REMEDIAL INVESTIGATION REPORT FOR ATLAS PARK SITE – PARCEL B GLENDALE, QUEENS

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FIGURES

TABLES

List of Appendices

EXECUTIVE SUMMARY

Introduction

This report presents the results of implementation of the New York State Department of Environmental Conservation (NYSDEC) approved Remedial Investigation Work Plan (RIWP) for the development known as The Shops at Atlas Park (NYSDEC Site No. C241045). The Remedial Investigation (RI) was conducted on behalf of Atlas Park LLC (Atlas) pursuant to the Brownfield Cleanup Program (BCP) Agreement between Atlas Park LLC and the NYSDEC. The Shops at Atlas Park (Atlas Park, or "the Site") is a 12.6 acre former industrial park located in Glendale, Queens, New York.

Site Location and Description

Atlas Park is identified as New York City Tax Block 3810, Lot 350. The Site is bounded by 80th Street to the west, Cooper Avenue to the north, an industrial property and the Long Island Rail Road (LIRR) Right-of-Way to the south, and Atlas Terminals industrial park to the east. The areas surrounding Atlas Park are zoned mixed residential and manufacturing. Atlas Park is located directly south of St. John's Cemetery. The area west of the Site, across 80th Street is predominantly zoned for light manufacturing, with some private residences. There is an industrial, triangular-shaped property to the south between the Site and the LIRR easement; the areas immediately south of the LIRR easement are primarily residential. The Atlas Terminals industrial site lies due east of Atlas Park; the area further to the east across 83rd Street is a mixture of residential and manufacturing properties.

Site Geology

Based on documented subsurface conditions, the Site is directly underlain by fill, followed by a native, Pleistocene epoch-age glacial sand and gravel outwash deposit. The top layer of fill consists primarily of brown, fine- to coarse-grained sand with varying amounts of gravel, silt, rock fragments, construction debris, etc. The fill ranges in thickness from 0 feet (ft), where the foundations of existing structures are bearing on natural soil, to about 16 ft. The average thickness of the fill is 5 ft.

Site Hydrogeology

Where saturated with groundwater, the Pleistocene deposits beneath the Site comprise the Upper Glacial Aquifer. The depth to the water table beneath the Site ranges from approximately 55 to 67 ft below grade surface (bgs), and groundwater flow direction ranges from the west-southwest to southwest.

Some residents of southeastern Queens County receive their drinking water source from groundwater. According to the New York City Department of Environmental Protection, the closest public water supply wells to the Site are located approximately 1.9 miles southeast of the Site, generally situated downgradient of the Site along the estimated groundwater flow path.

Site History

A Phase I Environmental Site Assessment (Phase I ESA) Report prepared for the Site by Ambient Group, Inc. (Ambient) in March 2001 described the Site history. According to this report, in 1867, the Site was owned by the Folk family and consisted primarily of farmland. Based on a review of Sanborn maps, several buildings occupied the Site prior to 1922 although their usage was unknown. In 1922, the property was sold to the Hemmerdinger Corporation and the Site (along with adjoining parcels) became Atlas Terminals. The Hemmerdinger Corporation leased portions of the Site to various manufacturing and processing companies during the period of usage and continues to remain a tenant at the Atlas Terminals portion of the property in the textile industry. In 2002, the 12.6 acre portion of the property, that is the subject of this RI Report, was transferred to Atlas Park LLC.

Project Background

Two previous investigations have been completed at the Site, the Phase I ESA completed by Ambient, and a Limited Phase II Site Investigation completed by Metcalf & Eddy in March 2002. The Phase II SI uncovered a discontinuous layer of historic fill ranging in thickness from about 3 to 10 feet. Portions of the upper zone of fill were found to contain petroleum hydrocarbons and elevated levels of several semivolatile organic compounds (SVOCs) and metals above the New York State Recommended Soil Cleanup Objectives (RSCOs), contained within the NYSDEC Technical and Administrative Guidance Memorandum (TAGM) HWR-4046 (January 1994). These contaminants appeared to be associated with ash and cinders present in the fill as localized pockets or otherwise mixed in with the fill, and were generally present within the upper 4 feet of fill but as deep as 7 ft bgs.

The Site also contained several suspected areas of concern (AOCs), including underground storage tanks (USTs) for fuel oil and gasoline storage, railroad tracks and off-loading areas, transformers, and chemical storage areas associated with various prior tenants of the Site. Prior to entry into the BCP, Atlas implemented some remedial work including asbestos abatement, the removal and closure of USTs, and implementation of environmental investigations to characterize soil in proposed areas of excavation.

On December 17, 2003, a BCP pre-application meeting was held between NYSDEC Region 2 staff, and representatives of Atlas Park LLC and Atlas Park's environmental consultant, Langan Engineering and Environmental Services, P.C. (Langan). At this meeting, it was agreed that to meet construction schedule requirements an Interim Remedial Measures Work Plan (IRMWP) would be completed for the portion of the site where major excavation was required by construction (the "IRM Area"), and a Remedial Investigation Work Plan (RIWP) would be completed for the areas where existing buildings and other structures will remain (the "RI Area"). A draft combined RI and IRM Work Plan (the "Work Plan") was submitted to the NYSDEC and the public on January 26, 2004. Based on NYSDEC's comments, a Final Work Plan was submitted on May 14, 2004 and approved by NYSDEC.

Following approval of the Final Work Plan, Atlas conducted a subsurface investigation within the IRM Area (IRM Site Investigation), in conjunction with a geotechnical investigation and concurrent with demolition of existing buildings. Data were developed during the IRM Site Investigation to support implementation of the IRM. A Draft IRM Site Investigation Report (IRM SIR) was submitted to NYSDEC on April 23, 2004.

With concurrence from NYSDEC, the IRM was initiated in October, 2004. The AOCs within the IRM Area are being addressed through excavation and endpoint soil sampling in accordance with the IRM Work Plan, supplemental work plans (e.g. Drum Removal Work Plan), and NYSDEC requirements (e.g., DER-10, STARS, etc.). One localized area has been identified where environmental conditions uncovered were remediated from within the IRM Area, but extend into the adjacent RI Area. Specifically, the lead-bearing waste layer noted above appears to extend beneath the southeast side of Building 28 in the RI Area.

Remedial Investigation Objectives

The purpose of the Remedial Investigation is to evaluate the nature and extent of contamination associated with potential AOCs identified by previous investigations within the RI Area, evaluate potential soil gas intrusion into future structures, and assess Site-wide groundwater conditions. The data provided in this report will be used to develop a remedy, if required, for AOCs within the RI Area, and a Site-wide groundwater remedy, if required.

The Remedial Investigation was completed within the RI Area on a parallel track with initiation of the IRM. This RI Report describes the procedures and results of the RI, conducted in accordance with the Work Plan as well as two addenda to the Work Plan dated May 5, 2004, and August 2, 2004.

RI Field Investigation

The RI field investigation was conducted between July 14 and August 25, 2004, and included:

- Mobilization and building interior inspection;
- Geophysical survey using Ground Penetrating Radar (GPR) and Electro-Magnetics (EM) in the outdoor portions of the RI Area;
- Subsurface soil borings;
- Soil sample collection and laboratory analysis;
- Soil gas sampling from beneath each existing building and laboratory analysis;
- Additional groundwater monitoring well installations to supplement wells installed during the IRM;
- One round of groundwater sampling and laboratory analysis from all Site wells;
- Ambient air monitoring; and
- Surveying of monitoring wells.

The RI findings are discussed below.

Nature and Extent of Contamination

<u>Ash/Cinders</u>

Ash and/or cinders were visibly identified within the historic fill layer at four of the 20 RI borings, at depths ranging from 2 to 15 ft bgs. All four borings were located within the footprints of existing buildings which will remain as part of the Site redevelopment. These findings are consistent with prior subsurface investigations (IRM SIR, Metcalf & Eddy), which showed the occurrence of ash/cinders is generally sporadic across the Site with no apparent pattern of distribution.

Five (5) samples containing visible ash and/or cinders were collected and analyzed, with results as follow:

- There were no TAGM exceedances for VOCs, PCBs, pesticides or herbicides.
- In one of the five samples, there were no TAGM exceedances for any of the tested compounds.
- TAGM exceedances occurred for SVOCs in two of the five samples containing ash/cinders, and for only one metal, mercury, in three of the five samples containing ash/cinders.

<u>Historic Fill (Not Containing Ash/Cinders)</u>

Thirty-eight (38) samples of fill/soil not containing ash/cinders were collected from the 20 soil boring locations, with results as follow:

General Findings

- The historic fill layer appears to be the primary source of the metals and SVOC TAGM exceedances, although a significant number of historic fill samples contain no TAGM exceedances.
- The historic fill is present throughout the Site, including under all of the existing buildings in the RI Area.
- The thickness of the historic fill in the RI Area ranges from 6 to 15 ft.
- There were no TAGM exceedances for VOCs, PCBs, pesticides, or herbicides in any samples of the historic fill.
- The individual compounds and levels detected in fill/soil in the RI Area are consistent with those detected in the IRM Area.

Metals Findings

- TAGM exceedances occurred in the historic fill for the metals mercury, arsenic, barium, cadmium, copper, and lead. Mercury exceeded the TAGM RSCO in the most samples (12 of 38), followed by copper (7 of 38), arsenic and cadmium (2 of 38 for each), and barium and lead (1 of 38 for each).
- Mercury exceedances occurred in the historic fill beneath buildings to a depth of 15 ft bgs and outdoors between buildings to a depth of 10 ft bgs.
- Copper exceedances occurred in the historic fill beneath buildings to a depth of 15 ft bgs, and outdoors between buildings to a depth of 4.5 ft bgs.

SVOCs Findings

- TAGM exceedances occurred in the historic fill for individual SVOCs in 15 of the 38 samples collected, from 10 of the 20 borings located throughout the RI Area including outdoor soil borings, upgradient boring locations, and borings within building footprints. The exceedances occurred exclusively for the polynuclear aromatic hydrocarbon (PAH) suite of SVOCs, including anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, chrysene, dibenzo(a,h)anthracene, fluoranthene, indeno(1,2,3-cd)pyrene, and phenanthrene.

- No samples of the historic fill exceeded the TAGM criteria for total SVOCs of 500 parts per million (ppm).
- The highest SVOC concentrations occurred in a shallow sample containing ash collected from beneath Building 1.

Groundwater

Relatively low levels of two VOCs, trichloroethene (TCE) and perchloroethylene (PCE) were detected in groundwater upgradient, downgradient, and within the interior portions of the Site above the NYSDEC Ambient Groundwater Standards and Guidance Values (SGVs). TCE was detected at a higher concentration in a Site upgradient well than the downgradient Site wells. PCE was detected at its highest level in a Site downgradient well located west of Building 1.

The source(s) of these VOC detections is unknown. The extensive IRM and RI dataset does not support the Site fill/soil as a primary source of either of these compounds in groundwater. There have been no TAGM exceedances of the TCE or PCE RSCOs in soil, and both compounds have been detected only at low concentrations or have been undetected in most samples. In addition, no "hot spots" containing these compounds have been uncovered during the IRM to date.

There were no PCBs, pesticides, herbicides or SVOCs detected above the SGVs in any groundwater samples. The SGVs for iron, magnesium, manganese and sodium were each exceeded in at least one groundwater sample; these results are consistent with background conditions and are not believed to reflect Site-related impacts.

The depth to groundwater is between 55 and 67 ft bgs and the nearest public water supply wells are approximately 1.9 miles downgradient of the Site. Based on calculations using the RI data, the PCE and TCE in groundwater will attenuate to concentrations below the state standard (to undetected levels) well before it reaches these public water supply wells.

Soil Gas and Ambient Air

VOCs, including TCE and PCE, were detected in the soil gas samples; however, there are no chemical-specific standards for soil gas for comparison purposes. No VOCs were detected on field instruments during ambient air screening during the RI at any time within the buildings, suggesting that vapor intrusion is minimal, if occurring at all.

Ambient (outside) air samples contained similar compounds as the soil gas samples, at concentrations that were generally lower than New York State Department of Health background indoor air concentrations.

Underground Storage Tanks

Apparent petroleum impacts were noted in one of the two soil borings conducted adjacent to the two heating oil USTs located in the southwest corner of the Site. Petroleum-like odors and PID readings were observed in soils between a depth of 11 to 23 ft bgs. One SVOC TAGM exceedance, for chrysene, occurred in a soil sample collected from 19 to 23 ft bgs. Low levels of typical petroleum constituents (benzene, ethylbenzene, and xylenes) were also detected but below the TAGM RSCOs.

Qualitative Human Health Exposure Assessment

An assessment of human health exposure was conducted for both current and future site conditions in accordance with the NYSDEC Draft DER-10 Technical Guidance for Site Investigation and Remediation, dated December 2002. The assessment included an evaluation of potential exposure media, receptor populations, and pathways of exposure to Site-related constituents of concern (COCs).

The existing structures in the RI Area are currently unoccupied, and soils are covered by the existing buildings and pavement. These structures and the existing surface cover prevent human physical exposure to the underlying historic fill. Therefore, there are currently no complete exposure pathways from soil to on-Site or off-Site human receptors.

Groundwater is over 55 feet below ground surface and is not used as a drinking water source within the influence of the Site, nor will pumping of groundwater for dewatering during construction be required. Therefore, there are not currently nor will there be in the future any complete exposure pathways from groundwater to on-Site or off-Site human receptors.

The planned construction activities in the RI Area may result in potential exposures to construction workers and the general public to Site-related COCs in fill, through excavation and removal of fill for new utilities and foundations. These potential exposures will be managed/prevented in accordance with the procedures contained within the IRM Work Plan, Health and Safety Plan, and Community Air Monitoring Plan.

Upon completion of the proposed construction activities, the RI Area will be completely covered by the proposed buildings, pavement, and landscaping (underlain by a minimum 12-inch clean soil cover). These structures will prevent direct human exposure to contaminated materials that are left in place. Moreover, the future use will be commercial, not residential. Controls and safeguards should be put into place to prevent maintenance and construction workers from being exposed to any such materials in the future. After the buildings are constructed, potential exposures due to vapor intrusion are unlikely as long as the existing building slabs are sealed. However, this potential exposure pathway can be addressed by a sub-floor depressurization system. In the IRM Area, assuming Track 1 cleanup is achieved, no potential exposure pathways will exist under any future circumstances.

Conclusions and Recommendations

The conclusions and recommendations of the RI are:

1. The concentrations of constituents of concern underlying the existing buildings in the RI Area can remain in place provided the building's concrete floors remain intact and a sub-floor depressurization system is installed to vent soil gasses to the outside air.

2. For Building 28, we recommend further delineation of lead-impacted soils and encapsulation of this material beneath the building's concrete floor.

3. Based on the low concentrations of COCs in groundwater, no identified on-Site source, and absence of a potential exposure pathway, i.e., not used a local drinking water source, no further investigation of groundwater is warranted.

4. Construction activities within the RI Area, including removal of the two UST systems and other excavation and trenching for utilities, foundations, etc., should be performed in accordance with procedures contained within the IRM Work Plan, Health and Safety Plan, and Community Air Monitoring Plan. The subsurface soils in these areas will be evaluated by confirmatory soil sampling and analysis.

5. Sufficient analytical data were gathered during the RI to establish site-specific cleanup levels and to develop remedial alternatives relative to the RI Area.

1.0 INTRODUCTION

This report presents the results of the New York State Department of Environmental Conservation (NYSDEC) approved Remedial Investigation Work Plan (RIWP), that was conducted on behalf of Atlas Park LLC for the development known as The Shops at Atlas Park (NYSDEC Site No. C241045). The RI was conducted pursuant to the Brownfield Cleanup Program (BCP) Agreement between Atlas Park LLC and the NYSDEC.

1.1 PROJECT BACKGROUND

Atlas Park LLC (Atlas) has entered into a Brownfield Cleanup Program (BCP) Agreement with the New York State Department of Environmental Conservation (NYSDEC), to investigate and, where necessary, remediate a 12.6 acre, subdivided portion of a larger 80-year old, 20-acre industrial park, Atlas Terminals, located in Glendale, Queens, New York. A USGS topographical quadrangle map showing the site location is presented as Figure 1. A new mixed-use project, to be called The Shops at Atlas Park (Atlas Park), will cover the 12.6 acre site (the "Atlas Park site" or the "site"), and include ±400,000 square feet of shopping, entertainment, dining, and office space. A description of the site and development plans were provided in the BCP application, submitted to NYSDEC on December 11, 2003. The site was accepted into the BCP in January 2004. An updated proposed Site Plan is provided herein as Figure 2.

Atlas Park is identified as New York City Tax Block 3810 and Lot 350. The Site is bounded by 80th Street to the west, Cooper Avenue to the north, an industrial property and the Long Island Rail Road (LIRR) Right-of-Way to the south, and Atlas Terminals industrial park to the east. The boundary between Atlas Park and Atlas Terminals site is currently delineated, from north to south, along the west wall of Buildings 10, 24, 22, 17, 6, and 18 located in Atlas Terminals, then southward to the west of Buildings 4 and 3 to the southern Site property line. Figure 2 shows the Atlas Park property boundary and existing, former, and future buildings.

Prior investigations at the Site uncovered a discontinuous layer of fill ranging in thickness from about 3 to 10 feet. Portions of the upper zone of fill were found to contain petroleum hydrocarbons and elevated levels of several semi-volatile organic compounds (SVOCs) and metals above the New York State Recommended Soil Cleanup Objectives (RSCOs), contained within the NYSDEC Technical and Administrative Guidance Memorandum (TAGM) HWR-4046 (January 1994). These contaminants appeared to be associated with ash and cinders present in the fill as localized pockets or otherwise mixed in with the fill, and were generally present within the upper 4 feet of fill but as deep as 7 feet below grade surface (bgs).

The Site also contained several suspected areas of concern (AOCs), including underground storage tanks (USTs) for fuel oil and gasoline storage, railroad tracks and off-loading areas, transformers, and chemical storage areas likely to be associated with various prior tenants of the Site (see Figure 3 for identified AOCs). Prior to entry into the BCP, Atlas implemented some remedial work including asbestos abatement, the removal and closure of USTs, and implementation of environmental investigations to characterize soil in proposed areas of excavation. Reports and summaries of these activities were provided in the Remedial Measures Work Plan (RIWP) dated January 26, 2004, and revised on May 14, 2004, described below.

On December 17, 2003, a BCP pre-application meeting was held between NYSDEC Region 2 staff, representatives of Atlas Park, and Atlas Park's environmental consultant, Langan Engineering and Environmental Services, P.C. (Langan). At this meeting, it was agreed that to meet construction schedule requirements an Interim Remedial Measures Work Plan (IRMWP) would be completed for the portion of the site where major excavation was required by construction (the "IRM Area"), and a Remedial Investigation Work Plan would be completed for the areas where existing buildings and other structures will remain (the "RI Area"). Figure 3 illustrates the delineation of the IRM and RI Areas. A draft combined RI and IRM Work Plan (the "Work Plan") was submitted to the NYSDEC and the public on January 26, 2004. Based on NYSDEC's comments, a Final Work Plan was submitted on May 14, 2004 and approved by NYSDEC.

Atlas subsequently conducted a subsurface investigation within the IRM Area (IRM Site Investigation), in conjunction with a geotechnical investigation and concurrent with demolition of existing buildings. Data were developed during the IRM Site Investigation to support implementation of the IRM. A Draft IRM Site Investigation Report (IRM SIR) was submitted to NYSDEC on April 23, 2004. With concurrence from NYSDEC, the IRM was initiated in October, 2004. The Remedial Investigation was completed within the RI Area on a parallel track with initiation of the IRM. This RI Report describes the procedures and results of the Remedial Investigation, conducted in accordance with the Work Plan, as well as two addenda to the Work Plan dated May 5, 2004, and August 2, 2004.

On-Site AOCs within the IRM Area are currently being addressed as part of the ongoing IRM. With the exception of the historic fill layer, no significant environmental conditions associated with the previously identified AOCs have been observed during the IRM, although other, unanticipated conditions have been uncovered. These unanticipated conditions include several localized areas containing petroleum-impacted soil and drummed waste, an underground storage tank (UST), and a layer of lead-bearing wastes (hazardous in some instances). All of these AOCs are being addressed during the IRM, through excavation and endpoint soil sampling in accordance with the IRM Work Plan, supplemental work plans (e.g., Drum Removal Work Plan), and NYSDEC requirements (e.g., DER-10, STARS, etc.). It is currently anticipated that all AOCs will be remediated in the IRM Area such that a Track 1 (unrestricted) cleanup will be achieved in this area of the Site. One localized area has been identified where environmental conditions uncovered were remediated from within the IRM Area, but extend into the adjacent RI Area, specifically a lead-hazardous waste layer extends beneath the southeast side of Building 28 in the RI Area (see Section 5.2.5).

1.2 PROJECT OBJECTIVE

The purpose of the Remedial Investigation is to evaluate the nature and extent of contamination associated with potential AOCs identified by previous investigations within the RI Area, and to assess Site-wide groundwater conditions. The data provided in this report will be used to develop a remedy, if required, for AOCs within the RI Area, and a Site-wide groundwater remedy, if required.

1.3 RI REPORT OUTLINE

The RI Report contains the following Sections:

- Section 1.0 presents the project background and objectives.
- Section 2.0 describes the Site background including results of previous investigations and identified AOCs.
- Section 3.0 describes the physical characteristics of the study area.
- Section 4.0 presents the RI field procedures completed.
- Section 5.0 presents the nature and extent of contamination as determined through the field investigation and analysis of environmental samples, including the extent of ash/cinder fill material, historic fill, and soil and groundwater quality.
- Section 6.0 presents a qualitative human health exposure assessment.
- Section 7.0 summarizes the results of the investigation and presents conclusions and recommendations.

2.0 SITE BACKGROUND

2.1 SITE DESCRIPTION

The Atlas Park site is 12.6 acres in size and was subdivided from Atlas Terminals, a 20-acre historic industrial park. Atlas Park is bounded by 80th Street to the west, Cooper Avenue to the north, the Long Island Rail Road (LIRR) Right-of-Way to the south, and Atlas Terminals industrial park to the east (See Figures 1 and 2). The RI Area comprises the west portion of the Site that abuts 80th Street, and contains Building Nos. 29, 7, 7A, 1, 28 and 37. All of these buildings except for Buildings 7 and 7A will remain and be renovated for the new development. Building 28 has been bisected into a north half and south half, separated by a piece of the IRM Area. All other former Site buildings have been demolished as part of the IRM. One building (No. 15), located in the northeast corner of the Site along Cooper Avenue, was originally included in the RI Area, as it was scheduled to remain as part of the redevelopment. Atlas has since decided to replace this building; therefore, it was demolished in December 2004 and early January 2005. A proposal to amend the IRM Area to include this building footprint has been submitted to NYSDEC.

2.2 ADJOINING PROPERTY DESCRIPTION

The areas surrounding Atlas Park are zoned mixed residential and manufacturing. Atlas Park is located directly south of St. John's Cemetery. The area west of the Site, across 80th Street is predominantly zoned for light manufacturing, with some private residences. There is an industrial, triangular-shaped property to the south between the Site and the LIRR easement; the areas immediately south of the LIRR easement are primarily residential. The Atlas Terminals industrial site lies due east of Atlas Park; the area further to the east across 83rd Street is a mixture of residential and manufacturing properties.

The site history was compiled and presented in a Phase I Environmental Site Assessment (Phase I ESA), completed by Ambient Group, Inc. (Ambient) in March 2001. The report was provided as an attachment in the BCP Application submitted on December 11, 2003 to NYSDEC. According to the report, in 1867, the Site was owned by the Folk family and consisted primarily of farmland. Based on a review of Sanborn maps as part of the Ambient report, several buildings occupied the Site prior to 1922 although their usage was unknown. In 1922, the property was sold to the Hemmerdinger Corporation and the Site became Atlas Terminals. The Hemmerdinger Corporation leased portions of the Site to various manufacturing and processing companies during the period of usage and continues to remain a tenant at the Atlas Terminals portion of the property in the textile industry. In 2002, the 12.6 acre portion of the property was transferred to Atlas Park LLC.

2.3 PREVIOUS INVESTIGATIONS

Two previous investigations have been completed at the Site: (1) Phase I ESA completed by Ambient in March 2001, and (2) Limited Phase II Investigation completed by Metcalf & Eddy in March 2002 (Phase II ESI). The results of these investigations are summarized in the Work Plan and the Draft IRM SIR, and were used to identify the on-Site AOCs. The pertinent findings of the two investigations relating to the RI Area are discussed below in Sections 2.3.1 and 2.3.2. The AOCs identified in the RI Area and investigated during the RI are described in Section 2.3.3.

2.3.1 Ambient Phase I ESA

A Phase I ESA was conducted in March 2001 for the entire 20-acre Atlas Terminals property and identified areas of environmental concern within the RI Area as follows:

- Underground Storage Tanks: Two 20,000-gallon No. 6 fuel oil USTs were observed in the vicinity of Building 7.

- Chemical Storage: Chemicals were identified on-site and stored in a manner that posed a material threat of release in Buildings 7 and 28.

- Presumed Asbestos Containing Materials and Lead Based Paint: Potential asbestos containing materials and lead-based pain were identified in most buildings. These materials were abated and documentation was provided to NYSDEC under separate cover.

2.3.2 Metcalf & Eddy Phase II ESI

A Phase II ESI was completed for the entire Atlas Terminals property in March 2002. Investigation activities on the Atlas Park property included completion of a total of 29 borings, 16 of which were completed within Atlas Park. Soil boring locations within the IRM and RI Areas and identified as SB-#, are presented on Figure 4. The findings of the Metcalf & Eddy Phase II relative to Atlas Park are summarized as follows:

- Groundwater lies at a depth greater than 40 feet bgs, the maximum drilled depth with no groundwater encountered at any boring locations.

- Two 20,000 gallon fuel oil USTs are located east of Building 7.

- No evidence of petroleum or chemical spills was observed in any soil samples collected from the Site.

- No volatile organic compounds (VOCs) were detected above the NYSDEC TAGM 4046 criteria.

- A fill stratum with an average depth of 3-4 feet underlies most of the Site. Distinct ash/cinder or mixed ash/cinder/soil fill layers were present in 11 of the 29 borings with thicknesses ranging from 0.1 to 3 feet.

- Portions of the ash/cinder component found within the fill contained one or more of the following semi-volatile organic compounds (SVOCs) at concentrations greater than the NYSDEC RSCOs and Groundwater Protection Criteria contained in TAGM 4046: benzo(a)anthracene, chrysene, bis (2-ethylexyl) phthalate, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, indeno(1,2,3-cd)pyrene and dibenz(a,h)anthracene. SVOCs were generally not detected or were detected below the TAGM levels in fill not containing visible ash or cinders.

- One or more of the following metals were detected at concentrations exceeding the TAGM criteria: aluminum, mercury, magnesium, cadmium, copper and zinc. However, the exceedances were for the most part marginally above the criteria. It was concluded that the exceedances cannot be readily attributed to the presence of the ash/cinders/fill since: 1) similar exceedances occurred at depths in the native glacial material; 2) they are not representative of metal compounds typically associated with ash, such as arsenic, cadmium, chromium, lead and nickel; and 3) they are primarily major-element types such as aluminum, magnesium, and zinc. Since most of the elevated metals only marginally exceed average background levels for Eastern United States (from TAGM 4046), it is likely that they are naturally occurring concentrations.

2.3.3 Summary of Areas of Concern

Based on the previous reports, site visits by Langan, and interviews with facility engineers, numerous AOCS were identified within Atlas Park and are summarized in Table 1 of the RIWP/IRMWP. The majority of the AOCs were identified within the IRM Area; these AOCs are being addressed as part of the IRM as will be documented in the Final Engineering Report for the IRM. The balance of the AOCs are located in the RI Area (see Figure 3), were investigated during the RI, and will be addressed as part of the Site-wide Remedial Action (RA). These AOCs include:

AOC-1C: Underground Storage Tanks

Two registered, 10,000 gallon capacity heating oil USTs are located between Buildings 7 and 29. These tanks have been taken out-of-service, and plans are currently underway to remove them shortly.

AOC-3A: Transformer

A transformer is located in a wooden shed south of Building 1, along the south property boundary.

AOC-6: Chemical Storage Areas

Within the RI Area, historical chemical storage reportedly occurred in Buildings 1, 7 and 28. Floor drains were observed within these Buildings. No evidence of chemical storage was observed during the most recent inspections.

- AOC-6A (Building 1): Lubricating oils, lithium grease and gear oil were reportedly stored within Building 1.
- AOC 6E (Building 7): Water treatment chemicals were reportedly stored within Building 7.
- AOC 6H (Building 28): Glue and adhesive chemicals were reportedly stored within Building 28. The central portion of Building 28 was investigated during the IRM Site Investigation. That portion of the building has since been demolished as part of the Site redevelopment.

AOC-7: Historical Uses

Within Building 1, miscellaneous businesses that stored, used, handled or disposed of petroleum or hazardous substances operated and include Chocolate & Paint Machinery Co., the Triangle Cable Co., Amity Dyeing and Finishing, Glendale Steel, and Eureka Oil.

AOC-9: Historic Fill

Based on historic records, the Site was filled and graded prior to 1920. Ash/cinders containing regulated contaminants above NYSDEC soil cleanup objectives have been found dispersed throughout Atlas Park.

3.0 PHYSICAL CARACTERISTICS OF THE STUDY AREA

3.1 SITE SETTING

3.1.1 Topography

The general Site topography is sloping to the south-southeast, with a ground surface elevation ranging from approximately 93 feet above mean sea level (msl) in the northwest portion of the Site adjacent to Cooper Avenue, to approximately 72 feet above msl in the southern portion of the Site, adjacent to the Long Island Railroad Easement. The ground surface slope is fairly uniform.

3.1.2 Surface Water and Drainage

Ridgewood Reservoir, located within Highland Park approximately 1.4 miles southwest of the Site, is the closest surface water body to the Site. The Site is approximately 3 miles north of the headwaters of Spring Creek, which drains into Old Mill Creek and then into Jamaica Bay over 4 miles south of the Site. Willow Lake, located within Meadow Park, is approximately 2 miles northeast of the Site.

Based on Site topography, the apparent surface water drainage is south/southeast towards the Long Island Railroad easement.

3.2 GEOLOGIC CONDITIONS

3.2.1 Regional Geology

Regional geologic conditions in this area of Queens generally consist of a thin layer of fill material overlying a wedge of unconsolidated sediment deposited during the Pleistocene and Cretaceous epochs on top of a bedrock basement. Bedrock outcrops in northwestern Queens County and dips to the southeast at a slope of approximately 80 ft/mile (Cartwright et al., 1998). Maximum thickness of the unconsolidated deposits range from 800 ft bgs in southeastern Kings County to greater than 1,100 ft bgs in southeastern Queens County.

The geology in the region is a product of multiple episodes of glaciation that took place during the Pleistocene epoch, approximately 20,000 years ago. Beneath the fill material, the native sediment is composed of Pleistocene-age glacial outwash sand and gravel that is described in Cadwell, 1989, as coarse to fine gravel with sand, proglacial fluvial deposition, well rounded and stratified. The Site abuts the southern edge of the terminal moraine, formed by sediment deposited by the leading edge of the glacier (Cadwell, 1989).

Below the Pleistocene deposits are a series of three hydrogeologic units deposited during the Cretaceous: Magothy Aquifer, Raritan Confining Unit and Lloyd Aquifer. The Magothy

Aquifer, which ranges in thickness from 0 to 500 ft (USGS, 1998), is approximately 100 feet thick beneath the Site (Smolensky et al., 1989). It is composed of fine to medium sand interbedded with lenses and layers of coarse sand and solid clay, and a layer of gravel at its base (Cartwright et al., 1998). Beneath the Magothy is the Raritan Confining Unit, a deltaic deposit composed of clay, silty clay and clayey and silty fine sand. This unit ranges in thickness from 0 to 250 ft (Cartwright et al., 1998) and is approximately150 to 200 ft thick beneath the Site (Smolensky et al., 1989). The Lloyd Aquifer, which underlies the Raritan Confining Unit, is composed of sediments of fluvial-deltaic in origin and consists of very fine to very coarse sand, gravel and interbedded clay and clayey and silty sand (Cartwright et al., 1998). This unit ranges in thickness from 0 to 300 ft (Cartwright et al., 1998) and is approximately 150 to 200 ft thick beneath the Site (Smolensky et al., 1989). A deep north-south trending paleochannel, eroded by the ancestral Hudson, is located east of the Site and cuts through all three of these Cretaceous deposits. This paleochannel was filled in by the Pleistocene deposits.

The Cretaceous deposits lie on top of bedrock, ranging from approximately 350 to 400 ft below the Site (Smolensky et al., 1989). The bedrock is defined as the Hartland Formation comprised of interbedded granite, schist and amphibolite.

3.2.2 Site Geology

A total of fifty-seven (57) soil borings were completed as part of the IRM and RI site investigations. Based on the lithology encountered, the Site is directly underlain by fill, followed by a native, glacial sand and gravel. The top layer of fill consists primarily of brown fine to coarse grained sand with varying amounts of gravel, silt, rock fragments, construction debris, etc. The fill ranges in thickness from 0 ft, where the foundations of existing structures are bearing on natural soil, to about 16 ft. The average thickness of the fill is 5 ft.

The glacial outwash is composed predominantly of coarse- to fine-grained sand with varying amounts of clay, silt and gravel. Cobbles and boulders are also present in areas. A silt layer was encountered in four borings (B-8, B-21, B-23 and B-42) at depths ranging from 4 ft to 13.5 feet below ground surface. The thickness of the silt ranged between 1.5 ft and 12 ft thick. With increasing depth, the outwash grades into a more uniform, fine- to medium-grained sand.

3.3 HYDROGEOLOGIC CONDITIONS

3.3.1 Regional Hydrogeologic Conditions

The horizontal component of regional groundwater flow is to the south, with localized southwesterly flow components (USGS, 1997). The Pleistocene deposits constitute the Upper Glacial Aquifer where they are saturated with groundwater. The water table lies within the Upper Glacial Aquifer throughout most of Kings and Queens Counties. These outwash deposits, composed of outwash sand and gravel, are moderately to highly permeable with an average horizontal hydraulic conductivity of approximately 270 ft/day and anisotropy of 10:1 (Franke and McClymonds, 1972), thus vertical hydraulic conductivity of approximately 27 ft/day.

Some residents of southeastern Queens County receive their drinking water source from groundwater. According to the New York City Department of Environmental Protection, the closest public water supply wells to the Site are located approximately 1.9 miles southeast of the Site, situated downgradient of the Site along the estimated groundwater flow path. The closest two public water supply wells to the Site are: 1) a well constructed in the Magothy Aquifer at 118th and Hillside Avenue in Kew Gardens Queens, approximately 1.9 miles southeast of Site, and 2) a well constructed in the Upper Glacial Aquifer at 11th Avenue and 126th Street in South Ozone Park, over 3 miles southeast of the Site.

3.3.2 Site Hydrogeologic Conditions

Based on water level measurements collected during the RI, the depth to groundwater ranges from approximately 55 to 67 ft bgs and consequently, groundwater elevation ranges from approximately 14 to 15 ft, Queens Borough Datum (QBD). Based on these measurements, the water table lies within the Upper Glacial Aquifer, and groundwater flow direction beneath the Site ranges from west-southwest to southwest. This groundwater flow direction is generally consistent with regional maps published by the U.S. Geological Survey. The groundwater elevations measured during the RI are presented on Table 17, and groundwater flow iso-contours are shown on Figure 12.

4.0 FIELD INVESTIGATION

Langan conducted the RI field investigation between July 14, 2004 and August 25, 2004 in accordance with the procedures set forth in the Field Sampling Plan (Appendix B) of the Remedial Investigation and IRM Site Investigation Work Plan submitted to the NYSDEC on January 26, 2004. The RI field program included the following activities:

- Mobilization and Building Inspection
- Geophysical survey using Ground Penetrating Radar (GPR) and Electro-Magnetics (EM) in the outdoor portions of the RI Area;
- Subsurface soil borings;
- Soil sample collection and laboratory analysis;
- Soil gas sampling and laboratory analysis beneath each building;
- Additional groundwater monitoring well installations to supplement the IRM wells;
- One round of groundwater sampling and laboratory analysis from all Site wells;
- Ambient air monitoring; and
- Surveying of monitoring wells.

The field investigation was preceded by mobilization and a thorough inspection of the interior of the buildings to remain within the RI Area. The objective of the inspection was to locate any sumps, drains, or concrete patch areas, etc. that may represent potential areas of past releases or discharges of contaminants to the ground beneath the buildings. Soil borings could then be preferentially located to investigate these structures/areas. With the exception of floor drains observed throughout Buildings 1, 7 and 28, there were no suspect openings observed in the building floor slabs.

The remainder of the field investigation is described below.

4.1 UTILITY CLEARANCE AND GEOPHYSICAL SURVEY

Prior to the subsurface investigation, the New York City One-Call Center was called for a Code 753 utility mark-out. In addition, a geophysical survey was completed by Hager-Ricther Geoscience, Inc. of Salem, NH (HRG) to clear utilities and to locate any subsurface structures that could represent source areas of buried contamination (e.g., drums, unknown tanks, etc.). The geophysical survey was performed on July 12 and 13, 2004.

Other than the boundaries of the two, known 10,000 gallon heating oil tanks, no potential suspect buried structures were located during the geophysical survey.

Potential utilities were marked out within a 10-foot radius of each subsurface investigation location with a Fisher TW-6 Pipe and Cable Locator (an electromagnetic metal-detector), utility-locating instruments, and ground penetrating radar (GPR). In addition, Langan met with and reviewed all of the drilling locations with a facility representative, and verified that all drilling locations were checked for utilities. Due to the presence of subsurface utilities, some of the boring locations were moved slightly and consequently, were not drilled in the exact locations presented in the RI Work Plan. The actual boring locations are presented on Figure 4.

4.2 FILL/SOIL INVESTIGATION

Twenty soil borings were located to determine the nature and extent of contamination in the RI Area through collection and analysis of soil, soil gas, and samples. A portion of the borings were located to meet the BCP's requirement to perform a perimeter boundary investigation.

- 9 borings were completed within the buildings which will remain to investigate soil and soil gas conditions beneath the buildings (B-45, B-46, B-48 through B-53, and B-59).

- 6 borings were completed to investigate soil conditions in outdoor areas in the southwest corner of the Site around Buildings 1, 7, 7A, 28 and 29 (B-7, B-9, B-10, B-16, B-38, and B-55); monitoring wells were installed in 2 of these borings (B-16/MW-16 and B-38/MW-38).

- 1 boring was completed in the open outdoor area where Building 28 had been demolished to investigate soil conditions (B-47).

- 4 borings were completed to investigate soil conditions and install groundwater monitoring wells (B-6/MW-6, B-20/MW-20, B-57/MW-57, and B-58/MW-58).

The soil borings were completed between July 14, 2004 and August 12, 2004. The drilling contractor was Aquifer Drilling & Testing, Inc. (ADT) of New Hyde Park, New York. Table 1 presents the final drilled depths, drilling method, and specific type of sampling performed at each boring location, including the prior IRM borings for reference. Table 2 summarizes additional information including the particular AOC investigated at each boring location.

Soil boring B-55 was not completed within Building 7 as shown on the RI/IRM WP Figure 3. Building 7 is a facility boiler building and was inaccessible by a drill rig. The boring was relocated approximately 25 feet south, outside of Building 7. One additional outdoor soil boring was completed in addition to those proposed in the RI/IRM WP. Soil boring B-47 was originally an interior soil and soil gas sampling location. Building 28 at this location was temporarily cut back during demolition and will be built back out at a future date. A new soil boring with soil sampling and no soil gas sampling was completed at the original B-47 location. The soil and soil gas sampling location, identified as B-59/SG-3 was completed approximately 50 feet to the north, inside the portion of Building 28 that existed during the time of the RI field investigation.

Generally, split-spoon soil sampling and environmental screening were conducted continuously to a depth of approximately 15 feet under the supervision of a Langan field engineer or geologist. Environmental screening was thereafter conducted every 5 feet in depth to the end of the boring. Soil samples retrieved from each boring were visually classified for soil type, grain size, texture, moisture content, and visible evidence of staining or adverse environmental impacts. Each sample obtained was screened for the presence of VOCs with a photo-ionization detector (PID) with a 10.6 eV lamp. Each boring was grouted to the surface upon completion. Boring logs are provided in Appendix A.

Hollow stem auger (HSA) or direct push Geoprobe drilling methods were used depending on access conditions and the objectives of the particular boring, as noted in Table 2.

4.2.1 Drilling Methods

4.2.1.1 Direct Push Geoprobe

Fourteen soil borings were completed by the Geoprobe drilling method with a Geoprobe 5400 remote, track-mounted rig with direct push methods, provided by ADT. Soil borings were advanced to depths of approximately 15 feet and continuously sampled with a 2-inch diameter, 4-foot macro-core tube sections to the final depths. Each macro-core sample was lined with a dedicated acetate liner.

4.2.1.2 Hollow Stem Auger

Six soil borings were completed by the HSA drilling method, with an F-10 truck mounted drill rig provided by ADT. Borings were completed with 4.25 - inch inner diameter (ID) HSA to the target boring depth.

The 6 borings were converted to monitoring wells and advanced to depths ranging from 70 feet to 77 feet. Soil samples were collected using 2-inch diameter, 2-foot long discrete split-spoon samplers. The augers were extended after each split spoon to ensure the sample represented the targeted depth interval.

4.2.2 Sampling Method and Rationale

Two to three soil samples were collected at each boring location and submitted to the laboratory for chemical analysis. Table 2 provides a summary of samples collected during the RI Site Investigation and the respective laboratory analyses. The soil samples were collected according to the following rationale:

- One sample from the zone with the highest PID readings or visual impacts. If no visual impacts or elevated PID readings were observed, this sample was collected from the fill material, which ranged from 5.5 feet to 15 feet.

- One sample from apparently clean soil (based on inspection and field screening with PID) obtained directly below the shallow sample. Due to poor recoveries at some boring locations, the second sample was collected at the next consecutive sampling interval allowing the collection of sufficient sample volume for laboratory analysis.

- In addition, one capillary fringe sample at boring locations that were converted to groundwater monitoring wells.

Soil samples were analyzed for the Target Compound List (TCL) VOCs, TCL SVOCs, Target Analyte List (TAL) metals and polychlorinated biphenyls (PCBs). Selected soil samples were also analyzed for TCL herbicides and TCL pesticides. Laboratory methods are described in Section 4.6.

Samples for VOCs were collected directly from the macro-cores or the split spoons, placed into appropriate pre-cleaned laboratory-supplied glassware, and compacted to minimize head space and pore space. The remaining sample volume was homogenized and placed in appropriate containers for SVOCs, metals, PCBs, herbicides and pesticides analysis. The sample containers were labeled, placed in a laboratory-supplied cooler and packed on ice (to maintain a temperature of 4°C). The coolers were picked up at the end of each day, or every other day, by a courier provided by the laboratory under strict chain-of-custody protocol, in accordance with the QAPP. Chain of custody documentation is presented in Appendix E. Equipment decontamination procedures are summarized in Section 4.8.

4.3 GROUNDWATER INVESTIGATION

4.3.1 Monitoring Well installation

Six groundwater monitoring wells were installed during the RI field investigation, 3 upgradient wells (MW-20, MW-57, MW-58) and 3 downgradient wells (MW-6, MW-16, and MW-38). These wells supplemented the 3 monitoring wells installed during the IRM, 1 upgradient well (MW-13) and 3 wells located in the center of the IRM Area (MW-12, MW-28, MW-56). Monitoring well MW-58 was a replacement well for former well MW-1, which was not properly installed during the IRM Site Investigation and had to be abandoned.

Monitoring wells were installed in accordance with the procedures set forth in the RI/IRM WP. Total well depth ranged from 70 to 77 ft bgs. Monitoring wells were drilled with 4.25-inch ID HSA and were constructed with 2-inch ID, threaded flush-joint, PVC casings and screens. A 15 foot screened interval with 0.010-inch slot openings was installed in each well. The annulus around the screens was backfilled with Morie No. 1 silica sand to a minimum height of two feet above the top of the screen. Auger flights were withdrawn as sand was poured to minimize borehole collapse and bridging. A bentonite pellet seal with a minimum thickness of two feet was placed above the sand pack and hydrated prior to placement of grout above the seal. The remainder of the annular space was filled with a cement-bentonite grout to near the ground surface. The grout was allowed to set for a minimum of 24 hours prior to development. Monitoring well construction details are summarized in Table 4 and well construction logs are presented in Appendix B.

Each monitoring well was completed with a sealed cap (J-plug) within either a flush-mounted vault. The J-plug will prevent surface water from infiltrating into the well during rain events etc. The concrete seal was sloped slightly to channel water away from the well. The top of the PVC casing was surveyed at each well by Langan on September 16, 2004. Top of well casings were surveyed to 0.01 foot relative to QBD.

4.3.2 Monitoring Well Development

Groundwater monitoring wells were developed at least 24-hours after installation, following procedures in accordance with the RI/IRM WP. The following is a table representing the date of monitoring well installation and date of monitoring well development:

Monitoring Well ID	Date of Installation	Date of Development
MW-38	7/20/2004	8/6/2004
MW-16	7/27/2004	8/9/2004
MW-20	7/29/2004	8/10/2004
MW-58	8/2/2004	8/11/2004
MW-57	8/6/2004	8/13/2004
MW-6	8/11/2004	8/13/2004

The monitoring well development logs are presented in Appendix C. The wells produced a sustained flow of groundwater that allowed development by pumping. All monitoring wells were developed using a submersible Grundfos pump. Prior to development, water levels were measured to the nearest 0.01 foot with a decontaminated water level indicator. During development, a target volume of at least four well volumes were pumoed from each well and stabilization of parameters (pH, temperature and specific conductance) was reached. Stabilization was reached when three consecutive readings for each field parameter showed less than 10% change. Water quality measurements were made using a Horiba U-22 water quality meter. All development water was contained in 55-gallon drums.

4.3.3 Groundwater Sampling

During the RI, groundwater samples were collected from all six RI monitoring wells and two of the four IRM wells (one IRM well, MW-28, had to be abandoned during building demolition). All wells were purged and sampled at least one week after development and in accordance with procedures set forth in the Work Plans and U.S. EPA's low-flow groundwater purging procedure to allow for collection of a representative sample ("Low-Flow [Minimal Drawdown] Ground-Water Sampling Procedures, "EPA/540/S-95/504, April 1996). MW-38 was sampled on August 20, 2004. MW-16 and MW-20 were sampled on August 23, 2004 while MW-57 and MW-58 were sampled on August 24, 2004. MW-6 was sampled on August 25, 2004. IRM wells MW-12 and M-56 were sampled on August 25, 2004. Groundwater sampling logs are presented in Appendix D.

Prior to sampling, the static water level was measured to the nearest 0.01 foot with a decontaminated water level indicator. Free product was not present in any of the wells and consequently, use of an oil/water interface probe was not necessary. Purging was completed with a decontaminated submersible Grundfos pump fitted with dedicated, disposable tubing. Purge rates were kept at less than 0.25 gallons per minute, in accordance with US EPA's low-flow guidance. Little or no drawdown was observed during purging in all wells.

Groundwater samples were collected directly from the submersible pump discharge line, and analyzed for the TCL VOCs, SVOCs, pesticides, and herbicides, TAL metals, and PCBs. The volatiles fraction was collected after the pump was turned off with a dedicated bailer into the laboratory-provided vials. The sample containers were labeled, placed in a laboratory-supplied cooler and packed on ice (to maintain a temperature of 4°C). Sample coolers were picked up on-Site by a courier from STL and delivered under proper chain of custody protocol for analysis. Table 3 provides a summary of analytical parameters for each sample collected. Chain of custody documentation is presented in Appendix E.

Groundwater levels were measured during the field investigation on several occasions in the RI and IRM wells, and two geotechnical wells installed during Langan's geotechnical investigation (LB-1 and LB-4) (see Table 17).

4.4 SOIL GAS INVESTIGATION

Nine soil gas samples were collected during the RI Site Investigation to evaluate the presence of volatile constituents beneath concrete floor slabs within buildings that will remain and undergo renovation during redevelopmet. Soil gas samples were collected between July 14, 2004 and July 16, 2004 in accordance with RI/IRM WP.

The soil gas sample was collected with a Geoprobe sampler consisting of a 5-foot long, 1.25 inch outer diameter (OD) steel tube and an inner, stainless-steel slotted screen (0.010 slot) which is 3.5 feet long and has 0.75 inch OD. A concrete core tool was used to open a 2-inch diameter hole in the concrete floor at the soil gas location. A Geoprobe was used to advance the soil gas probe was advanced through the surface soil to a depth of four feet bgs. and connected to Polyethylene disposable tubing. The assembly screen was subsequently exposed to the soil when the expendable drive point head was detached from the bottom of the probe assembly and pulled back 1.5 feet. The annulus around the probe assembly at the surface was then sealed with granular bentonite, which was hydrated to form an air-tight seal. Two probe assembly volumes of air were purged and the soil gas sample was drawn through the slotted screen and the tubing into a laboratory supplied Summa canister.

The soil gas sample was shipped under chain-of-custody protocol to Severn Trent Laboratories in Burlington, Vermont for VOCs analysis by EPA Method TO-15 analysis. Chain of custody documentation is presented in Appendix E.

4.5 QUALITY CONTROL SAMPLING

During the RI Site Investigation, field blanks, coded field duplicate samples and matrix spike/matrix spike duplicate (MS/MSD) samples were collected and submitted for laboratory analysis in accordance with the Quality Assurance Project Plan (QAPP), contained within the RI/IRM WP. During the course of the investigation, the following quality control samples were collected: two coded field duplicate soil samples and one coded field duplicate groundwater sample, two MS/MSD soil samples and one MS/MSD groundwater sample, three field blanks, and two trip blanks. A summary of quality control samples is presented in Table 5.

Field blanks were collected to determine the effectiveness of the decontamination procedures for sampling equipment. It is a sample of deionized, distilled water provided by the laboratory that has passed through the sampling apparatus. The field blanks were collected by running deionized water over decontaminated split spoon, and the Geoprobe sampling tube. The field blank samples were analyzed for TCL VOCs, TCL SVOCs, TAL metals and PCBs. A portion of the field blank samples were also analyzed for TCL Pesticides and TCL Herbicides.

Coded field duplicates were collected to determine the accuracy of the analytical methods. The samples are termed "coded" because they were labeled in such a manner that the laboratory will not be able to determine that they are a duplicate sample. This will eliminate any possible bias that could arise.

Matrix Spike/Matrix Spike Duplicate samples were collected to assess the effect of the sample matrix on the recovery of target compounds or target analytes. MS/MSD samples were analyzed for TCL VOCs, TCL SVOCs, TAL metals and PCBs. A portion of the MS/MSD samples were also analyzed for TCL Pesticides and TCL Herbicides.

4.6 SAMPLE ANALYSIS

All laboratory analyses of soil, groundwater, and soil gas samples were conducted by STL, a New York State Department of Health Environmental Laboratory Analysis Program (ELAP) approved laboratory certified for analyses using the most recent Analytical Services Protocol (ASP). Laboratory analyses were conducted in accordance with the USEPA SW-846 methods and NYSDEC ASP Level B deliverable format. Soil and groundwater samples were analyzed at the STL laboratory in Shelton, Connecticut, while STL's Burlington, Vermont lab analyzed the soil gas samples. Herbicide analyses were subcontracted to STL's laboratory in Pittsburgh, Pennsylvania. Laboratory analytical reports are provided in Appendix G.

Soil sample analyses included TCL VOCs by EPA Method 8260B, TCL SVOCs by EPA Method 8270C, TAL metals by EPA Methods 6010B and 7471A, and PCBs by EPA Method 8082. A portion of the soil samples were also analyzed for TCL Pesticides by EPA Method 8081A and TCL Herbicides by EPA Method 8151A. Groundwater samples were analyzed for TCL VOCs, TCL SVOCs, PCBs, TAL metals, TCL Pesticides and TCL Herbicides, while soil gas samples were analyzed for VOCs by EPA Method TO-15.

On February 17, 2004, Langan received Draft comments from NYSDEC on the work plans. One of NYSDEC's comments stated that groundwater samples should be analyzed for pesticides. All groundwater samples collected during the IRM investigation were analyzed for TCL Pesticides and TCL Herbicides. Based on NYSDEC's letter, Langan decided to analyze shallow soil samples for TCL Pesticides and TCL Herbicides. Approximately 45% of soil samples, generally the shallow samples (depth range: 1 to 6 ft bgs), were analyzed for TCL Pesticides and TCL Herbicides.

4.7 DATA VALIDATION

Upon receipt of final ASP Level B laboratory reports from STL, copies of the reports were shipped to Alpha Environmental Consultants, Inc. of Clifton Park, New York (Alpha Environmental) for data validation. Data validation was performed in accordance with the USEPA validation guidelines for organic and inorganic data review. Validation included the following:

- Verification of 100% of all QC sample results (both qualitative and quantitative);
- Verification of the identification of 100% of all sample results (both positive hits and non-detects);
- Recalculation of 10% of all investigative sample results; and
- Preparation of a Data Usability Summary Report (DUSR).

Data reduction, validation, and reporting procedures were completed in accordance with the QAPP provided in the RI/IRM WP. Data validation was completed for all laboratory reports. DUSRs are presented in Appendix F.

4.8 FIELD EQUIPMENT DECONTAMINATION

A temporary decontamination area, lined with polyethylene sheeting was constructed on the west side of Building 3, east of the Atlas Terminals Water Tower, for steam cleaning the drilling equipment and downhole well development and purging equipment. Water collected from the decontamination activities wa collected in 55-gallon drums and managed as described in Section 4.9.

All drilling equipment including the drilling rig, augers, bits, rods, tools, and etc. were cleaned with a high-pressure steam cleaning unit or a thorough non-phosphate detergent (e.g., Liquinox) and water wash and fresh water rinse, before beginning work and between boring locations. Tools, drill rods, and augers were placed on polyethylene plastic sheets following steam cleaning. Direct contact with the ground was avoided. The back of the drill rig and all tools, augers, and rods were decontaminated at the completion of the work and prior to leaving the Site.

Prior to sampling, all non-dedicated sampling equipment (bowls, spoons, split-spoon samplers, water level indicators, etc.) were either steam cleaned or washed using the following procedures:

- Potable water and a phosphate-free detergent wash.
- Dilute nitric acid rinse (10% for non-metallic equipment, 1% for split-spoon samplers)
- Distilled water rinse
- Acetone rinse
- Distilled water rinse
- Final de-ionized water rinse
- Air dry

Decontamination occurred at the sampling location and all liquids were contained in pails, buckets, etc. Between rinses, equipment was placed on polyethylene sheets or aluminum foil if necessary, avoiding contact with the ground.

4.9 INVESTIGATION-DERIVED WASTE MANAGEMENT

All investigation-derived wastes (IDW) generated during the RI Site Investigation were containerized. Soil, groundwater from development and purging, and decontamination water were placed into DOT approved 55-gallon steel drums with closed tops. Plastic sheeting from the decontamination pad were consolidated in DOT approved drums. The drums were staged east of Building 29, a secure area on Site, as determined by Langan and Atlas Park representatives. All IDW will be removed and disposed as non-hazardous material by Capitol Environmental Service, Inc.

5.0 NATURE AND EXTENT OF CONTAMINATION

This section discussed the nature and extent of regulated NYSDEC organic and inorganic compounds within the RI Area, based on the RI data. The analytical results are presented in figures and tables, as referenced below.

- Soil/Historic Fill – The soils data are presented in Tables 6 through 10 with exceedances of the TAGM RSCOs highlighted. TAGM exceedances in the RI Area are also presented in plan view on Figure 9 (for SVOCs) and Figure 10 (for metals), and in section view on Figure 7 incorporating subsurface information for selected boring locations. Specifically, Section D-D' shows the subsurface lithology encountered, presence of ash/cinders in the historic fill, sample collection depths, and exceedances of metals and SVOCs. There were no exceedances of PCBs, VOCs, herbicides or pesticides, as noted on the tables for these compounds. Table 2 summarizes the same general information shown on Section D-D' in tabular form, but also provides a narrative description of subsurface lithology observed.

- Groundwater - The groundwater data are presented in Tables 17 through 21 with exceedances of the NYSDEC Ambient Groundwater Standards and Guidance Values (SGVs) highlighted. Groundwater exceedances are also presented in plan view on Figure 12 (there were exceedances only for several VOCs and naturally-occuring metals). There were no exceedances of PCBs, SVOCs, herbicides or pesticides, as noted on the tables for these compounds.

- Soil Gas - The soil gas data are presented in Table 22. There are no applicable standards or guidance values for comparison with the soil gas data. The soil gas data are also presented in plan view on Figure 11 with the corresponding soils data for the same locations, for identifying any correlations between the soil and soil gas concentrations.

The IRM SIR demonstrated that detected concentrations of calcium, magnesium, nickel and zinc are naturally elevated in the native soils beneath the historic fill layer. These metals are naturally-occurring compounds present in minerals that comprise the native soils on-site, and are essential nutrients for humans, animals, and plant life. Comparable concentrations were found in the historic fill as in the native soils. Therefore, these metals were considered to be non-critical compounds with respect to the site remediation within the IRM Site area.

5.1 HISTORIC FILL/SOIL

5.1.1 Ash/Cinders

During the RI field investigation, ash and/or cinders were visibly identified within the historic fill layer at four of the 20 borings (B-46, B-47, B-49, and B-51) at depths ranging from 2 feet to 15 feet bgs (See Figure 7, Profile D-D'). These findings are consistent with the IRM Site Investigation, which showed that the occurrence of ash/cinders is generally sporadic across the Site with no apparent pattern of distribution. All 4 locations were located within the footprints of existing buildings which will remain as part of the Site redevelopment. At two borings, the ash/cinders formed a distinct layer, a 4-inch layer at B-49 and a 6-inch layer at B-51. In the other two borings, the ash/cinders were mixed in a sandy fill matrix, 8 inches thick at B-47 and 2 feet thick at B-49. Neither the distinct ash layers nor the ash-containing fill layers registered a PID response in the field.

At all borings where visible ash and/or cinders were found, a sample containing the ash/cinders interval was collected for laboratory analysis. Five (5) samples containing visible ash and/or cinders were collected and analyzed, with results as follow:

- There were no TAGM exceedances for VOCs, PCBs, pesticides or herbicides.
- In one of the five samples, from B-49 (2 to 4 ft bgs) there were no TAGM exceedances for any of the tested compounds.
- TAGM exceedances occurred for SVOCs in samples containing ash/cinders from borings B-46 (4 to 6 ft bgs) and B-51 (2 to 4 ft bgs).
- TAGM exceedances occurred for only one metal, mercury, in samples containing ash/cinders from borings B-47 (2 to 4 ft bgs), B-49 (2 to 4 ft bgs), and B-51 (2 to 4 ft bgs).

5.1.2 Historic Fill Not Containing Ash/Cinders

Forty (40) soil samples of historic fill not containing ash/cinders were collected from the 20 soil boring locations. The subsurface soil findings are summarized as follow (excluding the results for samples containing ash, described above).

General Findings

- Based on field observations and a review of the analytical findings, the historic fill layer appears to be the primary source of the metals and SVOC TAGM exceedances (except where noted otherwise below).

- The historic fill is present throughout the Site, including under all of the buildings, although a significant number of historic fill samples contain no TAGM exceedances.

- The depth of the historic fill in the RI Area ranges from 7 to 15 feet.

- There were no TAGM exceedances for VOCs, PCBs, pesticides, or herbicides in any historic fill samples.

- There were no TAGM exceedances in native soil samples collected within the capillary fringe (directly above the water table), at the six (6) borings where groundwater monitoring wells were installed (B-6, B-16, B-20, B-38, B-57 and B-58).

- The individual compounds and levels detected in soil in the RI Area are consistent with those detected in the IRM Area.

Metals Findings

- TAGM exceedances occurred in the historic fill for the metals mercury, arsenic, barium, cadmium, copper, and lead. Mercury exceeded the TAGM RSCO in the most samples (12 of 40), followed by copper (7 of 40), arsenic and cadmium (2 of 40for each), and barium and lead (1 of 40for each).

- Mercury exceedances occurred in the historic fill beneath buildings to a depth of 15 ft bgs (B-49 at 1.8 mg/kg, compared to the RSCO of 0.2 mg/kg), and outdoors to a depth of 10 ft bgs (B-10 at 0.51mg/kg); the highest mercury detection was in an off-Site soil sample collected along Cooper Avenue at soil boring B-57 (at 0 to 5 bgs and 2.6 mg/kg).

- Copper exceedances occurred in the historic fill beneath buildings to a depth of 15 ft bgs (B-49 at 51.6 mg/kg, compared to the RSCO of 50 mg/kg), and outdoors to a depth of 4.5 ft bgs (B-55 at 188 mg/kg); the highest copper detection was in a soil sample collected beneath Building 28 from 8 to 10 ft bgs (B-48 at 870 mg/kg).

- TAGM exceedances occurred in the historic fill and underlying native soils for some other metals, namely calcium, magnesium, nickel and zinc, which were previously demonstrated to be naturally-occurring compounds/concentrations and, therefore, are not of consequence to the findings of this investigation.

SVOCs Findings

- TAGM exceedances occurred in the historic fill for certain SVOCs in 15 of the 40 samples collected. The exceedances occurred exclusively for SVOCs in the polynuclear aromatic hydrocarbon (PAH) suite, including benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, fluoranthene, and indeno(1,2,3-cd)pyrene.

- TAGM SVOC exceedances occurred in the historic fill at 10 of the 20 boring locations, specifically the 3 outdoor soil borings in the southwest corner of the RI Area (B-9, B-10, and B-16), both upgradient boring locations along Cooper Avenue (B-57 and B-58), 4 borings within building footprints, and the downgradient perimeter well boring located along 80th Street (B-6).

- The highest SVOC concentrations occurred in a sample containing ash collected from beneath Building 1 (B-51 from 2 to 4 ft bgs at 340 mg/kg, below the RSCO for total SVOCs of 500 mg/kg).

- One SVOC TAGM exceedance, for chrysene, occurred in a native soil sample collected from 19 to 23 ft bgs at boring B-10, which appears to be related to conditions around the UST area. Petroleum-like odors and PID readings were observed between a depth of 11 to 23 ft bgs at this boring. Low levels of benzene, ethylbenzene, and xylenes, below the TAGM RSCOs, were also detected (See also below, Section 5.2, AOC-1C).

5.1.3 Evaluation of cPAHS and B(A)P Equivalences

As per agreement with NYSDEC, benzo(a)pyrene equivalents were calculated for all detected carcinogenic PAHs and are presented in Table 16.

5.2 AREAS OF CONCERN

The RI analytical results are discussed below relative to the specific AOCs identified to exist in the RI Area. In general, the RI data confirmed actual or potential impacts from only two of the AOCs, the USTs and historic fill. However, to satisfy the requirements of the Work Plan to investigate and report on all previously identified potential AOCs, the field findings and analytical results relative to each AOC are discussed below. Where the findings appear to relate to either the USTs or historic fill, and not the other AOCs, such is noted.

5.2.1 AOC-1C - Underground Storage Tanks

AOC 1-C consists of two, registered 10,000 gallon heating oil USTs located between Buildings 7 and 29. The tanks are oriented in a line trending west-east. These tanks have been taken out-of-service, and plans are currently underway to remove them shortly.

Two soil borings were completed to investigate the tank area, B-10 and B-16. Boring B-10 was completed downgradient (south) of the westernmost UST to a depth of 23 ft bgs using a Geoprobe (refusal occurred at 23 ft due to cobbles). Some staining, a petroleum-like odor, and PID responses as high as 87 parts per million (ppm) were observed in soils from 11 to 23 ft bgs. One SVOC, chrysene, was detected above the TAGM RSCO in a soil sample collected from 19 to 23 ft bgs, and benzene, ethylbenzene, and xylenes (BEX) were detected at concentrations below the respective RSCOs. These findings suggest some release of petroleum product to the ground in the area.

Boring B-16 was completed downgradient (south) of the easternmost UST. Boring B-16 was drilled to 74 feet bgs and converted into a groundwater monitoring well upon completion. There were no odors, staining or PID responses noted during drilling and soil sampling, other than slight creosote-like odors and a PID reading of 2.3 ppm from wood fragments obtained from 9 to 11 ft bgs. There were no TAGM exceedances in any soil samples collected from B-16.

5.2.2 AOC-3A - Transformers

A transformer is located in a wooden shed south of Building 1, along the property boundary. Boring B-9 was located to investigate this transformer, and was advanced to a depth of 15 feet bgs with the Geoprobe. There was no evidence of visual contamination, presence of ash or cinders or PID readings in the samples collected from the boring. There were no PCBs or VOCs detected in the samples collected at B-9. Benzo(a)pyrene and two metals, mercury and copper, exceeded TAGM RSCOs in the shallow soil (fill) sample from 1 to 3 feet bgs, but there were no TAGM exceedances in the two deeper samples collected from 3 to 5 feet and 8 to 10 feet bgs.

5.2.3 AOC-6A - Chemical Storage Area (Building 1)

Lubricating oils, lithium grease and gear oil were stored within Building 1. No evidence of current storage of these materials was noted during the building inspection. Two borings, B-50 and B-51, were completed within Building 1 at strategically placed locations (i.e., next to floor drains, wash tubs, etc.). Soil and soil gas samples were collected at each boring location.

Borings B-50 and B-51 were advanced to 15 feet and 13.5 ft bgs, respectively. Each boring was completed with the Geoprobe method. No evidence of contamination was recorded for either location except for a dark-colored interval within the historic fill, containing ash in a sandy matrix at B-51 at 2 to 4 ft bgs. This material was sampled and recorded the highest detected concentrations/exceedances of SVOCs of all the RI samples. TAGM mercury exceedances also occurred for this sample. The deeper sample from 6 to 8 ft bgs exceeded TAGM limits for SVOCs.

At B-50, copper exceeded the RSCO in the shallow sample from 3 to 5 ft bgs, but there were no exceedances in the deeper sample collected from 6 to 8 ft bgs directly below the shallow sample. Mercury exceedances also occurred, which appear to be related to the historic fill.

5.2.4 AOC-6E - Chemical Storage Area (Building 7)

Chemical water treatment chemicals were reportedly stored within Building 7. One boring was planned for completion within the building. However, due to access restrictions of the drilling equipment, the boring was relocated outside, immediately south of Building 7.

The soil boring, B-55, was advanced to a depth of 16 feet bgs with the HSA method. There were no indications of impacts from water treatment chemicals. However, soils present from 0.5 to 4.5 feet bgs exhibited black staining and a low PID response, and exceeded TAGM RSCOs for SVOCs and copper. The deeper sample collected from 8 to 12 ft bgs displayed no evidence of contamination and no exceedances of RSCOs were reported.

5.2.5 AOC 6H - Chemical Storage Area (Building 28)

Glue and adhesive chemicals were reportedly stored within Building 28. The central portion of Building 28 was investigated during the IRM Site Investigation via 2 soil borings and soil sampling; no significant environmental conditions were uncovered. That portion of the building has since been demolished as part of the Site redevelopment. It should be noted that during the ongoing IRM, a high lead-bearing waste layer (hazardous due to leachable lead in some instances) was uncovered east of the south remaining half of Building 28, and appears to extend beneath at least a portion of the south half of the building.

Four additional soil borings were completed during the RI within the Building 28 footprint, 3 inside the building and 1 in the outdoor area where the building was demolished but will be built back out during redevelopment. Soil samples were collected from all borings. Relatively high SVOC TAGM exceedances, apparently associated with the historic fill, occurred in soil samples from boring B-48 located in the south half of the building. SVOC concentrations were greater (twice as high) in the deep sample (8 to 10 ft bgs) compared to the shallow sample (2 to 4 ft bgs). In addition, some metals including barium at 1,260 milligrams per kilogram (mg/kg), copper at 870 mg/kg, and lead at 921 mg/kg, were also elevated in the deep soil sample from B-48. These metals have been found to be similarly elevated associated with the lead-hazardous wastes uncovered to the east during the IRM.

5.2.6 AOC-7 - Historical Uses (Building 1)

Within Building 1, miscellaneous businesses that stored, used, handled or disposed of petroleum or hazardous substances operated and include Chocolate & Paint Machinery Co., the Triangle Cable Co., Amity Dyeing and Finishing, Glendale Steel, and Eureka Oil. Two borings, including two soil gas samples, were completed within Building 1 at strategically placed locations (i.e., next to floor drains, wash tubs, etc.). See the discussion of findings for AOC-6A above.

5.2.7 AOC-9 - Historic Fill

All 20 soil borings completed as part of the RI Investigation were used to delineate the nature and extent of both contaminated and non-contaminated historic fill. The distribution of the historic fill, including ash/cinder layers, and elevated SVOCs and metals above NYSDEC TAGM RSCOs were discussed previously. The presence of historic fill was confirmed beneath the RI Area including beneath all existing buildings. The characteristics of the fill was found to be comparable to the IRM Area, although localized pockets containing higher-than-typical SVOC and metal concentrations were identified, specifically beneath Building 1 (B-51, SVOCs in sample from 2 to 4 ft containing ash) and Building 28 (B-48, SVOCs in samples from 2 to 4 ft and 8 to 10 ft bgs, and metals in sample from 8 to 10 ft bgs).

5.3 GROUNDWATER

Groundwater sampling results are summarized in Tables 18 to 22. No pesticides, herbicides or SVOCs were detected above NYSDEC Ambient Water Quality Standards and Guidance Values (SGVs) for the groundwater samples. Exceedances occurred only for some VOCs and metals as described below. Groundwater detections above the SGVs are shown on Figure 12.

5.3.1 Volatile Organic Compounds

In summary, relatively low levels of two VOCs, trichloroethene (TCE) and perchloroethylene (PCE), were detected in groundwater present between 55 and 67 ft below ground surface. The source(s) of these detections is unknown. The extensive IRM and RI dataset does not support the Site soils as a primary source of these compounds in groundwater. There have been no TAGM exceedances of the TCE and PCE RSCOs in soil, and both compounds have been detected only at low concentrations (maximum TCE concentration of 120 ug/kg, maximum PCE concentration of 28 ug/kg) or have been undetected in most samples. In addition, no "hot spots" containing these compounds have been uncovered during the IRM to date. The specific VOC groundwater findings are summarized as follow:

- There were no VOCs detected in 3 of the 4 upgradient wells (MW-57, MW-58 and MW-13), located along Cooper Avenue on the north side of the Site.

- One VOC, TCE, was detected at a higher concentration in an upgradient well than the downgradient Site wells. TCE was found in upgradient well MW-20 above the SGV of 5 micrograms per liter (ug/l) at a concentration of 20 ug/l, twice the maximum level found in any Site downgradient wells. Well MW-20 is located in the southeast corner of the Site bordering the Atlas Terminals property. TCE was detected in 2 of the 6 on-Site monitoring wells above the SGV, ranging from 6 ug/l in well MW-16 to 10 ug/l in downgradient well MW-38.

- PCE was detected in 3 of the 6 on-Site monitoring wells above the SGV of 5 ug/l, ranging from 23 ug/l in wells MW-28 and MW-6, to 96 ug/l in well MW-38, a downgradient well located west of Building 1 along West 80th Street. PCE was also detected in upgradient well MW-20, at 4 ug/l, below the SGV.

- Acetone was detected above the SGV in one well, upgradient well MW-57, but is believed to be attributed to field decontamination procedures using acetone.

- No other VOCs besides those discussed above were detected above SGVs in groundwater.

5.3.2 Metals

The SGVs for iron, magnesium, manganese and sodium were each exceeded in at least one groundwater sample; these results are consistent with background conditions and are not believed to reflect Site-related impacts.

5.3.3 Assessment of VOC Off-Site Migration

PCE was detected in two Site downgradient perimeter wells and TCE was detected in one Site downgradient well, at levels above the state SGVs. An assessment of off-site migration of PCE was performed with respect to potential impacts on the downgradient public drinking water supply wells. Although not supported by the IRM and RI soils dataset (see above Section 5.3.1), for purposes of this analysis PCE was conservatively assumed to be a Site-related COC.

Both PCE and TCE are subject to attenuation by naturally-occurring processes, including advection, dispersion, sorption, volatilization, and biological degradation. Both compounds are microbially-degraded through a process known as reductive dehalogenation, which is most prevalent under anaerobic conditions. The RI data indicate that groundwater conditions are slightly anaerobic, or reducing, with stabilized pH measured in the RI wells between about 3 and 5.5.

Calculations using the Site-specific RI data (PCE concentrations, hydraulic gradient), regional estimates for hydraulic conductivity of the Upper Glacial Aquifer, and default values for the remaining equation parameters, were completed to simulate the degradation/attenuation of the PCE. The nearest drinking water supply wells are approximately 1.9 miles away. The equations used, input parameters, and results are provided in Appendix I.

Based on these calculations, PCE concentrations are estimated to attenuate to undetectable levels within a maximum distance of about 1,000 feet from the Site boundary, or 1/10 the distance from the Site to the nearest public supply well. This distance is well outside of the potential capture zone of the well field, hence, PCE that may originate on-Site could not impact groundwater extracted from these wells.

5.4 SOIL GAS AND AMBIENT AIR

5.4.1 Soil Gas

Nine soil gas samples were collected during the completion of borings B-45, B-46, B-48, B-49, B-50, B-51, B-52, B-53 and B-59, within the buildings that will remain as part of the redevelopment plan (Figure 11). The samples were collected according to the methods set forth in Section 4.4 of this report. The results for the soil gas are summarized in Table 23.

VOCs, including TCE and PCE, were detected in the soil gas samples, but there are no chemical-specific standards for soil gas for comparison purposes. VOCs were detected at the highest concentrations beneath the north half of Building 28, and beneath Building 1. However, no VOCs were detected on field instruments in ambient air within any of the buildings at any time during the RI field program, suggesting that vapor intrusion is minimal, if occurring at all. The slabs represent vertical barriers to intrusion of soil vapors. Moreover, the future use of these buildings will be commercial in nature and not residential.

The source(s) of these soil vapors is unknown. The existing Site data do not support the Site soils or groundwater as a significant source of VOCs detected in soil gas beneath the buildings that will remain. There have been no TAGM exceedances for any VOCs in soil samples collected on-Site, including the IRM and RI Areas. With respect to TCE and PCE, the highest concentrations measured in soils from beneath the buildings in the RI Area were 22 ug/kg for PCE, and 0.6 ug/kg for TCE. While the groundwater is an unlikely source because of its great depth, no other sources on-Site have been found.

5.4.2 Ambient Air

Three ambient (outside) air samples were collected at the same time as the soil gas sampling. The results for the ambient air sampling are presented in Table 24, and the sampling locations are shown on Figure 11. Ambient air samples contained similar compounds as the soil gas samples, at concentrations that were generally lower than the New York State Department of Health background indoor air concentrations.

5.5 QUALITY CONTROL RESULTS

Duplicates, field blanks and MS/MSD samples were collected during the RI. Quality control sample results were verified during data validation. A summary of these results, based on data validation, is presented in Section 5.6. Field blank results are tabulated in Tables X through Y. Detections in the indicated samples include the following:

- Acetone (FB081004, FB081204, and FB082304)
- 4-Methyl-2-Pentanone (FB082304)
- Calcium (FB081004 and FB082304)
- Iron (FB081004)
- Zinc (FB082304)
- Heptachlor (FB081004)

Acetone, identified in all three field blank samples, is a common laboratory and field cross-contaminant and was found at concentrations below 11 ppb. Duplicate samples for soil samples are summarized with the soil analytical results in Tables 6 through 10. Duplicate sample results for groundwater samples are summarized with the groundwater analytical results in Tables 18 through 21. Field blank results are summarized on Tables 11 through 14.

5.6 DATA USABILITY

5.6.1 Data Usability Overview

Data validation was performed by Data Validation Services of North Creek, NY (Data Validation Services) in accordance with the USEPA validation guidelines for organic and inorganic review. Level B laboratory reports were provided by the laboratory, Severn Trent Laboratory of Connecticut (STL-CT) or Burlington, and forwarded to Data Validation Services for all samples collected during the RI Site Investigation. Data Usability Summary Reports (DUSRs) were provided by Data Validation Services and are attached in Appendix F. The DUSRs include a review of the following sample delivery groups (SDGs):

July 2004 DUSR

- SDG #207130 - 20 soil samples
- SDG #207141 - 8 soil samples
- SDG #207193 - 8 soil samples
- SDG #207211 - 1 soil sample

August 2004 DUSR

- SDG #207272 - 1 soil sample
- SDG #207240 - 4 soil samples
- SDG #207346 - 7 soil and 2 water samples
- SDG #207417 - 10 groundwater samples
- SDG #X – 9 soil gas samples

The DUSRs were generated from review of the summary form information, with review of sample raw data, and limited review of associated QC raw data. Full validation was not performed. However, the reported summary forms were reviewed for application of validation qualifiers, using guidance from the USEPA Region 2 validation SOPs, the USEPA National Functional Guidelines for Data Review, and judgment by Data Validation Services. The following items from each SDG were reviewed:

- Laboratory Narrative Discussion
- Custody Documentation
- Holding Times
- Surrogate and Internal Standard Recoveries
- Matrix Spike Recoveries/Duplicate Correlations
- Field Duplicate Correlations
- Preparation/Calibration Blanks
- Control Spike/Laboratory Control Samples
- Instrumental Tunes
- Calibration Standards
- ICP Serial Dilution
- CRI/CRA Standards
- Instrument IDLs

5.6.2 Data Usability Summary

Complete DUSR narratives are in Appendix F.

July 2004 DUSR: SDG #'s 207130, 207141, 207193, 207211, 207417
This DUSR contains a review of 37 soil samples collected between July 13, 2004 and July27, 2004 and analyzed for TCL VOCs, TCL SVOCs, TCL PCBs, TAL Metals, TCL Pesticides, and TCL Herbicides.

August 2004 DUSR: SDG #'s 207272, 207240, 207346
This DUSR contains a review of 12 soil samples, 12 aqueous samples and 9 soil gas samples collected from July 13, 2004 through August 25, 2004 and analyzed for TCL VOCs, TCL SVOCs, TCL PCBs, TAL Metals, TCL Herbicides and TCL Pesticides.

All edits made to the data qualifiers by Data Validation Services were made to the data summary tables.

Duplicate Samples:

Results for three blind field duplicate samples were reviewed as part of this DUSR, B-48 (2-4), B-57(68-70) and GW-38. The duplicate samples were analyzed for the same parameters as the primary samples.

Field Blanks:

Results for three field blanks were reviewed as part of this DUSR, FB081004, FB081204, and FB082304.

April 2, 2004 DUSR: SDG #98714

This DUSR contains a review of nine soil gas samples collected on from July 13, 2004 through July 16, 2004 and analyzed for volatile analytes by USEPA method TO-15.

6.0 QUALITATIVE HUMAN HEALTH EXPOSURE ASSESSMENT

An assessment of human health exposure was conducted for both current and future site conditions in accordance with the NYSDEC Draft DER-10 Technical Guidance for Site Investigation and Remediation, dated December 2002. The assessment included an evaluation of potential exposure media, receptor populations, and pathways of exposure to Site-related constituents of concern (COCs). Complete exposure pathways have the following five elements: 1) a contaminant source; 2) contaminant release and transport mechanism; 3) a point of exposure; 4) a route of exposure; and 5) a receptor population.

6.1 POTENTIAL EXPOSURE MEDIA

Potential on-Site sources of impacted materials include the historic fill containing certain SVOCs and metals above NYSDEC RSCOs, localized pockets of more elevated SVOCs in soil beneath some of the buildings, a localized area potentially containing lead-bearing wastes beneath the east side of Building 28, and two USTs. The historic fill is present throughout the Site, including under all of the buildings, although levels of COCs do not exceed the NYSDEC RSCOs at all sampled locations.

Two USTs exist in the south end of the RI Area. Data from one soil boring indicates potential impacts to soil from the tank area. The extent of any impacts in soil are currently unknown, therefore, exposure potential for this area can not currently be evaluated. Plans are underway to remove these tanks and any associated petroleum-impacted soils uncovered.

VOCs were detected in the soil gas samples collected from beneath existing buildings in the RI Area, including TCE and PCE. The source(s) of the VOCs detected in soil gas is unknown. The existing Site data do not support the Site soils or groundwater as a significant source of VOCs detected in soil gas. While the groundwater is an unlikely source because of its great depth, no other sources on-Site have been found.

In summary, the environmental media that may serve as pathways for contaminant migration are subsurface soil/fill and groundwater. Surface soil is not considered to be a pathway for contaminant migration because the site is currently paved or covered with buildings, and in the future will be paved or covered with buildings and landscaped areas. Surface water runoff is not considered to be a pathway for contaminant migration, currently because the pavement and buildings prevent contact between surface water runoff and subsurface soils, and in the future because the Site will be served by an engineered stormwater drainage system. Vapor intrusion to indoor air presents a low but potential exposure pathway that can be addressed by a sub-slab depressurization system.

6.2 CONSTITUENTS OF CONCERN (COCs)

A constituent of concern is defined as a compound that is present within Site media (e.g., soil, groundwater) at concentrations exceeding the applicable standards and attributable to Site operations or conditions. Site-specific COCs for the RI Area within Atlas Park were determined from a review of the Site analytical data, specifically the detected levels, frequency of detection, and any apparent trends in distribution suggesting they are potentially related to Site operations. Based on this analysis, COCs were identified for subsurface soil and groundwater as discussed below.

6.2.1 Soil

The COCs for soil were identified to be SVOCs (PAHs) and the metals mercury, arsenic, barium, cadmium, copper, and lead.

6.2.2 Groundwater

PCE and TCE have been identified as COCs in groundwater. Metals, specifically sodium, magnesium, iron and manganese, were also detected in groundwater at levels exceeding the SGVs; however, these analytes are not COCs because they are believed to be due to naturally occurring conditions.

6.3 EXPOSURE ASSESSMENT

6.3.1 Current Conditions – RI Area

In most of the RI Area, soils are currently covered by the existing buildings and pavement. Where present, these structures and the existing surface cover prevent human physical exposure to the underlying historic fill and lead-bearing waste. In the near future, limited excavation activities will be undertaken in the RI Area. Therefore, the same exposure scenarios as described below for the current IRM Area will apply.

Where they are intact, the building slabs represent vertical barriers to intrusion of volatile compounds into the buildings. As the existing structures are currently unoccupied, there are currently no complete exposure pathways between soil vapors in the ground and human receptors in the on-Site buildings. In addition, no volatile compounds were detected in ambient air at any time within the buildings during the RI field program, suggesting that vapor intrusion is minimal, if occurring at all.

Groundwater COCs, specifically PCE, may be migrating off Site as evidenced by a comparison of upgradient and downgradient PCE concentrations. There is a potential that human contact could occur via groundwater pumping. However, there are no public drinking water supply wells in the vicinity of the Site that could be impacted. Therefore, this potential migration pathway is incomplete.

Therefore, we conclude there are currently no complete exposure pathways from soil, soil gas, or groundwater to human receptors on Site in the RI Area, although such exposure pathways to construction workers maybe present during construction.

6.3.2 Short-Term Construction Conditions (Current - IRM Area/Future - RI Area)

The planned and ongoing construction activities at the Site will result in potential exposures to Site COCs. Construction activities include excavation as part of the ongoing IRM, demolition/renovation of the existing buildings, and excavation and removal of some impacted soil for new utilities and other structures shortly in the RI Area. All five elements are present, therefore, there is a moderate potential for exposure to occur to construction workers and facility representatives to soil COCs via direct contact and ingestion of contaminated soils, and inhalation of organic vapors and dust containing Site COCs arising from the excavation activities.

The proposed construction activities may also result in exposure to the public through volatilization of vapors into the air, and through off-site migration of dust containing site COCs. However, regarding volatilization of vapors, it should be noted that there have been no significant detections of volatile organic compounds on Site to date.

There is neither currently nor in the future will there be an exposure pathway to groundwater COCs, due to the great depth to groundwater (no construction dewatering required) and because it is not used a drinking water source in the near vicinity of the Site.

As part of the ongoing IRM (and in the future during the RI) potential exposures are being managed/prevented in accordance with the procedures contained within the IRM Work Plan, Health and Safety Plan, and Community Air Monitoring Plan, including maintaining site security, and applying appropriate health and safety measures, such as monitoring the air for organic vapors and dust, dust suppression measures, and wearing the appropriate personal protective equipment.

6.3.3 Future (Post-Construction) Conditions

Upon completion of the proposed construction activities, the RI Area will be completely covered by the proposed buildings, pavement, and landscaping (underlain by a minimum 12-inch clean soil cover). These structures will prevent direct human exposure to contaminated materials that are left in place. The future use will be commercial, not residential. Controls and safeguards should be put into place to prevent maintenance and construction workers from being exposed to any such materials in the future. After the buildings are constructed, a complete exposure pathway via potential inhalation of subsurface vapors should not exist as long as the existing building slabs are sealed. However, vapor intrusion to indoor air presents a low but potential exposure pathway that can be addressed by a sub-slab depressurization system. In the IRM Area, assuming Track 1 cleanup is achieved, no potential exposure pathways will exist under any future circumstances.

7.0 CONCLUSIONS AND RECOMMENDATIONS

The conclusions and recommendations of the RI are:

1. The concentrations of constituents of concern underlying the existing buildings in the RI Area can remain in place provided the building's concrete floors remain intact and a sub-floor depressurization system is installed to vent soil gasses to the outside air.

2. For Building 28, we recommend further delineation of lead-impacted soils and encapsulation of this material beneath the building's concrete floor.

3. Based on the low concentrations of COCs in groundwater, no identified on-Site source, and absence of a potential exposure pathway, i.e., not used a local drinking water source, no further investigation nor remediation of groundwater is warranted.

4. Construction activities within the RI Area, including removal of the two UST systems and other excavation and trenching for utilities, foundations, etc., should be performed in accordance with procedures contained within the IRM Work Plan, Health and Safety Plan, and Community Air Monitoring Plan. The subsurface soils in these areas will be evaluated by confirmatory soil sampling and analysis.

5. Sufficient analytical data were gathered during the RI to establish site-specific cleanup levels and to develop remedial alternatives relative to the RI Area.