed for cyanide by TestAmerica according to EPA Method SW9012. TestAmerica reports that Cyanide was not detected above the laboratory RL

Cyanide subsurface soil results are summarized in **Table 3b**.

5.2.7 Waste Characterization

Three composite soil samples were analyzed for VOCs, TCLP VOCs, SVOCs, TCLP SVOCs, TPH, PCBs, pesticides, herbicides, RCRA metals, TCLP RCRA metals and general chemistry to pre-characterize GCM-containing soil for waste disposal (i.e., as part of the remedy in **Section 8.0**). Waste characterization soil results are summarized in **Table 7**. Soil sample results for RX-30 (0-10) were submitted and approved by the waste disposal facility for disposal of lead-impacted soil generated during soil boring advancement during the RI (see **Section 4.4**). Future waste disposal profiles will be prepared based on soil samples collected in accordance with the appropriate work plan.

5.2.8 Additional Metals Characterization Analysis

Two soil samples, RX-30 (11 to 12 ft-bgs) and RX-36 (6 to 8 ft-bgs), were analyzed for TCLP metals by TestAmerica according to EPA Method 6010C and 7470A. TestAmerica reports that:

- TCLP lead was detected above the laboratory RL in two locations.
- No other metal was detected above the laboratory RL using the TCLP.

A summary of TCLP analysis results are presented in **Table 7**.

5.2.9 Grossly Contaminated Media Observations

The extent of GCM[14] in the subsurface was delineated by visual and olfactory observations and soil headspace screening of soil samples collected during test pit and soil boring activities (e.g. "detectable without laboratory analysis"). Subsurface conditions and observations regarding the potential presence of GCM are documented in test pit and soil boring logs included as Appendices D and E, respectively. Subsurface conditions consist predominantly of fill materials (varying amounts of sand, silt, gravel and cobbles with inclusions of tar, ash, coal, brick, wood and metal fragments) to varying depths ranging from ground surface to approximately 10 ft-bgs. Fill material is underlain by native soil consisting of predominantly gray, tan or brown, silt, sand and gravel.

GCM was present in ten test pit and three soil borings installed during the Remedial Investigation at the Site. A summary of GCM thicknesses is presented as **Table 4**.

Generally, GCM was encountered in the northeastern, northwestern and southern portions of the 299 Homer Street property, with GCM thicknesses decreasing towards the western boundary of the Site, adjacent to Homer Street. GCM was not encountered between the underground sewer utility and Homer Street. GCM was encountered in ten test pit locations at depths ranging from 2 to 14 ft-bgs, and in three soil borings at depths from 3 to 16 ft-bgs. The maximum observed GCM thickness was 13 feet and the maximum observed depth of GCM was 16 ft-bgs in the combined location of RXTP-05 and RX-30.

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[14] GCM is defined in NYSDEC DER-10 Technical Guidance for Site Investigation and Remediation, dated May 3, 2010, as "soil, sediment, surface water or groundwater which contains sources or substantial quantities of mobile contamination in the form of NAPL that is identifiable either visually, through strong odor, by elevated contaminant vapor levels or is otherwise readily detectable without laboratory analysis."

The approximate extent of GCM beneath 291 and 299 Homer Street is displayed on **Figure 4**. The approximate extent of GCM illustrated beneath 299 Homer Street on **Figure 4** was determined using observations recorded during the 2011 and 2012 subsurface investigations, the 2014 RI, and refined with observations from the recent IRM. The approximate extent of GCM illustrated beneath 291 Homer Street on **Figure 4** was determined from field observations recorded during the 2011 and 2012 subsurface investigations in addition to the 2014 RI field observations. Observations collected from excavation, test pit, and soil borings at the Site between 2011 and 2014 indicate the distribution of GCM is more discretized beneath 291 Homer Street than the more continuous distribution of GCM observed beneath 299 Homer Street.

5.3 Groundwater Analytical Results

Six groundwater samples were collected and submitted for laboratory analysis from monitoring wells RXMW-04, RXMW-24, RXMW-27, RXMW-28, RXMW-31, and RXMW-33. Groundwater sample results were compared to NYSDEC GA AWQSGVs, where available. A summary of groundwater analytical results is presented below including the number of detected compounds, the number of compounds exceeding AWQSGVs and the locations where groundwater samples exceeded AWQSGVs. RI groundwater analytical results discussed below are summarized in **Table 5b**. Analytical laboratory reports are provided in Appendix K. NYSDEC Spill Number 1102014 groundwater sample results from the 2011 and 2012 investigations are provided in **Table 5a** and summarized in Appendix O and P, respectively.

5.3.1 Volatile Organic Compounds

Six groundwater samples were analyzed for VOCs by TestAmerica according to EPA Method 8260C. TestAmerica reports:

- Eighteen VOCs were detected above the laboratory RLs;
- Six VOCs were detected above the AWQSGVs in the groundwater sample collected from RXMW-33, including:
    - Benzene;
    - Toluene;

- 1,2,4-Trimethylbenzene;
- 1,3,5-Trimethylbenzene;
- o-Xylene; and
- Total Xylenes.

VOC concentrations were not encountered above the AWQSGVs in groundwater samples from the five other monitoring wells sampled during the Remedial Investigation. VOC groundwater results are summarized in **Table 5b**.

5.3.2 Semi-Volatile Organic Compounds

Six groundwater samples were analyzed for SVOCs by TestAmerica according to EPA Method 8270C. TestAmerica reports that:

- Two SVOCs were detected in at least one groundwater sample above the laboratory RLs;
- No SVOCs were detected in groundwater samples above the AWQSGVs.

SVOCs groundwater results are summarized in **Table 5b**.

5.3.3 Total Metals

Six groundwater samples were analyzed for TAL metals by TestAmerica according to EPA Methods 6010C and 7470A. TestAmerica reports that:

- Thirteen metals were detected in at least one groundwater sample above the RLs;
- Four metals were detected above the AWQSGVs in groundwater samples including:
  - Iron (RXMW-24, RXMW-27, RXMW-28, RXMW-31, RXMW-33)
  - Magnesium (RXMW-33);
  - Manganese (RXMW-24, RXMW-27, RXMW-28, RXMW-31, RXMW-33); and
  - Sodium (RXMW-04, RXMW-24, RXMW-27, RXMW-28, RXMW-31, RXMW-33).

TAL metals groundwater results are summarized in **Table 5b**.

5.3.4 Herbicides, Pesticides, and PCBs

Six groundwater samples were analyzed for herbicides, pesticides, and PCBs by TestAmerica according to EPA Methods 8151A, 8081B, and 8082A respectively. TestAmerica reports that:

- No organochlorine pesticides were detected above the laboratory RLs;
- No herbicides were detected above laboratory RLs; and
- No PCBs were detected above the laboratory RLs.

Herbicides, pesticides, and PCBs groundwater results are summarized in **Table 5b**.

5.3.5 General Chemistry

Six groundwater samples were analyzed for cyanide by TestAmerica according to EPA Methods 9012A. TestAmerica reports that:

- Cyanide was detected above the laboratory RL but not above the AWQSGVs at one location (RXMW-04).

Cyanide monitoring wells groundwater results are summarized in **Table 5b**.

5.3.6 Petroleum Fingerprinting (GRO/DRO)

Six groundwater samples were analyzed for petroleum fingerprinting by TestAmerica according to EPA Method 8015D. TestAmerica reports that:

- GRO/DRO were detected above the laboratory RLs at five locations (RXMW-24, RXMW-27, RXMW-28, RXMW-31, RXMW-33); and
- There are no AWQSGVs groundwater criteria for gasoline and diesel range organics.

Petroleum fingerprinting groundwater analytical results are summarized in **Table 5b**.

5.3.7 Light Non-Aqueous Phase Liquid (LNAPL)

LNAPL was observed at four of 11 Site monitoring wells gauged during the Remedial Investigation. The presence of LNAPL in monitoring wells RXMW-12, RXMW-13 and RXMW-18 is located in the vicinity of GCM in Site soils. LNAPL was detected in off-Site monitoring well RXMW-24 on June 3, 2014, but was not detected in RXMW-24 on June 4, 2014. An LNAPL thickness summary is presented in **Table 1**.

5.4 Soil Vapor Analytical Results

Soil vapor samples were collected from soil vapor points SVP-04 through SVP-10, with the exception of SVP-08, on June 4, 2014. SVP-08 could not be sampled due to a high water table in the vicinity of SVP-08, being above the soil vapor point depth, resulting in the presence of water in the soil vapor point tubing. The off-Site property adjacent to SVP-08 is currently vacant, so there are no receptors present on that property. Further, if off-Site soil vapor migration were to occur, it would be prevented from migrating more than 100 feet from the Site by the presence of Twomile Creek located on the adjacent property. As a result, no additional investigation is proposed to evaluate soil vapor in the vicinity of SVP-08.

An ambient air sample (AMB060414) was collected in the vicinity of SVP-09 and SVP-10 on June 4, 2014. A summary of RI soil vapor VOC and methane concentrations is presented below. RI soil vapor results and NYSDEC Spill Number 1102014 soil vapor results from the 2011 and 2012 investigations are included as **Table 6**. Laboratory analytical data packages are included as Appendix L. The 2011 and 2012 investigation results are summarized in Appendix O and P, respectively.

5.4.1 Volatile Organic Compounds

Soil vapor and ambient air samples were analyzed for VOCs by Accutest according to EPA Method TO15. Accutest reports that:

- Twenty-four VOCs were detected above the laboratory RL in one or more soil vapor samples; and
- Two VOCs were detected above the laboratory RL in the ambient air sample.

A summary of soil vapor and ambient air VOC results is presented in **Table 6**.

5.4.2 Methane

Samples were analyzed for Methane by Accutest according to EPA Method 8015M. Methane was detected at one location, SVP-09, at a concentration of 518 mg/m^3. Methane was detected at all three soil vapor points sampled during the 2011 subsurface investigation associated with NYSDEC Spills Number 1102014. As described in **Section 3.2,** at one soil vapor location, SVP-01, methane was detected at a concentration 449,000 mg/m^3, exceeding

25% of the LEL. The results of the September 2011 subsurface investigation were reported to NYSDEC in the August 24, 2012 *Revised Subsurface Investigation Summary Report*, provided as Appendix O. Additionally, as requested[15] by NYSDEC, in 2012 Roux Associates screened indoor air in the office portion of the 291 Homer Street existing Site building to evaluate if explosive conditions existed within the building based on the soil vapor methane concentrations detected during the 2011 investigation. The 2012 investigation indicated that methane was not present within the 291 Homer Street existing Site building at detectable concentrations. The results of the 2012 investigation were reported to NYSDEC in the March 12, 2013 *Subsurface Investigation Summary Report*, prepared by Roux Associates, provided as Appendix P.

As described in **Section 4.7**, an additional sub-slab vapor point sample, SVMP-07, was collected on March 24, 2015 to evaluate the sub-slab methane soil vapor concentration to confirm that methane is not present at levels above 25% of the LEL in the vicinity of the 2011 Subsurface Investigation SVP-01 sample location (**Figure 3c**). Methane was not detected in sub-slab soil vapor from SVMP-07. Field data and screening data are included as Appendix I.

A summary of all previous subsurface investigation, RI, and additional SVMP-07 soil vapor methane results is presented in **Table 6**.

5.5 Data Usability

In general, data achieved the data quality objective of this RI. Specifically, data validation was performed in accordance with the guidelines presented in the *USEPA Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review, June 2008*, and in consideration of the specific requirements of USEPA method TO-15. A DUSR was prepared in accordance with Appendix 2B of DER-10, by a Roux Associates Senior Chemist, independent of the project team, and is included as Appendix M.

As described in the DUSR, seven air samples, 52 soil samples, six groundwater samples, one wastewater sample, three soil and one groundwater field duplicate, and four trip blanks were evaluated. Data was rejected or qualified when surrogate recoveries were outside of laboratory control limits, continuing calibration verification was outside of laboratory control

[15] This request was made verbally from NYSDEC to Roux Associates.

limits, recoveries and reproducibility of matrix spikes were outside of laboratory control limits, or detections were made between the method detection limit but below the reporting limit.

Sample analyses were found generally compliant with method requirements. Most of the sample data were usable, with qualification of the sample results/detection limits as estimated, or with edit of positive results to non-detect at the corresponding detection limit. However, compounds with non-detect results in some samples from SVOC and herbicide analyses were rejected as not usable because of the recovery of surrogate compounds. In addition, some VOCs, SVOCs, herbicides, and cyanide in certain samples were also rejected as not usable because of the recovery of the compounds in the matrix spikes or matrix spike duplicates which used these samples as background samples.

The remaining validated data was used to develop the conceptual Site model described in the RI. Although some data was rejected, there is adequate lateral and vertical distribution of samples in various environmental media to fully assess the Site. Excluding the data points described in the DUSR does not change the conclusions of this RI/AAR or impact the remedy selection since the extent of excavation is based on the extent of GCM.

5.6 IRM Delineation and Remedial Activities Results

The IRM pre-characterization subsurface soil sampling program included advancing twenty-nine soil borings for the purpose of:

- Eight borings (RX-22A through RX-22H) to further delineate horizontal and vertical extent of elevated PAHs above 500 milligrams per kilogram (mg/kg) in potentially non-GCM impacted soil surrounding RI soil boring RX-22;
- Eight borings (RX-30A through RX-30H) to further delineate horizontal and vertical extent of leachable lead above 5 milligrams per liter (mg/L) surrounding RI soil boring RX-30; and
- Thirteen borings (RU-01 through RU-11, RX-EXP-1, and RX-EXP-2) for the pre-characterization of reuse and disposal soils from within the anticipated IRM excavation footprint.

IRM subsurface soil analytical results are summarized in **Table 8** through **Table 11**. IRM soil analysis was conducted by Accutest Laboratories (Accutest) of Marlborough, Massachusetts

(NYSDOH Environmental Laboratory Approval Program (ELAP) approved). Analytical laboratory reports are included in Appendix J.

5.6.1 Delineation of PAH Impacted Soil Boring RX-22 Results

Four soil samples (RX-22A through RX-22D) were collected and analyzed by Accutest for PAH compounds according to EPA Method 8270D. Accutest reports that:

- Two PAH compounds (benzo(a)anthracene and chrysene) were detected above the Commercial Use SCO but none exceeded the alternative total PAH criteria[16].

IRM soil samples delineating the RI soil boring RX-22 are summarized in **Table 8.**

A review of RX-22 delineation boring logs (**Appendix E-2**) and field observations from the pre-characterization activities indicate that GCM-impacted soil is located at depths between 2 to 5 ft-bgs in the vicinity of RI soil boring RX-22, therefore shallow-depth elevated PAH soil concentrations in the vicinity of RX-22 are attributable to GCM-impacted soil and do not represent a "hot spot." Furthermore, due to the shallow depths to GCM in this area, all surface soil and GCM-impacted soils from the vicinity of RX-22 will be removed during Remedial Activities, therefore requiring no further delineation of PAH or any remedial activities solely targeting PAHs in the vicinity of RI soil boring RX-22.

5.6.2 Delineation of Leachable Lead Impacted Soil Boring RX-30 Results

Twenty four soil samples were collected from eight boring locations (e.g. three depths from eight locations). IRM soil borings RX-30A, RX-30B, RX-30C, and RX-30D represented a ten foot offset from the RI soil boring RX-30. IRM soil borings RX-30E, RX-30F, RX-30G, and RX-30H represented a 20 foot offset from RI soil boring RX-30. Initially all depth intervals from RX-30A through RX-30D were released for analysis by Accutest for TCLP Lead by EPA Method 1311. Sample results from RX-30A through RX-30D ranged from 0.038 mg/l to 62.4 mg/l. Based on a horizontal and vertical interpretation of the initial TCLP lead results, one depth interval from RX-30G, two depth intervals from RX-30F, and all three depth intervals from RX-30E and RX-30H were analyzed for TCLP lead, resulting in a total of 21soil samples being analyzed to support the delineation of RI soil boring RX-30 area. TCLP lead sample results

[16] NYSDEC's Subsurface Soil Cleanup criteria for total PAHs of 500 mg/kg as outlined in CP-51 Soil Cleanup Guidance.

from RX-30E through RX-30H interval ranged from 0.02 mg/l to 4.0 mg/l. These results provided a horizontal and vertical delineation of a leachable lead "hot spot" in the vicinity of RI soil boring RX-30, as illustrated on **Figure 7**.

IRM soil samples delineating the RI soil boring RX-30 are summarized in **Table 9**.

5.6.3 Reuse Pre-characterization

Reuse pre-characterization soil samples were collected and analyzed for VOCs, SVOCs, pesticides, herbicides, PCBs, metals (inorganics), and general chemistry. Eleven discrete VOC samples were collected from soil borings RU-01 through RU-11. In addition to the 11 discrete VOC samples, four composite samples, RU-02, RU-04, RU-07, and RU-10, were analyzed for the full suite including SVOCs, pesticides, herbicides, PCBs, metals (inorganics), and general chemistry. Analytical results indicated that all soils sampled above GCM material within the footprint of the proposed IRM excavation boundary met NYSDEC Table 375-6.8(b) Commercial Use SCOs and are therefore suitable for re-use on-Site. Analytical results are summarized in **Table 10**.

5.6.4 Waste Disposal Pre-characterization

Waste characterization soil samples were collected in an effort to pre-characterize GCM-impacted soils for off-Site disposal. Three composite soil samples, WC-COMP-A, WC-COMP-B, and WC-COMP-C, and one discrete sample, WC-10, were collected from a depth ranging from 5 to 12 ft-bgs, corresponding to depths where GCM was observed. Each composite sample consisted of three discrete samples, which were subsequently laboratory composited (by Accutest) prior to analysis. Conservatively, sample WC-10 was not composited due to an elevated field soil headspace screening result measurement above the other nine waste characterization samples. All three composite samples and the discrete sample were analyzed for TCLP VOCs, TCLP SVOCs, PCBs, TCLP RCRA-8 metals, ignitability, flashpoint, pH, and percent solids per Chaffee Landfill requirements. Soil samples results were submitted and approved by Chaffee Landfill waste facility for use as landfill daily-cover material and transported under non-hazardous waste manifests. Waste pre-characterization soil results are summarized in **Table 11**.

6.0 DISCUSSION OF THE NATURE AND EXTENT OF CONTAMINATION

The following section describes the physical geologic and hydrogeologic conditions at the Site, as well as the nature and extent of contamination in soil, groundwater, and soil vapor observed at the Site.

6.1 Site Geology

The Site is typically underlain by fill material characterized generally by brown sand and gravel. This fill material, containing coal slag, brick, wood, ash, tar-like material, root fragments, concrete, crushed porcelain fragments, metal fragments, glass and concrete, is present throughout the Site, with the exception of two areas. Inclusions, such as coal slag or brick, were not observed in the portion of the Site along Homer Street, west of the sewer line, nor were they observed in the southern corner of the Site, in the vicinity of RXMW-31. Fill material, where present, extends from ground surface to as deep as 16 ft-bgs (RX-15). Native material present beneath the layer of fill is typically gray, but also tan or brown, silt, sand and gravel. Site test pit and soil boring/monitoring well installation logs are presented in Appendix A through Appendix E-2.

6.2 Site Hydrogeology

Eleven groundwater monitoring wells were installed at the Site between 2012 and 2014. Roux Associates conducted a groundwater elevation survey on June 3, 2014. Depth to water at the Site ranged from less than 1 ft-bgs (RXMW-26) to 8.95 ft-bgs (RXMW-12). A summary of Site gauging results during the RI activities is presented as **Table 1**. Groundwater generally flows to the east-southeast beneath the Site (**Figure 5**). As described in **Section 4.6.1,** monitoring wells RXMW-12 and RXMW-14 were observed to recharge much more slowly than other monitoring wells at the Site. These wells were excluded from analysis of groundwater flow at the Site. An area of perched groundwater was observed to be present in the central portion of the Site, in the vicinity of RXMW-13 and RXMW-26. This perched condition may be due to the presence of heterogeneous fill material in this area.

6.3 Soil Quality

Site soil assessment was conducted to identify the nature and extent of contamination in surface soils and subsurface soils. Surface soils were evaluated to identify potential direct exposure risks at the Site. Subsurface soils were evaluated during the RI and further

assessed during the IRM to delineate the horizontal and vertical extent of contamination at the Site.

6.3.1 Surface Soils

Surface soil samples were collected from immediately below the root zone, where possible, to characterize the nature and extent of contamination in soil that receptors will be most likely exposed. Generally, soil conditions met standards established by NYSDEC for residential use and commercial use, with two exceptions – PAHs at RXTP-08, and arsenic in multiple locations.

As indicated in **Section 5.3**, two PAHs, benzo(a)pyrene and dibenz(a,h)anthracene, are present at concentrations exceeding the NYSDEC Table 375-6.8(b) unrestricted and commercial criteria in surface soil at RXTP-08. The RXTP-08 surface soil sample was collected from material that was described as containing inclusions of ash and coal. RXTP-08 is located within the proposed Remedial Action excavation footprint of the proposed New Paint Shop. As discussed in **Section 8.0**, the proposed remedy will eliminate exposure to PAH surface soil from this location either by placing the soil beneath a cover system (i.e., beneath a building or pavement, or beneath one foot of clean soil covering a demarcation layer) or by disposing of this soil off-Site as illustrated on **Figure 6**.

Arsenic is present in surface soil samples from 13 locations at the Site exceeding the Unrestricted Use SCOs and three locations exceeding Commercial Use SCOs. The three locations exceeding the Commercial Use SCO for arsenic are within either the footprint of the completed IRM excavation or within the footprint of the proposed Remedial Action excavation. Additionally, although arsenic concentrations in surface soil exceed SCOs, the concentrations of arsenic detected at the Site are consistent with natural background conditions, as discussed in **Section 8.2.1**. The maximum arsenic concentration in surface soil is 19.6 mg/kg, which is below the Background Threshold Value (BTV) for the State of New York[17] of 24.2 mg/kg and the Site-specific background concentration derived by Roux Associates of 33 mg/kg. As discussed in **Section 8.9.4**, the proposed remedy will utilize a cover system to eliminate soil exposure from locations where arsenic concentrations exceeded Commercial Use SCOs. The cover system will be comprised of analytically

[17] Vosnakis and Perry, 2009.

confirmed Commercial Use SCO compliant surface soil (top one foot), emplacement of a one foot thick soil cover system above a demarcation layer, where necessary, or beneath Site improvements (e.g., buildings, pavement, etc.). The approximate extents and configuration of the cover system remedy are illustrated on **Figure 7**.

6.3.2 Subsurface Soils

GCM was detected in seven of 16 soil borings and 10 of 12 test pits on 299 Homer Street. GCM extends from the property boundary with 291 Homer Street, to the east, south and southwest. GCM was not observed in soil borings or monitoring wells installed between the sewer line and Homer Street. Therefore, Roux Associates expects that the western extent of GCM is approximately seventy-five feet from the eastern edge of Homer Street. Further, observations recorded during the IRM confirmed this conceptual understanding of the extent of GCM beneath central portion of 299 Homer Street. GCM extends to the property boundary with NYSDOT to the east as far south as RXTP-09. GCM was not observed in the southern and southeastern portion of the Site (RXMW-31, RX-32, RXMW-33), and the southern extent is expected to be between RXTP-01, RXTP-02 and Johnson Street. A summary of GCM thickness observations is included as **Table 4**.

During the RI, a total of 73 subsurface soil samples were collected at the Site for laboratory analysis. As described in **Section 5**, certain VOCs, SVOCs and metals were detected at concentrations exceeding Unrestricted Use SCOs and Commercial Use SCOs. Higher levels of adsorbed phase contamination were found in soil that contained GCM. This relationship was observed not only with compounds likely to be found in tar-like material or petroleum saturated soil (i.e., PAHs compounds), but also with metals such as arsenic and lead. A comparison of Site subsurface soils to Commercial Use SCOs is presented on **Table 3a** and **Table 3b.** Locations of soil concentrations in excess of the Commercial Use SCOs and/or background concentrations are typically collocated with GCM.

Additionally, subsurface soil sampling activities conducted during the IRM, as described above in **Section 5.6**, further refined the conceptual understanding of the nature and extent of subsurface contamination by demonstrating both; 1) elevated PAH concentrations detected in the vicinity of RX-22 are due to the presence of GCM being comingled with shallow soils, and 2) the elevated leachable lead concentrations detected in the vicinity of RX-30 have been

delineated, representing a leachable lead "hot spot", and will be addressed by soil removal and off-Site disposal. The location of IRM soil borings and depiction of the extent of soils anticipated to have leachable lead concentrations in excess of 5 mg/l is illustrated on **Figure 7.** A summary of IRM analytical subsurface soil results are presented in **Tables 8** through **Table 11**.

Exposure to soil contamination exceeding Commercial Use SCOs will be eliminated by both removing the feasible extent of soil containing GCM and leachable lead impacted soil in the vicinity of RX-30 delineated during the IRM, as illustrated on **Figure 4** and **Figure 7**, respectively. Further, a cover system will be installed to prevent contact with residual subsurface soil exceeding Commercial Use SCOs, if any remains in place.

6.4 Groundwater Quality

During the RI, groundwater samples were collected from three monitoring wells located along the upgradient Site boundary (i.e., along Homer Street) and three monitoring wells located along the downgradient Site boundary (i.e., along the NYSDOT property) to identify if contaminants were migrating on-Site from an upgradient source and if Site-related contaminants were migrating off-Site. No contaminants were identified in the three upgradient monitoring wells (RXMW-04, RXMW-27 and RXMW-28). Petroleum-related VOCs, including benzene, toluene, total xylenes, 1,2,4-trimethylbenzene and 1,3,5-trimethylbenzene were found to exceed their individual AWQSGV in groundwater samples from one monitoring well, RXMW-33, along the downgradient Site boundary.

RXMW-33 is located immediately downgradient of areas containing 5 to 9 feet of GCM (RX-36/RXTP-10 and RXTP-06, respectively). Previous investigations had identified similar petroleum-related contaminants (i.e., benzene, toluene, total xylenes, naphthalene, 1,2,4-trimethylbenzene and 1,3,5-trimethylbenzene) in on-Site monitoring wells (i.e., RXMW-14, RXMW-18 and RXMW-26) located in areas of GCM in the central portion of the Site. The presence of these contaminants in RXMW-33 indicates that Site-related contamination is likely migrating off-Site downgradient of areas of significant GCM. However, since these concentrations are generally low, they are expected to attenuate if the source material (i.e., GCM) is removed. Further, note that there are no off-Site receptors near the Site (i.e., the downgradient property is I-86).

Previous investigations had identified arsenic above the AWQSGV in two groundwater samples (RXMW-18 and RXMW-26) at the Site. During the RI, arsenic was not detected above the AWQSGV in any of six samples. Arsenic was not detected in groundwater samples from five of six monitoring wells during the RI. The lone groundwater sample where arsenic was detected above the laboratory RL was RXMW-28, located along the upgradient Site boundary.

Four metals, iron, magnesium, manganese and sodium, were detected above their respective AWQSGVs in groundwater samples collected from the Site during the RI. Manganese and iron were present in five of six groundwater samples collected during the RI. Dissolved manganese and iron may be present as the result of anaerobic biodegradation of GCM at the Site. Elevated manganese and iron concentrations are likely associated with reduced conditions due to the presence of GCM at the Site.[18] Reducing conditions can dissolve manganese and iron in soil leading to elevated groundwater concentrations.

Magnesium and sodium are naturally occurring dissolved minerals. In general, if they exceed their AWQSGVs, the exceedances are relatively close to regulatory criteria. The distribution of magnesium and sodium in groundwater does not correlate with a specific release. Further, as described above, there are no off-Site receptors near the Site. Therefore, magnesium and sodium will not be addressed in the Remedial Action.

LNAPL was encountered at four Site monitoring wells in the vicinity of observed GCM. The presence of LNAPL in monitoring wells RXMW-12, RXMW-13 and RXMW-18 is likely associated with GCM in Site soils. While LNAPL was detected in off-Site monitoring well RXMW-24 on June 3, 2014, it was not detected in RXMW-24 on June 4, 2014. The intermittent presence of a small quantity of LNAPL in RXMW-24 is indicative of a small localized source of GCM in this area, which was observed in this location during monitoring well installation.

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[18] Certain microorganisms can use petroleum hydrocarbons as a fuel source. The presence of GCM creates a favorable environment for growth of these microorganisms. These microorganisms first metabolize hydrocarbons aerobically, consuming dissolved oxygen. When the dissolved oxygen is depleted, anaerobic metabolism can occur through nitrate reduction, followed by manganese reduction and then iron reduction. (Interstate Technology and Regulatory Council (ITRC) 2009. *Technology Overview: Evaluating Natural Source Zone Depletion at Site with LNAPL*. April 2009.)

6.5 Soil Vapor and Air Quality

Soil vapor results from the previous investigation, RI, and additional SVMP-07 sample indicate the following:

- Soil vapor contamination that may be the result of Site-related contaminants (i.e., ethylbenzene, xylenes and trimethylbenzene isomers volatilizing from GCM) is present at the Site.
- Future exposure to soil vapor contamination due to vapor intrusion to indoor air will be prevented by the installation of vapor barriers beneath existing and currently planned Site buildings and a SSDS, and by excavation and off-Site disposal of the potential on-Site source (i.e., GCM).
- Soil vapor contamination is not migrating off-Site.
- Methane is not present at a detectable concentration in soil vapor beneath the slab of the 291 Homer Street existing Site building.
- Methane concentrations at levels above 25% of the LEL are not present at the Site.

Soil vapor contamination is present at the Site, as discussed in **Section 5.4** and shown on **Table 6**. The potential on-Site source of soil vapor contamination is GCM impacted soil. The GCM has been characterized as a tar-like material and petroleum saturated soil. The type of petroleum present in petroleum saturated soil has been further characterized to be diesel fuel (see **Table 5**). Detected VOCs associated with diesel fuel include ethylbenzene, xylenes and trimethylbenzene isomers. Other petroleum-related VOCs (e.g., benzene and gasoline range organics) have been detected in groundwater, and may be related to the presence of petroleum-related VOCs in soil vapor, including benzene, hexane, cyclohexane and ethanol.

Other VOCs detected in Site soil vapor include halogenated aliphatic and halomethane VOCS (tetrachloroethylene, methylene chloride, chloroform, bromodichloromethane, chloromethane, etc.). There are no known releases of chlorinated solvents, nor have constituents of chlorinated VOCs been detected in Site soil or groundwater. These other VOCs detected are not associated with the petroleum contamination known at the Site. Therefore, the presence of halogenated aliphatic and halo methane VOCs are not related to Site contamination.

Soil vapor concentrations encountered during 2014 sampling were generally consistent with, or significantly less than, soil vapor concentrations encountered in 2011.[19] Methane was only detected in one of seven Site-wide soil vapor samples collected in 2014, compared to three of three samples collected during the 2011 subsurface investigation. Roux Associates and Remedial Engineering evaluated the previous methane detections at the Site, including the sample SVP-01 (collected in 2011) methane concentration of 449,000 mg/m^3 which exceeds 25% of the LEL, and believe the SVP-01 result is anomalously high. Specifically, of the three soil vapor locations sampled in 2011, the next highest methane concentration was 6,820 mg/m^3 (SVP-03), which is two orders of magnitude lower than the SVP-01 methane concentration and well below 25% of the LEL. Additionally, of the six soil vapor locations sampled in 2014, methane was only detected at one location (SVP-09) at a concentration of 518 mg/mg^3. Furthermore, pursuant to NYSDEC and NYSDOH comments received on March 2, 2015 in response to the RI/AAR dated January 30, 2015, an additional sub-slab vapor point sample, SVMP-07, was collected for methane analysis. SVMP-07 was collected immediately beneath the existing slab, adjacent to the 2011 Subsurface Investigation sample SVP-01 (see **Section 4.**7). The result from sample SVMP-07 indicates that methane is not present at a detectable concentration in soil vapor beneath the slab of the 291 Homer Street existing Site building further supporting that the 2011 SVP-01 concentration is anomalously high and methane is not present at levels above 25% of the LEL.

Since the Remedial Action proposed for the Site (see **Section 8.0**) includes removing the source of contamination from the Site (i.e., GCM), management of Site indoor air quality through the use of vapor barriers beneath existing and currently planned Site buildings and a SSDS (see **Section 8.9.5.2**), potential migration of soil vapor into the existing and future Site buildings will be mitigated. At this time, Roux Associates and Remedial Engineering do not believe soil vapor contamination presents a future exposure risk at the Site.

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[19] One exception was chloroform which was detected in five of six soil vapor samples at concentrations up to a maximum concentration of 120 µg/m³ in the soil vapor sample collected from SVP-09. Chloroform has not been detected in any soil or groundwater samples collected at the Site. Chloroform soil vapor detections during the 2011 and 2014 investigations at MJ Painting have been generally in the vicinity of the public water supply line and sanitary sewer lines. This spatial relationship may indicate that halomethane compounds are migrating in subsurface preferential pathways along water and sewer utilities. Additionally the September 1997 U.S. Department of Health and Human Services *Toxicological Profile For Chloroform* indicates that "chloroform is released into the environment as a result of its manufacture and use; its formation in the chlorination of drinking water, municipal and industrial wastewater, and swimming pool and spa water; and from other water treatment processes involving chlorination."

Site-related VOCs detected in soil vapor were present in the soil vapor sample collected from SVP-10 located near the source area (i.e., near the GCM and LNAPL) at concentrations well below concentrations detected in soil vapor points located along the Site boundaries. Maximum concentrations of all detected VOCs were found in soil vapor samples collected hydraulically upgradient or side gradient from SVP-10 (i.e., SVP-04, SVP-05 or SVP-09, see **Figure 3c**). This indicates that soil vapor contamination is not migrating off-Site from an on-Site source.[20] Further, since the Remedial Action proposed for the Site (see **Section 8.0**) includes removing the source of contamination from the Site (i.e., GCM), off-Site migration of soil vapor contamination is not likely to occur in the future.

[20] As discussed in **Section 5.4**, a soil vapor sample could not be collected from SVP-08 during the RI due to an elevated water table in the vicinity of SVP-08. Therefore it could not be determined if soil vapor contamination is migrating off-site in the vicinity of SVP-08. However, since the adjacent property is vacant, Twomile Creek would prevent soil vapor migration further than 100 feet from the Site, and the potential on-site source of soil vapor contamination (i.e., GCM) will be excavated and disposed off-site, an additional investigation is not proposed in this area.

7.0 QUALITATIVE EXPOSURE ASSESSMENT

A qualitative exposure assessment was completed in accordance with Section 3.3(c)4 and Appendix 3B of DER-10 to determine the route, intensity, frequency and duration of actual or potential exposures to contaminants for both human health and/or fish and wildlife resources.

7.1 Qualitative Human Health Exposure Assessment

The purpose of a qualitative human health exposure assessment is to evaluate and document how people might be exposed to Site-related contaminants, and to identify and characterize the potentially exposed populations under current and reasonably anticipated future Site use. The qualitative exposure assessment evaluates the five elements associated with the exposure pathways present or potentially present at the Site. These elements are:

1. The source or sources of contamination, including the location of the contaminant release, or if the original source of contamination is unknown, the contaminated environmental medium (i.e., soil, indoor or outdoor air, biota, water) at the exposure point;
2. The contaminant release and transport mechanism by which the contaminant moves from the source to the point where receptors are exposed;
3. The exposure points or locations where actual or potential human contact with contamination may occur;
4. The routes of exposure by which a contaminant gets taken into the body; and
5. The potential receptors that may be exposed to contaminants at an exposure point.

A complete exposure pathway exists where each of these five elements are present or potentially present.

A summary of each of the five exposure pathway elements is presented below, followed by an exposure assessment summary.

7.1.1 Contaminant Sources

As described in **Section 5.2**, GCM, including tar-like material and soil saturated with oil, is present in the subsurface across a significant portion of the Site. The specific source of the GCM is not known, but has been inferred to be the result of historical operation of this area as part of the former Socony refinery (see **Section 2.2**). Tar-like material has migrated to the surface in small portions of the Site. Further, GCM is most likely the source of contaminants

present in surface soil, subsurface soil, groundwater, and soil vapor. In general, contaminated soil, soil vapor, and groundwater have been observed at the Site.

7.1.2 Contaminant Release and Transport Mechanisms

Contaminant release and transport mechanisms are specific to the type of contaminant and Site use. Under existing Site use, contaminants present in surface soil, or in subsurface soil and GCM exposed during construction excavation activities, can be transported as fugitive dust or volatilize into outdoor air. Contaminants present in GCM and subsurface soil may be leaching to groundwater, where they could infiltrate into future construction excavations or potentially migrate off-Site. Likewise, contaminants present in soil vapor may be migrating to indoor air in existing buildings on-Site or migrating off-Site. Contaminants present in soil vapor could also collect in future construction trenches or migrate to indoor air in future on-Site buildings.

Regarding migration of soil vapor to indoor air, all currently planned Site buildings will have a SSDS and vapor barrier installed during construction to eliminate the soil vapor intrusion pathway. The 291 Homer Street existing building has a vapor barrier in place, and a SSDS will be installed beneath the office portion of the 291 Homer Street existing Site building as part of the Remedial Action.

7.1.3 Exposure Points

Surface soil in any unpaved or undeveloped portion of the Site is considered an exposure point. Subsurface soil throughout the Site is considered an exposure point as there is not a current environmental easement or SMP in place that prohibits digging into the subsurface. Due to the relatively shallow depth to groundwater at the Site, groundwater may be contacted during ground intrusive activities (e.g., within a construction trench). However, groundwater is not considered to have an exposure point for ingestion because there are no drinking water production wells at the Site and because a local municipal potable water supply is provided by the City of Olean.[21] The City of Olean draws water from well Sites at 104 Richmond Avenue (Well Site M18), 1900 East River Road (Well Sites 37/38), and from the Ischua Creek (a tributary of Olean Creek) via the City of Olean's Water Filtration Plant, 1332 River

[21] On January 27, 2014, Christopher Crawford, Water Resources Specialist, of the Cattaraugus County Health Department confirmed via email to Roux Associates that the City of Olean, which is served by a public water supply system, does not have any private drinking water wells.

Street. The water treatment plant on River Street is approximately 0.75 miles east of the Site and is not located hydrologically downgradient. Well Site M18 and Well Sites M37/38 are 2.6 and 2.8 miles southeast of the Site, respectively. Outdoor air impacted by contaminated soil vapor or volatilization from contaminated groundwater may be contacted during ground intrusive activities, such as trenching. In addition, indoor air within the 291 Homer Street existing Site building is an exposure point; however, as discussed above, a vapor barrier is in place beneath the 291 Homer Street existing Site building. Additionally, a SSDS will be installed beneath the office portion of the 291 Homer Street existing Site building and a SSDS and vapor barrier will be installed beneath each of the currently planned Site buildings to eliminate the vapor intrusion pathway. Institutional controls at the Site, in the form of an environmental easement and a SMP as described in DER-10, will be implemented to restrict the use of groundwater at the Site, maintain the cover system, restrict soil disturbance activities, and require operation and maintenance of the SSDS.

7.1.4 Exposure Routes

Based on the exposure points identified above, potential routes of exposure are listed below:

Exposure Point	Exposure Route
Surface soil or subsurface soil	Dermal absorption, inhalation and incidental ingestion
Indoor air or outdoor air	Inhalation
Groundwater	Dermal absorption

7.1.5 Potential Receptors

The identification of potential human receptors is based on the characteristics of a Site, the surrounding land uses, and current and reasonably anticipated future land uses. Currently the Site is used as a commercial paint facility, with offices, a warehouse and various areas of outdoor equipment storage. Current receptors include indoor workers, outdoor workers (e.g., groundskeepers or maintenance staff), and visitors/trespassers. The Site is not currently fenced, and has neighboring residential properties. Adult or youth trespassers may occasionally access the Site.

Reasonably anticipated future use of the Site is for commercial use, as MJ Painting plans to expand its facility by constructing three new buildings at the Site, including additional office

and warehouse space, and a paint shop. Future receptors include indoor workers, outdoor workers (e.g., groundskeepers or maintenance staff), and visitors/trespassers.

7.1.6 Exposure Assessment Summary

Based on the above assessment, the potential exposure pathways for the Site condition are listed below:

Current Use Scenario	
Indoor Worker	Inhalation of volatile contaminants present in soil vapor via indoor air migration
Construction Worker	Direct contact, incidental ingestion and inhalation of contaminants present in GCM and soil; direct contact and incidental ingestion of contaminants present in groundwater; inhalation of volatile contaminants present in groundwater and in soil vapor
Outdoor Worker	Direct contact, incidental ingestion and inhalation of contaminants present in GCM and soil
Visitor/Trespasser	Direct contact, incidental ingestion and inhalation of contaminants present in GCM and soil
Future Use Scenario	
Indoor Worker	Inhalation of volatile contaminants present in soil vapor via indoor air migration
Construction Worker	Direct contact, incidental ingestion and inhalation of contaminants present in GCM and soil; direct contact and incidental ingestion of contaminants present in groundwater; inhalation of volatile contaminants present in groundwater and in soil vapor
Outdoor Worker	Direct contact, incidental ingestion and inhalation of contaminants present in GCM and soil
Visitor/Trespasser	Direct contact, incidental ingestion and inhalation of contaminants present in GCM and soil

7.1.7 Qualitative Off-Site Exposure Assessment

The qualitative exposure assessment must include a full delineation of the nature and extent of off-Site impacts, unless the remedial party is a volunteer in the BCP, in which case, off-Site field information is only needed sufficient to identify the presence of contamination and support the qualitative off-Site exposure assessment for these Sites.

As discussed in **Section 6.5**, soil vapor contamination is not migrating off-Site.

Overburden groundwater elevations indicate that the overall groundwater flow direction at the Site is from northwest to southeast. Monitoring wells RXMW-31 and RXMW-33 are located along the downgradient Site boundary and monitoring well RXMW-24 is located just off-Site on the downgradient NYSDOT property. Together these three monitoring wells monitor groundwater that has the potential to migrate off-Site. Contaminants present in groundwater samples collected from these monitoring wells are considered to be migrating off-Site. As discussed in **Section 6.4**, contaminants present in one or more of these monitoring wells above AWQSGV include benzene, toluene, 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, and total xylenes, along with inorganic compounds including iron, magnesium, manganese and sodium. Note however, the NYSDOT property does not contain any buildings, and is rarely accessed by outdoor workers engaged in maintaining the access along the embankment of I-86, or trespassers. The nearest downgradient occupied buildings are located on the opposite side of I-86, more than 600 feet from the Site. Off-Site exposure to Site-related contaminants in groundwater is not expected.

7.2 Fish and Wildlife Impact Assessment

The Site includes a commercial building surrounded by paved parking areas and landscaped grassy areas. The majority of fauna found at the Site are avian and small mammal species. No federally listed or proposed threatened or endangered species are known to exist at the Site according to the U.S. Fish and Wildlife Service Environmental Conservation Online System.

Three new buildings, surrounded by additional paved parking and newly landscaped areas, are currently planned for the undeveloped portions of the Site. Buildings, pavement and maintained landscaping will substantially limit availability of suitable cover type for reestablishment of biota. Further, contamination at the Site is a localized source, which has not migrated and will not migrate from the source to impact any off-Site resources. As such, the Fish and Wildlife Resource Impact Analysis Decision Key (DER-10, Appendix 3C) indicates no fish and wildlife resources impact analysis is warranted.

8.0 REMEDIAL ALTERNATIVES ANALYSIS

The following Remedial Alternatives Analysis was performed to select a remedial approach for the Site using the Remedy Selection Evaluation Criteria identified in 6 NYCRR Part 375-1.8(f) and Section 4.2 of DER-10. DER-10 Section 4.4(d)(2) requires a minimum of two remedial alternatives be developed for a BCP Site. Three remedial alternatives were developed for the Site: 1) a Track 1 Unrestricted Use alternative, 2) a Track 2 Restricted Use alternative, and 3) a Track 4 Restricted Use with cover system alternative. The NYSDEC has not made a determination of significant threat implications for the Site. Descriptions of the Track 1, Track 2, and Track 4 cleanup alternatives are provided below:

- Track 1 (6 NYCRR Part 375-3.8(e)(1)) requires Site media to meet 6 NYCRR Part 375-6.8 Unrestricted Use SCOs which would allow the Site to be used for any purpose without restrictions (Unrestricted Use). The soil remediation component would achieve Unrestricted Use SCOs for all soils above bedrock to 6 NYCRR Part 375-6.8(a) Unrestricted Use SCOs. The groundwater remediation component may be achieved by a restriction on groundwater use if the applicant is a volunteer and groundwater monitoring has demonstrated to NYSDEC that there has been a bulk reduction in groundwater contamination and contaminants are at asymptotic levels. Therefore, this alternative assumes that all soil and fill exceeding the Unrestricted Use SCOs and/or GCM would be excavated and transported for off-Site disposal at multiple excavation areas across the Site at depths up to 20 ft-bgs. An estimated soil disposal volume of 68,000 cubic yards is expected. Additionally, this Track may require demolition of the 291 Homer Street existing Site building and the recently constructed New Warehouse and New Office buildings (**Figure 6)** to address GCM, if any, and soils exceeding Unrestricted Use SCOs extending beneath the buildings.

- Track 2 (6 NYCRR Part 375-3.8(e)(2)) requires Site media to meet 6 NYCRR Part 375-6.8 Restricted Use SCOs which would allow the Site to be used for commercial purposes (Restricted Use). The soil remediation component would achieve Restricted Use Commercial SCOs for all soils within 15 feet of the ground surface to 6 NYCRR Part 375-6.8(b) Commercial Use SCOs and if necessary record an environmental easement for the Site requiring any contaminated soils remaining at depth to be managed along with other Site soils, pursuant to a SMP. The groundwater remediation component may be achieved if off-Site groundwater does not exceed standards and by an on-Site restriction of groundwater use. This alternative may only use short-term institutional or engineering controls. Therefore, this alternative assumes that all soil and fill exceeding the Commercial Use SCOs and/or GCM would be excavated and transported for off-Site disposal at multiple excavation areas across the Site at depths up to 15 ft-bgs. An estimated soil disposal volume of 52,000 cubic yards is expected. Analysis of this Track will evaluate if it is feasible to implement demolition of the 291 Homer Street existing Site building to address any impacts

(GCM or soil/fill exceeding Commercial Use SCOs)[22], if any, that may be present beneath the building.

- Track 4 (6 NYCRR Part 375-3.8(e)(4)) requires Site media to meet either solely or a combination of: 1) the Restricted Use SCOs set forth in 6 NYCRR 375-6.8, 2) modified Site-specific SCOs as set forth in 6 NYCRR 375-6.9, or 3) propose Site-specific SCOs which are protective of public health and the environment. This alternative may use long-term institutional or engineering controls and will use a cover system across the entire Site, comprised of soil cover or Site development (e.g., buildings or pavement), as described in **Section 8.9.4**, to eliminate exposure from any residual contamination.

A Track 3 cleanup alternative was considered but not analyzed for the Site. A Track 3 remedial alternative entails a Site cleanup to Restricted Use SCOs with SCOs modified according to 6 NYCRR 375-6.9 based on Site-specific data. Based on 6 NYCRR 375-6.9 and the supporting NYSDEC Technical Support Document[23] modification of SCOs is broken into two categories; 1) for Site contaminants for which specific SCOs are not listed in 6 NYCRR 375-6.8, and 2) modification of Track 3 remedial SCOs based on Site-specific data for certain parameter values, including inhalation, groundwater, and protection of ecological resources from bioaccumulative contaminants. All contaminants of concern for this Site are listed in 6 NYCRR 375-6.8 and there is no Site-specific data to support modification of SCOs. Therefore a Track 3 cleanup alternative would not be applicable to this Site and modified and Site-specific SCOs were not calculated for the Track 4 cleanup alternative as discussed below.

A Commercial Use Track 4 cleanup has been selected for the Site. The Track 4 cleanup is protective of human health and the environment, and is compliant with applicable SCGs. This remedial approach is less disruptive to the community, does not require building demolition, and does not cause significant impairment of the MJ Painting commercial operations. The Track 4 cleanup is consistent with future intended Site uses, is feasibly implementable, and represents a significant cost saving over removal of Site soils to comply with either Unrestricted or Restricted Use SCOs (e.g., Track 1 or Track 2).

The detailed Remedial Alternatives Analysis is provided in the following sections.

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[22] The NYSDEC approved October 14, 2014 *Addendum to Interim Remedial Measures Work Plan* included the use of a Site-specific concentration for Arsenic, consistent with background concentrations.

[23] NYSDEC and NYSDOH, 2006. *New York State Brownfield Cleanup Program Development of Soil Cleanup Objectives Technical Support Document.* September 2006.

8.1 Remedial Action Objectives

RAOs are media-specific objectives for the protection of public health and the environment. Based on the contaminated media identified **Section 5.0**, the Site-specific RAOs consist of:

Soil

- Prevent ingestion or direct contact with soil exceeding Commercial Use SCOs.
- Prevent migration of contaminants that would result in groundwater contamination.

Groundwater

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

Soil Vapor

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

Based on the RAOs described above, the GRAs for the Site will include excavation, a cover system, and institutional controls. Further description of GRAs including estimates of areas, volumes, and methods of implementation are described in Section 8.7 through Section 8.9.

8.2 Site Contaminants of Concern

Roux Associates identified the following contaminants of concern (COCs) present at the Site:

- Arsenic
- Lead
- Mercury
- Total PAHs

8.2.1 Arsenic

Arsenic is frequently present within urban background soils in New York State at concentrations in excess of the Commercial Use SCO (16 mg/kg), particularly at former

industrial properties with a history of fossil fuel burning, oil refining, and fertilizer production such as that which occurred in the vicinity of the Site. Accordingly, comparison of arsenic concentrations to Site-specific background conditions is considered appropriate. Vosnakis and Perry (2009)[24] recommend a BTV of 24.2 mg/kg based on the 95th percentile concentration of arsenic present in 101 background soil samples collected in the state of New York.[25] Locally, Turnkey reported an arsenic background concentration of 45 mg/kg based on a 95% upper confidence limit (UCL) on the mean from 318 soil samples collected at the Olean Redevelopment Property located approximately 1,200 feet south of the Site.[26]

Roux Associates performed a statistical analysis of the distribution of arsenic concentrations at the Site to derive the arsenic background concentration. The 95% UCL on the mean was calculated using ProUCL.[27] The 95% UCL provides an upper bound within a data set, below which values are likely representative of a given dataset (i.e., background concentrations). The 95% UCL on the mean for arsenic concentrations in Site soil is 33.33 mg/kg.[28]

Arsenic was detected at three surface soil sample locations in excess of the Commercial Use SCOs as discussed in **Section 5.1.3**. All three locations are within the footprint of the IRM or proposed Remedial Action excavations. Further, an evaluation of Site-wide subsurface sample arsenic concentrations in excess of the background concentration (33.33 mg/kg) indicate that zones of elevated arsenic concentrations are typically collocated within zones of GCM-impacted material. The GRA for arsenic will be soil removal. Since GCM containing soil will be removed, it is anticipated that the majority of soil exceeding the calculated

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[24] Vosnakis, Kelly A.S. and Elizabeth Perry. 2009. "Background Versus Risk-Based Screening Levels – An Examination of Arsenic Background Soil Concentrations in Seven States." *International Journal of Soil, Sediment and Water*. Volume 2, Issue 2, Article 2.

[25] Vosnakis and Perry (2009) examined background arsenic from over 1,600 background soil samples collected from 189 sites in Kentucky, Maryland, New York, Ohio, Pennsylvania, Virginia, and West Virginia from 1995 through 2001. They reported that arsenic was detected in 80 of 101 background soil samples collected in the state of New York. The maximum detected background arsenic concentration was 40.3 mg/kg, while the 95th percentile concentration was 24.2 mg/kg. They recommended using the 95th percentile concentration as a Background Threshold Value (BTV). Concentrations "below the BTV would be considered representative of background."

[26] Turnkey, 2013. *Comprehensive Remedial Investigation/Alternatives Assessment Report, Olean Redevelopment Property, BCP Site Nos. C905031, C905032, & C905033, Olean, New York.* Prepared for Olean-Gateway, LLC, July 2013.

[27] EPA, 2010. *ProUCL 4.1 Statistical Software for Environmental Applications for Data Sets with and without Nondetect Observations.* May 2010. Office of Research and Development. EPA/600/R-07/041. Available from http://www.epa.gov/osp/hstl/tsc/software.htm. May 2010.

[28] ProUCL output files area provided in Appendix N.

background concentration for the Site will be removed. Pre-characterized on-Site non-GCM soil may be re-used as excavation backfill. This reuse material will be utilized as initial backfill, minimizing potential for reuse soil to be within one foot of the ground surface. Pre-characterized reuse soil analytical data from the IRM, summarized in Table 10, indicates that Site-wide non-GCM soil will may be expected to contain arsenic concentrations below the calculated Site background (33.33 mg/kg). Additionally, a cover system will be utilized at the Site to ensure there is no exposure to residual soils with elevated arsenic exceeding Commercial Use SCOs.

8.2.2 Lead

Soil with total lead concentrations exceeding the Commercial Use SCO (1,000 mg/kg) will be tested by Toxicity Characteristic Leaching Procedure (TCLP) analysis to determine if it poses a threat to leach to groundwater. During the RI, an area of leachable lead, as indicated by TCLP lead concentrations above 5 mg/L, was identified in the vicinity of RX-30. This area was successfully delineated during the IRM, indicating the presence of a leachable lead "hot spot", as discussed in **Section 6.3.2**. The GRA for the leachable lead "hot spot" will include removal and off-Site disposal. Additionally, any other potential area of TCLP lead concentrations above 5 mg/L, as identified by Remedial Action pre-characterization sampling, will be removed for off-Site disposal.

Prior to off-Site disposal, soils with TCLP lead concentrations above 5 mg/L will be stabilized with a stabilizing agent (e.g., Maectite®) which chemically stabilizes lead in the soil matrix. Analytical sampling will be conducted on Maectite® stabilized soil to confirm TCLP lead concentrations below 5 mg/L, allowing the soil to be disposed of at Chaffee Landfill as suitable daily cover material. Any potential soil exceeding TCLP lead concentrations of 5 mg/L will be disposed off-Site at an appropriate facility. No Maectite® stabilized soil will be reused on-Site.

8.2.3 Mercury

An evaluation of Site-wide subsurface sample mercury concentrations in excess of the Commercial Use SCO (2.8 mg/kg) indicate that zones of elevated mercury concentrations are collocated within zones of GCM-impacted material. The GRA for mercury will be soil removal. Since GCM containing soil will be removed, it is anticipated that soil exceeding the Commercial Use SCO for mercury will be removed. Pre-characterized on-Site non-GCM soil may be re-used

as excavation backfill. This re-use material will be utilized as initial backfill, minimizing potential for reuse soil to be within one foot of the ground surface. Mercury was detected at concentrations ranging from 0.044 to 0.3 mg/kg in non-GCM soil pre-characterized for reuse during the IRM, as summarized in **Table 10**. Based on the Site-wide evaluation indicating that Commercial Use SCO mercury detections are collocated with GCM-impacted soil and the results of the IRM re-use precharacterization, it is likely that all non-GCM soil intended to be re-used on Site will meet the mercury Commercial Use SCO. Additionally, a cover system will be utilized at the Site to ensure there is no exposure to any potential residual soil with mercury exceeding Commercial Use SCOs, if present.

8.2.4 Polycyclic Aromatic Hydrocarbons

For PAHs, the alternative soil Cleanup Level of 500 mg/kg total PAHs was employed in lieu of individual PAH-specific Commercial Use SCOs for soil beneath buildings, pavement, or at least one foot of soil cover, in accordance with NYSDEC CP-51 Soil Cleanup Guidance. NYSDEC CP-51 permits this alternative soil cleanup level in subsurface soil for commercial use, where ecological SCOs are not applicable, in conjunction with a deed restriction and a SMP, both of which will be implemented at the Site.

An evaluation of Site-wide subsurface sample PAH concentrations in excess of the CP-51 alternative soil cleanup level (500 mg/kg) indicate that zones of elevated PAH concentrations are collocated within zones of GCM-impacted material. The GRA for PAHs will be soil removal. Since GCM containing soil will be removed, it is anticipated that soil exceeding the alternative soil Cleanup level for PAHs will be removed. Pre-characterized on-Site non-GCM soil may be re-used as excavation backfill. This reuse material will be utilized as initial backfill, minimizing potential for reuse soil to be within one foot of the ground surface. Total PAHs were detected at concentrations ranging from 2.49 to 16.1 mg/kg in non-GCM soil pre-characterized for reuse during the IRM, as summarized in Table 10. Based on the Site-wide evaluation indicating that Commercial Use SCO Total PAH detections are collocated with GCM-impacted soil and the results of the IRM re-use precharacterization, it is likely that all non-GCM soil intended to be re-used on Site will meet the Total PAH alternative cleanup level of 500 mg/kg. Additionally, a cover system will be

utilized at the Site to ensure there is no exposure to any potential residual soil with PAHs exceeding the alternative cleanup level for PAHs, if present.

8.3 Comparison to Commercial Use Soil Cleanup Objectives

Arsenic, barium, lead, mercury, total PAHs, and 1,2,4-Trimethylbenzene were detected above the Commercial Use SCOs in at least one soil sample collected from the Site. All such exceedances were co-located with GCM. Soil removal will be the GRA to achieve bulk reduction of soils exceeding Commercial Use SCOs. Other non-GCM impacted soil will be re-used at the Site as backfill beneath a cover system.

Excavation extents during Remedial Action activities will be determined by the distribution of GCM, not analytical confirmation of soils exceeding Commercial SCOs. Due to the preponderance of soils exceeding Commercial Use SCOs being collocated with GCM, a bulk reduction of contamination associated with the COCs discussed above will be completed by GCM source removal. Track 4 remedies must address all sources as a component of the remedy. Short- and long-term institutional and engineering controls are allowed to achieve protection of public health and the environment. The remedy under Track 4 must provide a cover system over any exposed residual soil contamination exceeding Commercial Use SCOs. Soils which are not otherwise covered by Site improvements (e.g, buildings, pavement, etc.) must be covered with soil that complies with the use-based SCOs in 6 NYCRR Table 375-6.8(b) levels within one foot of the ground surface.

The selected remedy, Track 4 Restricted Use, includes long-term institutional controls, a SSDS to eliminate potential impacts to indoor air, and a cover system that has all residual contamination covered either by buildings, sidewalks, pavement or a one foot thick cover of soil that complies with the Commercial Use SCOs and eliminates any exposure to residual soil contamination, if any.

8.4 Identification of Remedial Alternatives

The following three remedial alternatives (one being an Unrestricted Use scenario) have been identified for the Site:

Remedial Alternative 1

- Track 1 Scenario: Remediate to Unrestricted Use Criteria via excavation and off-Site

disposal of all soil exceeding Unrestricted Use SCOs and where GCM is observed;

Remedial Alternative 2

- Track 2 Scenario: Remediate to Restricted Use Criteria via excavation and off-Site disposal of all soil exceeding Restricted Use SCOs and where GCM is observed;

Remedial Alternative 3 (Selected Remedy)

- Track 4 Scenario: Remediate to Restricted Use with Site-specific SCOs (Commercial Use SCOs applied)[29] through excavation and off-Site disposal of all accessible soil where GCM is observed, includes long-term institutional controls, a SSDS to eliminate possible impacts to indoor air, and a cover system that has all residual contamination covered either by buildings, sidewalks, pavement or a one foot thick cover of soil that complies with the Commercial Use SCOs within remedial activities areas; natural attenuation of groundwater and/or soil vapor; and institutional/engineering controls.

The following sections provide a description and detailed evaluation of these remedial alternatives in accordance with Section 4.4[c] of DER-10. A detailed evaluation of each alternative, including positive aspects, negative aspects, and an evaluation relative to eight of the nine specific evaluation criteria from 6 NYCRR Part 375 described in **Section 8.6**, can be found in **Sections 8.7, 8.8,** and **8.9**. The ninth evaluation criteria, community acceptance, cannot be fully evaluated until the public comment period is completed.

8.5 Remedy Selection Evaluation Criteria

Remedial alternatives were evaluated and a remedy selected upon consideration of the following nine factors as outlined in 6 NYCRR Part 375-1.8(f) and DER-10:

- Overall protectiveness of public health and the environment;
- Standards, criteria, and guidance (SCGs);
- Long-term effectiveness and permanence;
- Reduction of toxicity, mobility or volume of contamination through treatment;
- Short-term impacts and effectiveness;
- Implementability;

[29] The NYSDEC approved October 14, 2014 *Addendum to Interim Remedial Measures Work Plan* included a provision for reuse of soils exceeding the arsenic Commercial Use SCO but below reasonable background concentrations.

- Cost-effectiveness;
- Community acceptance; and
- Land use.

A description of each individual evaluation criterion is provided below.

8.5.1 Overall Protection of Human Health and the Environment

From DER-10: "This criterion is an evaluation of the ability of each alternative or the remedy to protect public health and the environment.

1. How each alternative would eliminate, reduce, or control through removal, treatment, containment, engineering controls or institutional controls any existing or potential human exposures or environmental impacts identified by the remedial investigation.
2. The ability of each alternative to achieve each of the RAOs.
3. Overall protection of human health and the environment draws on the assessments of other evaluation criteria, especially long term effectiveness and permanence, short term effectiveness, and compliance with SCGs."

8.5.2 Standards, Criteria and Guidance

From 6 NYCRR Part 375: "The remedy will:

(i) Conform to standards and criteria that are generally applicable, consistently applied, and officially promulgated, that are either directly applicable, or that are not directly applicable but are relevant and appropriate, unless good cause exists why conformity should be dispensed with.

Good cause exists if any of the following is present:

(a) the proposed action is only part of a complete program or project that will conform to such standard or criterion upon completion;

(b) conformity to such standard or criterion will result in greater risk to the public health or to the environment than alternatives;

(c) conformity to such standard or criterion is technically impracticable from an engineering perspective;

(d) the program or project will attain a level of performance that is equivalent to that required by the standard or criterion through the use of another method or approach; and

(e) consider applicable Department guidance."

8.5.3 Long Term Effectiveness and Permanence

From 6 NYCRR Part 375: "A program or project that achieves a complete and permanent cleanup of the Site is preferred over a program or project that does not do so."

8.5.4 Reduction in Toxicity, Mobility or Volume of Contamination through Treatment

From 6 NYCRR Part 375: "Reduction in toxicity, mobility, or volume of contamination through treatment: a program or project that permanently and significantly reduces the toxicity, mobility, or volume of contamination is to be preferred over a program or project that does not do so. The following is the hierarchy of technologies ranked from the most preferable to the least preferable:

i. destruction, on-Site or off-Site;

ii. separation or treatment, on-Site or off-Site;

iii. solidification or chemical fixation, on-Site or off-Site; and

iv. control and isolation, on-Site or off-Site."

8.5.5 Short Term Impacts and Effectiveness

From DER-10: "This criterion is an evaluation of the potential short term adverse environmental impacts and human exposures during the construction and/or implementation of an alternative or remedy.

1. Identify the potential human exposures, adverse environmental impacts, and nuisance conditions at the Site resulting from the implementation of the remedy or alternative. Identify how they would be controlled and the effectiveness of the controls. The potential short term impacts to be evaluated include nuisance conditions or potential exposures resulting from increased traffic, including truck trips, detours or loss of the use of access to property, odors, vapors, dust, habitat disturbance, run off from the Site, and noise.

2. A discussion of engineering controls that would be used to mitigate the short term impacts (i.e., dust control measures) should be included.

3. The length of time needed to implement the remedy or alternative including time to achieve the remedial objectives should be estimated.

4. While sustainability will be a consideration in remedy selection, as set forth in **Section 1.14**, it will not change any existing statute, regulation or guidance."

8.5.6 Implementability

From DER-10: "This criterion is an evaluation of the technical and administrative feasibility of implementing an alternative or remedy."

1. Technical feasibility includes the difficulties associated with construction and the ability to monitor the effectiveness of an alternative or remedy.
2. Administrative feasibility is evaluated, which includes:
    a. the availability of the necessary personnel and material; and
    b. potential difficulties in obtaining specific operating approvals, access for construction, etc.
3. The evaluation of the reliability and viability of implementation of the institutional or engineering controls necessary for a remedy, as detailed in subdivision 4.2(b)."

8.5.7 Cost

From DER-10: "This criterion is an evaluation of the overall cost effectiveness of an alternative or remedy."

1. A remedy is cost effective if its costs are proportional to its overall effectiveness. To evaluate cost effectiveness:
    a. the overall effectiveness of an alternative or remedy is determined by evaluating the criteria set forth in subdivisions (d), (e) and (f) above;
    b. a comparison of the overall effectiveness is then made to the cost of the alternative or remedy; and
    c. an assessment is made as to whether the cost is proportional to the overall effectiveness, to determine whether it is cost effective.
2. Capital costs and costs associated with Site management for each alternative are estimated in accordance with subparagraph 4.3(a)5.iii."

8.5.8 Community Acceptance

From DER-10: "This criterion is evaluated after the public review of the remedy selection process as part of the final DER selection/approval of a remedy for the Site.

1. Any public comment relative to these criteria will be considered by DER after the close of the public comment period.

2. Documentation of the public comments received is to be consistent with the citizen participation plan identified for a remedial program in accordance with applicable DEC policy."

8.5.9 Land Use

From Part 375: "In assessing reasonable certainty, the Department shall consider:

(i) the current, intended, and reasonably anticipated future land uses of the Site and its surroundings in the selection of the remedy for soil remediation under the brownfield cleanup and environmental restoration programs, and may consider land use in the State superfund program, where cleanup to pre-disposal conditions is determined not feasible;

(ii) the Department's determination on the use of the Site will be in accordance with subdivision 375-1.8(g);

(iii) the reasonably anticipated future use of the Site and its surroundings, which shall be documented in the analysis of alternatives, taking into consideration factors including, but not limited to, the following:

(a) current use and historical and/or recent development patterns;

(b) applicable zoning laws and maps;

(c) brownfield opportunity areas as designated set forth in GML 970-r;

(d) applicable comprehensive community master plans, local waterfront revitalization plans as provided for in EL article 42, or any other applicable land use plan formally adopted by a municipality;

(e) proximity to real property currently used for residential use, and to urban, commercial, industrial, agricultural, and recreational areas;

(f) any written and oral comments submitted by members of the public on the proposed use as part of the activities performed pursuant to the citizen participation plan;

(g) environmental justice concerns, which for purposes of this subpart, include the extent to which the proposed use may reasonably be expected to cause or increase a disproportionate burden on the community in which the Site is located, including low income minority communities, or to result in a disproportionate concentration of commercial or industrial uses in what has historically been a mixed use or residential community;

(h) federal or State land use designations;

(i) population growth patterns and projections;

(j) accessibility to existing infrastructure;

(k) proximity of the Site to important cultural resources, including federal or State historic or heritage sites or native American religious sites;

(l) natural resources, including proximity of the Site to important federal, State or local natural resources, including waterways, wildlife refuges, wetlands, or critical habitats of endangered or threatened species;

(m) potential vulnerability of groundwater to contamination that might emanate from the Site, including proximity to wellhead protection and groundwater recharge areas and other areas identified by the Department and the State's comprehensive groundwater remediation and protection program established in ECL article 15, title 31;

(n) proximity to flood plains;

(o) geography and geology; and

(p) current institutional controls applicable to the Site."

8.6 Remedial Activities to be Implemented

This section describes remedial activities that will be completed for either remedial alternative that may be selected for the Site. The scope of work and purpose of these activities will be similar for either remedial alternative.

- Mobilization and Site Preparation;
- Stormwater Management and Erosion Control during Construction;
- Dust Control;
- Temporary Staging and Stockpiling;
- Traffic Control;
- Off-Site Disposal and Equipment Decontamination;
- Installation of New Monitoring Wells and Groundwater Monitoring; and
- Health and Safety and Community Air Monitoring.

The forthcoming RAWP will discuss the above scope of work items in greater detail.

8.7 Track 1 Cleanup Alternative

In accordance with DER-10, an evaluation of at least one alternative that restores the Site to pre-release conditions and complies with Unrestricted Use Criteria is required. Given the nature of contamination, excavation and off-Site disposal is deemed the only alternative capable of achieving such end points. The following sections provide an evaluation of Remedial Alternative 1, Excavation to Meet Unrestricted Use Soil Criteria, which serves as the unrestricted use alternative for the Site.

8.7.1 Description of Track 1 Cleanup Alternative

This alternative would include a Track 1 cleanup of the Site requiring excavation and off-Site disposal of all soil/fill that contains contaminants exceeding 6 NYCRR Part 375-6.8(a) Unrestricted Use SCOs and any soil where GCM was observed (**Tables 2 through 4** and **Figure 4**). Based on the presence of GCM and exceedances of Unrestricted Use SCOs at multiple locations at the Site it is assumed that the Site would require complete excavation to depths of up to 20 ft-bgs. Due to the depth of the excavation, it is assumed that sheeting around the excavation area and extensive dewatering would be required. The approximate volume of soil to be excavated and removed from the Site is 68,000 cubic yards. Soil and groundwater remediation would be achieved through total source removal. Groundwater monitoring would be conducted until SCGs or asymptotic groundwater conditions are achieved. A Track 1 cleanup removes the necessity of engineering or institutional controls.

Due to the potential of non-GCM soils having total metal concentrations that may exceed the Unrestricted Use SCOs, it is assumed that no Site soils will be reused as backfill. Dewatering activities would be required to depress the water table across the entire Site to allow for complete GCM excavation. Water generated during the dewatering activities would be treated on-Site and discharged in accordance with applicable regulatory requirements. Clean fill would be brought onto the Site to return Site grade to pre-existing elevations.

In order to excavate all soils exceeding the Unrestricted Use Criteria at the Site, all existing structures, buildings, sidewalks and roadways located at the Site would need to be demolished and, subsequently, replaced as part of this Remedial Alternative.

Excavated material and recovered free-product (if any) would be disposed off-Site in accordance with applicable regulations to a State-approved facility. Post-excavation bottom and sidewall sampling and waste characterization sampling for material to be disposed would be conducted. The excavated area would be back-filled with common fill that meets the Unrestricted Use Criteria. For costing purposes, it is assumed that the demolished buildings, sidewalks, and landscaped areas would be restored to existing operational requirements. Areas currently paved with asphalt would be repaved to match existing conditions.

8.7.2 Preliminary Screening of Track 1 Cleanup Alternative

The main benefits of a Track 1 cleanup alternative are that:

- Is a proven, permanent and accepted technology;
- Provides protection of public health and the environment via removal of all contamination to meet the Unrestricted Use Criteria, to the extent practicable; and
- Requires no long-term O&M or monitoring.

However, the main drawbacks of a Track 1 cleanup alternative are that it:

- Requires a significant volume of material to be excavated, transported and disposed off-Site.
- Results in the most notable short-term impacts to the workers and surrounding community, with potentially high levels of odor, dust and truck traffic. The potential adverse impacts of this alternative to the community and workers, though mitigated to the extent practical with engineering controls, would be higher, relative to other, less intrusive alternatives, due to the amount of excavation, heavy construction, and transportation actions that would be needed to perform the remedy. Some off-Site potential impacts, such as increased air emissions contributing to local pollution and global greenhouse gas, cannot be minimized through implementation of engineering controls;
- Is not practicably feasible and the most difficult to implement due to the amount of excavation shoring and dewatering, and demolition of the 291 Homer Street existing Site building, recently constructed 299 Homer Street buildings and paved areas located at the Site; and
- Is not cost-effective because it would be orders of magnitude more costly than the other cleanup alternative that can achieve the RAOs.

8.7.3 Evaluation of Track 1 Cleanup Alternative

The following sections provide an evaluation of a Track 1 cleanup alternative based on the nine specific evaluation criteria from 6 NYCRR Part 375-1.8(f) and DER-10.

8.7.3.1 Overall Protection of Human Health and the Environment

A Track 1 cleanup would be protective of human health and the environment for the Site because it would address any potential human exposures or environmental impacts caused by the presence of GCM, contaminated soil contact, and off-Site LNAPL migration. However, due to the large amount of GCM impacted soil to be excavated and transported off-Site, this alternative would have the potential for impact on human health and the environment through possible exposures to contaminants, traffic accidents, and a large volume of generated waste that would be disposed of off-Site at a landfill.

In addition, a Track 1 cleanup would meet all of the RAOs for the Site for soil, free-product, groundwater, and soil vapor, as described above in **Section 8.1**. By removing all soil exceeding the Unrestricted Use Criteria, extensive dewatering during excavation, and back-filling the areas with clean fill, the Site would be restored to pre-existing conditions, to the extent practicable.

8.7.3.2 Standards, Criteria and Guidance

A Track 1 cleanup would meet the SCGs for soil, free-product and groundwater. This alternative would address current Site soil and/or fill exceeding 6 NYCRR Part 375-6.8(a) Unrestricted Use SCOs and any soil where GCM was observed. Groundwater monitoring would be conducted until SCGs are achieved or groundwater contaminants reach asymptotic levels.

8.7.3.3 Long-term Effectiveness and Permanence

A Track 1 cleanup would provide long-term effectiveness and permanence of protection of human health and the environment for the Site. All contamination in soil and groundwater would be removed; therefore, the potential for human exposure and impacts to ecological receptors would be addressed. Institutional and/or engineering controls would not be required and are not included as part of this alternative.

8.7.3.4 Reduction of Toxicity, Mobility, or Volume of Contamination through Treatment

A Track 1 cleanup would reduce the volume of contaminants by removing soil that exceeds the Unrestricted Use Criteria. Impacted groundwater would be treated via dewatering/water treatment during excavation and off-Site disposal of impacted soil. The Track 1 cleanup also permanently eliminates any potential LNAPL at the Site via excavation, to the extent practicable. Groundwater remediation would be accomplished through sources removal.

Excavation, transport, and disposal do not treat the toxicity, mobility or volume of contamination through treatment. Rather, the toxicity, mobility, and volume of contamination are relocated to an engineering controlled location (land-fill).

8.7.3.5 Short-term Impacts and Effectiveness

A Track 1 cleanup would have significant short-term impacts to Site use. This option would require building demolition and cessation of the Site commercial operations. Additionally, complete excavation would impact the local community through noise, dust, and traffic associated with heavy remediation construction and waste transportation. These risks would be mitigated through the implementation of engineering controls as necessary(i.e. Site-specific Health and Safety Plan (HASP), dust and odor suppression, traffic control, and air monitoring as specified in the Community Air Monitoring Plan). Dewatering activities would substantially suppress the natural Site vicinity water table. Sustainability of this remedy would be considered unfavorable due to the large carbon footprint, high emissions resulting from equipment and truck traffic, and high volume of waste generated during completion of this remedy.

8.7.3.6 Implementability

The materials, equipment, and personnel associated with the implementation of a Track 1 cleanup are commercially available and have been proven effective and reliable for remediation of the media of concern at other sites. However, a Track 1 remediation is not practicably feasible due to the amount of demolition, excavation, shoring, dewatering and construction required, and health and safety concerns associated with implementation. The excavation area is particularly large and deep, with shoring required around the excavation.

The administrative feasibility of implementing this alternative would be low. Demolition of the 291 Homer Street existing Site building and recently constructed 299 Homer Street buildings would be a large disruption to the current Site commercial operations. The current Site operations would need to be discontinued and/or potentially relocated, which is highly impracticable and infeasible.

8.7.3.7 Cost Effectiveness

The anticipated cost of a Track 1 full excavation and removal cleanup alternative is $11,750,000. These costs indicate that source removal to comply with a Track 1 Cleanup is not a cost-effective remedial approach. While widespread GCM is observed in locations throughout the Site, non-hot spot excavation, and removal of all soils to comply with Residential Use SCOs, would likely result in excessive soil volume removals and subsequent excessive transportation costs, disposal costs, demolition costs, loss of business revenue, and significant disruption to the operating Site commercial business.

8.7.3.8 Community Acceptance

Community acceptance cannot be evaluated at this point due to the public comment period having not yet been completed.

8.7.3.9 Land Use

A Track 1 cleanup would allow for unrestricted use of the Site following the completion of the Remedial Action, which permits all use beyond the current and reasonably anticipated land use and zoning of the Site. However, the implementation of a Track 1 cleanup is incompatible with the existing land use of the Site, since the current operating businesses would be required to be shut down. In addition, the implementation of a Track 1 Remedial effort to bring the Site to a condition to allow such unrestricted use is not cost-effective or warranted for the following reasons:

1. The current zoning of the Site is industrial/commercial;
2. Currently, the land is in productive use. Implementing the remedy would require discontinuation of this productive use for the duration of the Remedial Action; and
3. The reasonably anticipated future use of the Site would remain industrial/commercial use.

8.8 Track 2 Cleanup Alternative

A Track 2 cleanup to Restricted Commercial Use SCOs would be consistent with the intended use of the Site. Given the nature of contamination, excavation and off-Site disposal is deemed the only alternative capable of achieving such end points. The following sections provide an evaluation of Remedial Alternative 2, Excavation to Meet Restricted Use Soil Criteria.

8.8.1 Description of Track 2 Cleanup Alternative

This alternative would include a Track 2 cleanup of the Site requiring excavation and off-Site disposal of all soil/fill that contains contaminants exceeding 6 NYCRR Part 375-6.8(a) Commercial Use SCOs and any soil where GCM was observed (**Tables 2 through 4** and **Figure 4**). Based on the presence of GCM and exceedances of Commercial Use SCOs at multiple locations at the Site it is assumed that the Site would require complete excavation to depths of up to 15 ft-bgs. Due to the depth of the excavation, it is assumed that sheeting around the excavation area and extensive dewatering would be required. The approximate volume of soil to be excavated and removed from the Site is 52,000 cubic yards. Soil and groundwater remediation would be achieved through total source removal. Groundwater monitoring would be conducted until SCGs or asymptotic groundwater conditions are achieved. A Track 2 cleanup removes the necessity of long-term engineering or institutional controls.

Due to the potential of non-GCM soils having total metal concentrations that may exceed the Commercial Use SCOs, it is assumed that no Site soils will be reused as backfill. Dewatering activities would be required to depress the water table across the entire Site to allow for complete GCM excavation. Water generated during the dewatering activities would be treated on-Site and discharged in accordance with applicable regulatory requirements. Clean fill would be brought onto the Site to return Site grade to pre-existing elevations.

In order to excavate all soils exceeding the Commercial Use SCOs at the Site, the 291 Homer Street existing Site building may need to be demolished and, subsequently, replaced as part of this Remedial Alternative.

Excavated material and recovered free-product (if any) would be disposed off-Site in accordance with applicable regulations to a State-approved facility. Post-excavation bottom and sidewall sampling and waste characterization sampling for material to be disposed would be conducted. The excavated area would be back-filled with common fill that meets the Restricted Use Criteria. For costing purposes, it is assumed that the demolished buildings, sidewalks, and landscaped areas would be restored to existing operational requirements. Areas currently paved with asphalt would be repaved to match existing conditions.

8.8.2 Preliminary Screening of Track 2 Cleanup Alternative

The main benefits of a Track 2 cleanup are that:

- Is a proven, permanent and accepted technology;
- Provides protection of public health and the environment via removal of all contamination to meet the Restricted Use Criteria, to the extent practicable; and
- Requires no long-term O&M or monitoring.

However, the main drawbacks of a Track 2 cleanup are that it:

- Requires a significant volume of material to be excavated, transported and disposed off-Site.
- Results in the most notable short-term impacts to the workers and surrounding community, with potentially high levels of odor, dust and truck traffic. The potential adverse impacts of this alternative to the community and workers, though mitigated to the extent practical with engineering controls, would be higher, relative to other, less intrusive alternatives, due to the amount of excavation, heavy construction, and transportation actions that would be needed to perform the remedy. Some off-Site potential impacts, such as increased air emissions contributing to local pollution and global greenhouse gas, cannot be minimized through implementation of engineering controls;
- Is not practicably feasible and is difficult to implement due to the amount of excavation shoring and dewatering, the potential demolition of the 291 Homer Street existing Site building, and disruption of the Site commercial operations; and
- Is not cost-effective because it would be orders of magnitude more costly than the other remedial alternative that can achieve the RAOs.

8.8.3 Evaluation of Track 2 Cleanup Alternative

The following sections provide an evaluation of a Track 2 cleanup based on the nine specific evaluation criteria from 6 NYCRR Part 375-1.8(f) and DER-10.

8.8.3.1 Overall Protection of Human Health and the Environment

A Track 2 cleanup would be protective of human health and the environment for the Site because it would address any potential human exposures or environmental impacts caused by the presence of GCM, contaminated soil contact, and off-Site LNAPL migration. However, due to the large amount of GCM impacted soil or soil exceeding Commercial Use SCOs requiring excavation and off-Site disposal, this cleanup would have the potential for impact on human health and the environment through possible exposures to contaminants, traffic accidents, and a large volume of generated waste that would be disposed of off-Site at a landfill.

In addition, a Track 2 cleanup would meet all of the RAOs for the Site for soil, free-product, groundwater, and soil vapor, as described above in **Section 8.1**. By removing all soil exceeding the Restricted Use Criteria, extensive dewatering during excavation, and back-filling the areas with clean fill, the Site would be restored to pre-existing conditions, to the extent practicable.

8.8.3.2 Standards, Criteria and Guidance

A Track 2 cleanup would meet the SCGs for soil, free-product and groundwater. This alternative would address current Site soil and/or fill exceeding 6 NYCRR Part 375-6.8(b) Restricted Use SCOs and any soil where GCM was observed. Groundwater monitoring would be conducted until SCGs are achieved or groundwater contaminants reach asymptotic levels.

8.8.3.3 Long-term Effectiveness and Permanence

A Track 2 cleanup would provide long-term effectiveness and permanence of protection of human health and the environment for the Site. All contamination in soil and groundwater would be removed to commercial standards; therefore, the potential for human exposure and impacts to ecological receptors would be addressed. Institutional and/or engineering controls would not be required and are not included as part of this alternative.

8.8.3.4 Reduction of Toxicity, Mobility, or Volume of Contamination through Treatment

A Track 2 cleanup would reduce the volume of contaminants by removing soil that exceeds the Restricted Use Criteria. Impacted groundwater would be treated via dewatering/water treatment during excavation and off-Site disposal of impacted soil. The Track 2 cleanup also permanently eliminates any potential LNAPL at the Site via excavation/removal, to the extent practicable. Groundwater remediation would be accomplished through sources removal.

Excavation, transport, and disposal do not treat the toxicity, mobility or volume of contamination through treatment. Rather, the toxicity, mobility, and volume of contamination are relocated to an engineering controlled location (land-fill).

8.8.3.5 Short-term Impacts and Effectiveness

A Track 2 cleanup would have significant short-term impacts to Site use. This option would require building demolition and cessation of the Site commercial operations. Additionally, complete excavation would impact the local community through noise, dust, and traffic associated with heavy remediation construction and waste transportation. These risks would be mitigated through the implementation of engineering controls as necessary (i.e. Site-specific Health and Safety Plan (HASP), dust and odor suppression, traffic control, and air monitoring as specified in the Community Air Monitoring Plan). Due to the potential extent of a Track 2 cleanup excavation, these engineering controls would be significantly disruptive the commercial operations of MJ Painting. Dewatering activities would substantially suppress the natural Site vicinity water table. Sustainability of this remedy would be considered unfavorable due to the large carbon footprint, high emissions resulting from equipment and truck traffic, and high volume of waste generated during completion of this remedy.

8.8.3.6 Implementability

The materials, equipment, and personnel associated with the implementation of a Track 2 cleanup are commercially available and have been proven effective and reliable for remediation of the media of concern at other Sites.

The administrative feasibility of implementing this alternative would be low. The excavation extent in the vicinity of the existing Site commercial business would render business operations impossible. The current Site operations would need to be discontinued and/or potentially relocated, which is highly impracticable and infeasible.

8.8.3.7 Cost Effectiveness

The anticipated cost of a Track 2 full excavation and removal cleanup is $9,200,000. These costs indicate that source removal to comply with a Track 2 cleanup is not a cost-effective remedial approach. While widespread GCM is observed in locations throughout the Site, non-hot spot excavation, and removal of all soils to comply with Commercial Use SCOs, would likely result in excessive soil volume removals and subsequent excessive transportation costs, disposal costs, demolition costs, loss of business revenue, and significant disruption to the operating Site commercial business.

8.8.3.8 Community Acceptance

Community acceptance cannot be evaluated at this point due to the public comment period having not yet been completed.

8.8.3.9 Land Use

A Track 2 cleanup would allow for Restricted use of the Site following the completion of the Remedial Action, which permits all use beyond the current and reasonably anticipated land use and zoning of the Site. However, the implementation of a Track 2 cleanup is incompatible with the existing land use of the Site, since the current operating businesses would be required to be shut down. In addition, the implementation of a Track 2 Remedial effort to bring the Site to a condition to allow such Restricted use is not cost-effective or warranted for the following reasons:

1. The current zoning of the Site is industrial/commercial;
2. Currently, the land is in productive use. Implementing the remedy would negatively impact this productive use for the duration of the Remedial Action; and
3. The reasonably anticipated future use of the Site would remain industrial/commercial use.

8.9 Track 4 Cleanup Alternative

The following sections provide an evaluation of a Track 4 cleanup. A Track 4 cleanup would remediate the Site to Commercial Use SCOs.

A Track 4 cleanup includes the following components:

- Excavation of soil containing GCM;
- Excavation of leachable lead-impacted soil;
- Groundwater contamination source removal;
- Cover system;
- Indoor air quality management;
- Institutional and Engineering Controls; and
- Evaluation of Soil Vapor Extraction.

8.9.1 Excavation of Soil Containing GCM

Soil containing GCM at the Site will be excavated to the greatest extent feasible and transported off-Site for disposal. Excavation beneath the 291 Homer Street existing Site building is not feasible. Full excavation of GCM to final depths vertically beneath property boundaries may be achieved through the use of sheeting and shoring. GCM has been observed in seven separate areas, as shown on **Figure 4**. The excavation extents, as illustrated on **Figure** 4, are subject to change during the Remedial Action activities, based on the actual observed distribution of GCM in the subsurface. One of these areas (Area A) is divided into six subareas (Areas A-1 through A-6) based on the approximate thickness of GCM in each subarea. Excavation will be initiated in each of these areas and will proceed vertically and laterally until GCM is no longer encountered, or until groundwater infiltration into the excavation makes further excavation infeasible,[30] or until the excavations reach the vicinity of the existing Site buildings or property boundaries as described below. Additional detail regarding the depth, average thickness, and anticipated volume of GCM-impacted soil within the remedial areas depicted in **Figure 4** will be provided in the forthcoming RAWP.

[30] Estimated at two feet below the groundwater table.

However, for costing purposes, based on existing data, it is estimated that approximately 9,000 cubic yards of GCM-impacted soil would be excavated from the Site.

The excavation sidewalls will be sloped to maintain both excavation sidewall stability and the geotechnical integrity of the surrounding ground surface and work area. The sloping will be determined by Remedial Engineering personnel in consultation with the Contractor, and will comply with Remedial Engineering's standard operating procedures and OSHA requirements (29 CFR 1926 Subpart P). The vertical extent of excavation may extend below the water table, in which case dewatering may be required. If excavation in the vicinity of underground utilities is required, soft-digging techniques (e.g., hand digging, air knifing) will be utilized and additional excavation sidewall stabilization measures may be employed (e.g., trench boxes, sheet piling). Further, excavations in the vicinity of the existing building or property boundaries may be required to remove GCM located within the sidewall slope. In the event that GCM removal immediately adjacent to existing buildings or up to a property boundary is necessary, sheet piles or shoring (e.g., trench boxes) will be used to prevent damage to the building or reach the full necessary extent of excavation. If sheet piles or shoring is necessary, it will be designed by a licensed professional engineer and installed by the Contractor. Non-GCM-impacted material (i.e., soil/fill not containing GCM) that is removed during the excavation will be segregated, stockpiled, and may be reused on-Site as backfill (see RAWP for additional details) or characterized for solid waste disposal and disposed of off-Site at a permitted commercial solid waste disposal facility.

8.9.2 Excavation of Leachable Lead-Impacted Soil

An area of leachable lead, as indicated by TCLP lead concentrations above 5 mg/L, was identified in the vicinity of RX-30. This area was successfully delineated during the IRM, indicating the presence of a leachable lead "hot spot", as discussed in **Section 6.3.2**. The GRA for the leachable lead "hot spot" will removal and off-Site disposal. Additionally, any other potential area of TCLP lead concentrations above 5 mg/L, as identified by Remedial Action pre-characterization sampling, will be removed for off-Site disposal.

Prior to off-Site disposal, soils with TCLP lead concentrations above 5 mg/L will be stabilized with a landfill approved stabilizing agent (e.g., Maectite®) which chemically stabilizes lead in the soil matrix. Analytical sampling will be conducted on Maectite®

stabilized soil to confirm TCLP lead concentrations below 5 mg/L, allowing the soil to be disposed of at Chaffee Landfill as suitable daily cover material. Any potential soil exceeding TCLP lead concentrations of 5 mg/L will be disposed off-Site at an appropriate facility.

8.9.3 Groundwater Contamination Source Removal

The elimination of off-Site migration of contaminated groundwater will be achieved by source removal. Approximately 9,000 cubic yards of GCM will be excavated from the Site. In addition, LNAPL encountered on groundwater within the excavation near will be removed via vacuum extraction and transported off-Site for disposal.

Following completion of excavation activities, groundwater conditions will be monitored at the Site to confirm that practicably removed source material has successfully eliminated off-Site groundwater contamination migration. Any monitoring wells destroyed during remedial activities will be replaced within backfilled excavation areas. On-Site residual groundwater contamination, if present, is expected to attenuate through naturally occurring biodegradation, which is likely occurring at the Site based on the presence of methane in soil gas and dissolved iron and manganese and the lack of dissolved oxygen in groundwater collected from monitoring wells located along the downgradient (i.e., southeast) property boundary. Periodic groundwater monitoring will continue under a SMP following completion of the remedial activities to document the successful elimination of off-Site contaminant migration in groundwater. Remediation of on-Site groundwater to AWQSGVs was not selected as an RAO at this Site because institutional controls restricting groundwater use are expected to remain in place, and the vapor barriers and SSDS are expected to be maintained and operated for the foreseeable future. Groundwater monitoring would be conducted until SCGs are achieved or asymptotic levels are reached. Groundwater monitoring beyond the SMP may be required if constituents associated with residual GCM, if present, are determined to be migrating in Site groundwater.

8.9.4 Cover System

A cover system will be utilized to eliminate soil exposure from residual contamination, if any. The cover system will be comprised of one of the following (where necessary): 1) analytically confirmed Commercial Use SCO compliant surface soil (top one foot), 2) a one foot thick soil cover system placed above a demarcation layer, or 3) beneath Site

improvements (e.g., buildings, pavement, etc.). The approximate extents and configuration of the cover system remedy are illustrated on **Figure 7**.

8.9.5 Indoor Air Quality Management

Site indoor air quality will be managed through the use of vapor barriers beneath existing and currently planned Site buildings and a SSDS, as described below.

8.9.5.1 Vapor Barrier

A vapor barrier membrane will be installed to mitigate the potential migration of vapors (associated with residual waste in the subsurface soil, if any) into currently planned Site buildings. All proposed development consists of slab-on-grade construction.

8.9.5.2 Sub-slab Depressurization System

Potential migration of soil vapor into the office portion of the 291 Homer Street existing Site building and currently planned Site buildings will be mitigated with the construction of a SSDS. The purpose of the proposed SSDS is to mitigate the concentrations of contamination within the soil gas, if any, beneath the buildings at the Site, and minimize potential exposure risk, to the workers within the buildings.

The completed SSDS designs will include the layout of the piping network and SSDS process equipment. The SSDSs will be designed to incorporate the building foundation designs in order to most effectively place the vent pipes to avoid structural elements while also maximizing propagation of vacuum under the slab. The SSDS design plans will be submitted to NYSDEC and NYSDOH for review prior to construction of the SSDS.

System testing and effluent air monitoring will be performed at SSDS startup to confirm operation. Testing will include post-mitigation indoor and outdoor air sampling during the heating season and at least 30 days after building construction, pressure field extension testing, identification and sealing of leaks, and confirmation that the warning device is operating correctly. Routine maintenance, monitoring, and certification of the SSDS will occur annually for a period of 10 years after installation as will be defined in the SMP. Operational startup testing of the SSDS will be documented and submitted to NYSDEC in

the FER and ongoing operation and maintenance (O&M) will be documented in compliance with the SMP.

8.9.6 Institutional Controls

Institutional controls at the Site, in the form of an environmental easement and a SMP as described in DER-10, will be implemented to restrict the use of groundwater at the Site, maintain the cover system, restrict soil disturbance activities, and require operation and maintenance of the SSDS. The environmental easement will identify all allowable uses of the Site, including its currently intended commercial and industrial use, which is consistent with the SCGs. The property owner, Mr. John, is prepared to agree to establish and maintain the easement in a form which is made enforceable by the State. The environmental easement will be executed prior to approval of the FER.

The benefits of a Track 4 remedial approach would be: meets Site soil and groundwater RAOs, is technically practicable, less disruptive to Site and community, is feasibly implementable, and more cost effective than a Track 1 cleanup. A Track 4 cleanup approach will limit future Site use.

8.9.7 Potential in-situ Remedial Alternatives

Pursuant to NYSDEC and NYSDOH comments received on March 2, 2015 in response to the RI/AAR dated January 30, 2015, an evaluation was conducted of potential in-situ remedial alternatives to address GCM, if any, beneath the 291 Homer Street existing Site building. The evaluation is presented below in **Section 8.9.10**.

8.9.8 Preliminary Screening of Track 4 Cleanup Alternative

The main benefits of a Track 4 cleanup are that it:

- Is a proven, permanent and accepted technology;
- Provides protection of public health and the environment via removal contamination to meet Commercial SCOs, consistent with current and anticipated future Site use;
- Is completed in a relatively short remedial time frame; and
- Is cost-effective and feasibly implementable.

The main drawbacks of a Track 4 cleanup are that it:

- Requires a significant volume of material to be excavated, transported and disposed off-Site; and

- While less than a Track 1 cleanup, the Track 4 cleanup still results in short-term impacts to the workers and surrounding community, with potentially high levels of odor, dust and truck traffic. The potential adverse impacts of this alternative to the community and workers, though mitigated to the extent practical with engineering controls, would be higher, relative to other, less intrusive alternatives, due to the amount of excavation, heavy construction, and transportation actions that would be needed to perform the remedy. Some off-Site potential impacts, such as increased air emissions contributing to local pollution and global greenhouse gas, cannot be minimized through implementation of engineering controls. However, no less intrusive alternative was identified for GCM removal.

8.9.9 Evaluation of Track 4 Cleanup Alternative

The following sections provide an evaluation of a Track 4 cleanup based on the nine specific evaluation criteria from 6 NYCRR Part 375-1.8(f) and DER-10.

8.9.9.1 Overall Protection of Human Health and the Environment

Soil

Excavation would remove leachable lead impacted soils and GCM-impacted soil within the Site in the vicinity of existing, observed LNAPL accumulations. Installation of a cover system (e.g., analytically confirmed existing soil, imported soil, or Site development), along with implementation and maintenance of institutional/engineering controls, would prevent contact with potential, residual contaminated soil, and prevent inhalation of potentially residual contaminants that would potentially volatilize from soil. Implementation and maintenance of institutional/engineering controls would prevent contact with potential, residual contaminated soil. A Track 4 cleanup includes the use of institutional/engineering controls, which further protect human health and environment by, among other things, placing restrictions on land use based on the clean-up criteria and protecting workers and the community from the potential of contact or exposure through development and implementation of a SMP designed in accordance with NYSDEC DER-10.

Groundwater

The Track 4 cleanup would provide protection of human health and the environment by practicably removing source material contamination resulting in impacted groundwater quality. Also, ingestion of contaminated groundwater is not an exposure pathway as

groundwater is not used for drinking water purposes in this area, but rather is supplied by the local municipality through another source. Any potential, residual groundwater impacts remaining would degrade over time via MNA. The Track 4 cleanup includes the use of institutional/engineering controls, which further protect human health and environment by, among other things, placing restrictions on land use based on the clean-up criteria, prohibiting the use of groundwater as drinking water, and protecting workers and the community from the potential of contact or exposure through development and implementation of a SMP.

As discussed previously, LNAPL has been observed at the Site during groundwater, test pitting, and excavation activities. This alternative would remove the existing, isolated LNAPL via excavation of GCM-impacted soil within the areas LNAPL have been observed. Source removal is expected to reduce or eliminate the presence of LNAPL at the Site. Ultimately, groundwater would be restored, to the extent practicable, by source-zone removal and natural attenuation of residual contamination, if present.

Soil Vapor

No Site-specific criteria for soil vapor exist for the Site. However, in the event of future redevelopment, engineering controls, such as the vapor barrier and SSDS, will be in place as a proactive measure in order to ensure long-term, potential soil vapor impacts are mitigated.

8.9.9.2 Standards, Criteria and Guidance

There are currently groundwater exceedances of the NYSDEC AWQSGVs Class GA Groundwater Criteria and soil exceedances of the Part 375 Commercial Criteria. However, as discussed in 8.8.4, Site groundwater is not compared to the AWQSGV criteria as part of this remedial approach. Excavation of impacted soils and associated dewatering will remove contamination from the Site to the extent practicable, and any potential exceedances of the SCGs will be mitigated through the installation of a cover system. Natural attenuation would result in further reductions in groundwater concentrations towards compliance with SCGs to the extent practicable. It should be noted that groundwater is not used for drinking water in this area, but is supplied by the municipality.

The Track 4 cleanup also includes the use of institutional/engineering controls, which place restrictions on land use based on the clean-up criteria and protecting workers and the community from the potential of contact or exposure through development and implementation of a SMP.

8.9.9.3 Long-term Effectiveness and Permanence

The proposed excavation, cover system, indoor air quality mitigation, and the use of institutional/engineering controls would provide for an effective remedy that protects the public and the environment from GCM, contaminated groundwater, and soil vapor.

Soil

The soil removal action would effectively and permanently remove soils containing GCM or above Commercial Use SCOs from the Site to the extent that it is practicably feasible. Through the use of institutional/engineering controls, the potential for ingestion or contact with soil would be eliminated. Institutional/engineering controls include, but are not limited to, placing restrictions on land use based on the clean-up criteria and protecting workers and the community from the potential of contact or exposure through development and implementation of a SMP.

Groundwater

Soil excavation, dewatering, and LNAPL removal are expected to permanently eliminate potential groundwater contaminant sources from the excavated areas and improve groundwater quality. Residual groundwater contamination would be further reduced over time via natural attenuation. The potential impact on human exposures, ecological receptors and the environment from residual groundwater contamination would be limited due to the use of institutional/ engineering controls. Institutional/engineering controls include, but are not limited to, vapor barrier installation, SSDS installations, installation of a cover system, prohibiting the use of groundwater as a drinking water source and protecting workers and the community from the potential of contact or exposure through a SMP. Ingestion of contaminated groundwater is not a concern as groundwater is not used for drinking water in this area, but rather is supplied by the local municipality.

Soil Vapor

As discussed previously no Site-specific criteria for soil vapor exist for the Site. However, in the event of future redevelopment, engineering controls, such as the vapor barrier and SSDS, will be in place as a proactive measure in order to ensure long-term, potential soil vapor impacts are mitigated.

8.9.9.4 Reduction of Toxicity, Mobility, or Volume of Contamination through Treatment

A Track 4 cleanup would reduce the volume of contaminants by significant source removal. Impacted groundwater would be treated via dewatering/water treatment during excavation and off-Site disposal of impacted soil. Groundwater remediation would be accomplished through source removal and further by natural attenuation.

Excavation, transport, and disposal do not treat the toxicity, mobility or volume of contamination through treatment. Rather, the toxicity, mobility, and volume of contamination are relocated to an engineering controlled location (land-fill).

8.9.9.5 Short-term Impacts and Effectiveness

Soil Excavation

The potential adverse impacts to the community and workers would be similar to a Track 1 cleanup. These potential impacts (i.e., potential exposure to contaminants, exposure to equipment exhaust and safety risks during soil excavation and transportation) would be addressed in the Site-specific HASP and Community Air Monitoring Plan (CAMP), which would also outline monitoring during the construction. These risks would be mitigated through the implementation of engineering controls as necessary (i.e. Site-specific HASP, dust and odor suppression, traffic control, and CAMP monitoring). Dewatering activities would suppress the natural Site vicinity water table less than a Track 1 cleanup. Sustainability of this remedy would be considered unfavorable due to the large carbon footprint, high emissions resulting from equipment and truck traffic, and high volume of waste generated during completion of this remedy.

Institutional/Engineering Controls

There would be no short-term impacts to workers, the surrounding community or the environment through proper implementation and maintenance of proposed

institutional/engineering controls. Sustainability of this remedy, relative to Track 1, would be considered favorable due to the lower carbon footprint and energy requirements for completion of this remedy.

8.9.9.6 Implementability

The materials, equipment, and personnel associated with the implementation of a Track 4 cleanup are commercially available and have been proven effective and reliable for remediation of the media of concern at other sites. A Track 4 cleanup avoids any demolition or reconstruction at the Site. Shoring will be required near the property line extents of the excavation.

The administrative feasibility of implementing this alternative would be high. Demolition and reconstruction of the Site buildings would not be required. No significant disruption to the currently operating commercial business is anticipated.

8.9.9.7 Cost Effectiveness

The anticipated cost of a Track 4 excavation and removal cleanup is $2,500,000 to $3,500,000. A Track 4 cleanup represents the most cost-effective manner to remediate the Site. Only soil containing GCM or above Commercial Use SCOs would be disposed off-Site. To the extent practicable or soil above Commercial Use SCOs would be reused on-Site below the cover system. Targeted excavation will minimize the volume of soil removed, and eliminate excessive transportation and disposal costs.

Additionally, there would be no disruption to the Site business operations during implementation of a Track 4 cleanup and no loss of business revenue is anticipated.

8.9.9.8 Community Acceptance

Community acceptance cannot be evaluated at this point due to the public comment period having not yet been completed.

8.9.9.9 Land Use

A Track 4 cleanup will result in a land use restriction to commercial Site use after GCM excavation, a cover system installation, and SSDS installation. A restricted commercial use is consistent with anticipated future Site uses and local zoning.

The reasonably anticipated future use of the Site would remain industrial/commercial use.

8.9.10 Evaluation of Potential in-situ Remedial Alternatives

Pursuant to NYSDEC and NYSDOH comments received on March 2, 2015 in response to the RI/AAR dated January 30, 2015, an evaluation was conducted of potential in-situ remedial alternatives to address GCM, if any, beneath the 291 Homer Street existing Site building. The following potential in-situ remedial alternatives were evaluated:

1) In-situ chemical oxidation (ISCO) injections; and

2) Installation and operation of a soil vapor extraction system (SVE).

These potential in-situ remedial alternatives were evaluated in consideration of the Remedy Selection Evaluation Criteria outlined in **Section 8.5**, particularly feasibility of implementation; short-term Site impacts; long-term effectiveness and permanence; reduction of toxicity, mobility or volume of contamination through treatment; and overall cost-effectiveness. While feasibly implementable; significant short-term impacts, significant costs, and the expected poor long-term effectiveness, indicate that in-situ remediation of GCM, if any, beneath the 291 Homer Street existing Site building to be of low practicality. The cleanup proposed for the Site would remove bulk quantities of soil containing GCM and soil above Commercial Use SCOs from the Site to the extent that it is practically feasible.

Short-term impacts of either potential in-situ remedy would result in negative impacts and disruption to the operating Site commercial business due to the displacement of Site operations from portions of the 291 Homer Street existing Site building during implementation. Either in-situ remedy would result in short-term existing Site building partial demolition (e.g., additional concrete cutting or penetration of Site foundation slabs). MJ Painting operations utilize the majority of the available Site either through building footprint, material storage, commercial vehicle storage, or commercial vehicle traffic. Due to the limited size of the Site, any remedial alternative requiring storage of treatment chemicals or small buildings to house treatment systems would hinder the ability of MJ Painting to utilize the entire Site for commercial operations. Furthermore, either in-situ remedy would have significant costs (e.g., short-term displacement of commercial operations, demolition and restoration of Site structures,

construction, operation and maintenance) which reduce the practicality of implementation due to an expected minimal contribution toward reduction of the bulk Site contamination.

Regarding long-term effectiveness and permanence; and reduction of toxicity, mobility or volume of contamination through treatment, Roux Associates and Remedial Engineering do not believe that ISCO injections or a SVE system would effectively reduce bulk quantities of soil or groundwater contamination resulting from GCM, if any, beneath the building due to the characteristics of the GCM observed at the Site and the heterogeneous nature of the fill encountered at the Site. Site groundwater quality conditions monitored since 2011 indicate relatively low levels of dissolved phase contaminant impacts at the Site, which are expected to decrease and become asymptotic subsequent to the proposed Site source removal remedial activities. Discussions of Site conditions and known treatment limitations expected to result in low-level effectiveness of either in-situ remedial alternative is presented below.

ISCO injections would not be appropriate remedial alternative to address GCM, if any, beneath the 291 Homer Street existing Site building because of the following:

- ISCO injections would most likely be ineffective at reducing the volume of separate phase petroleum/GCM observed at this portion of the Site;
- The alteration to oxidation-reduction (redox) potential in subsurface soils caused by the ISCO injections may cause negative impacts to Site groundwater quality (e.g., while short-term system stimulation toward oxidizing conditions may reduce concentrations of benzene-related petroleum constituents, unwanted reactions such as oxidation of lead (Pb^0) to more oxidized forms (Pb^{2+} or Pb^{3+}) which increase lead water solubility/mobility, or oxidation of naturally occurring sulfide to sulfate which may result in increased water solubility/mobility of natural occurring arsenic; and
- While inducing short-term oxidizing conditions, long-term redox conditions will typically return to pre-treatment conditions, resulting in a “rebound” of targeted oxidation contaminants.

Based upon these reasons, Roux Associates and Remedial Engineering do not believe ISCO injections are a viable remedial alternative to address GCM, if any, beneath the 291 Homer Street existing Site building.

Roux Associates and Remedial Engineering anticipate that SVE will not effectively remediate the portion of the Site adjacent to and beneath the 291 Homer Street existing Site

building based upon a review of Site analytical data, groundwater elevation data, and soil boring logs as follows:

- Soil vapor sampling results do not indicate a significant release of VOC fraction contamination emanating from Site GCM;
- Groundwater elevation data indicates a shallow depth to water, typically 4 to 6 ft-bgs, providing a thin vadose zone available for SVE. As previously discussed, the upper 6 feet of soil beneath the building is comprised of imported fill which was placed on 291 Homer Street prior to the construction of the 291 Homer Street existing Site building; and
- Soil boring logs indicate that soil from 0 to 10 ft-bgs across 291 Homer Street is typically heterogeneous with a high fines content indicating potentially low permeability not conducive to SVE.

Based upon these reasons, Roux Associates and Remedial Engineering do not believe a SVE system is a viable remedial alternative to address GCM, if any, beneath the 291 Homer Street existing Site building.

Considering the above information, Roux Associates and Remedial Engineering do not believe there is significant merit in implementing a remedial effort to address potential GCM beneath the 291 Homer Street existing Site building. Groundwater conditions observed at the Site since 2011 indicate relatively low levels of dissolved phase contamination. Despite the widespread presence of GCM-impacted soils at the Site, only a minimal fraction of this material is leaching to groundwater or contributing to soil vapor concentrations (e.g. mobile contamination). Therefore, in consideration of what the quantity of potential GCM beneath the 291 Homer Street existing Site building, if any, may represent in terms of bulk Site contamination, removal activities beneath this building would not significantly enhance the cleanup outcome.

In-situ remediation beneath the 291 Homer Street existing Site building is not technically practicable and therefore is not proposed. The proposed Track 4 cleanup, includes addressing potential future indoor air issues, through the use of a vapor barrier and SSDS (to be installed beneath the office portion of the 291 Homer Street existing Site building). Note that the SMP will include provisions to address potential impacted soil located beneath the 291 Homer Street existing Site building if encountered during future subsurface activities performed within the building footprint.

8.10 Institutional and Engineering Controls

Institutional controls will include recording an environmental easement that limits Site use to commercial activities, prevents the use of Site groundwater, and mandates all future activities which disturb Site soils are done in accordance with the Site-specific SMP. An SMP will be developed in accordance with DER-10.

Engineering controls will include existing soil cover and newly installed soil caps in areas outside of building footprints, vapor barriers beneath the existing and future Site buildings, and SSDS beneath existing and future Site buildings.

8.11 Remedial Approach Comparison and Recommendation

A Commercial Use Track 4 cleanup is preferred for the Site. The Track 4 cleanup is protective of human health and the environment. This remedial approach is less disruptive to the community than Track 1, does not require building demolition, and does not cause significant impairment of the MJ Painting commercial operations. The Track 4 cleanup is consistent with future intended Site uses and represents a significant cost saving over complete removal of all Site soils. Additional details of the selected remedy will be provided in the forthcoming RAWP.

9.0 PRINCIPAL PERSONNEL AND WORK SCHEDULE

9.1 Principal Personnel

Provided below is a list of key personnel involved in the work, contact information and their responsibilities:

Mike John, Sr. – Property Owner
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David Ciccalone – Task Manager
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Ian Reed – Project Principal
Principal/Office Manager
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9.2 Work Schedule

The subsequent remedial activities at the Site are described in the RAWP and will be initiated upon approval of that Work Plan. Remedial Activities are tentatively scheduled to begin in the second quarter of 2015. The NYSDEC Project Manager will be notified at least seven days in advance of all field activities. A Construction Completion Report will be prepared in accordance with NYSDEC DER-10 following the conclusion of Remedial Action activities and submitted to NYSDEC.