Contract No.: EP-W-09-002
WA #: 034-RARA-02PF

Region 2 RAC2
Remedial Action Contract

Remedial Action Report
Groundwater Extraction and Treatment System for the Groundwater Remedy on the Lawrence Aviation Industries Property

Lawrence Aviation Industries Site

Remedial Action

Port Jefferson Station, New York

August 24, 2011

CDM

REMEDIAL ACTION REPORT
GROUNDWATER EXTRACTION AND TREATMENT SYSTEM FOR THE GROUNDWATER REMEDY
ON THE LAWRENCE AVIATION INDUSTRIES PROPERTY
LAWRENCE AVIATION INDUSTRIES SITE
REMEDIAL ACTION
PORT JEFFERSON STATION, NEW YORK
Work Assignment No.: **034-RARA-02PF**

Prepared for:
U.S. Environmental Protection Agency
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EPA Work Assignment No.	: 034-RARA-02PF
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Contract No.	: EP-W-09-002
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PROJECT:	EPA Region 2 RAC2 Contract No.: EP-W-09-002 Work Assignment No.: 034-RARA-02PF
DOC CONTROL NO.:	3320-034-00991
SUBJECT:	Remedial Action Report Groundwater Extraction and Treatment System for the Groundwater Remedy on the Lawrence Aviation Industries Property Lawrence Aviation Industries Site Remedial Action Port Jefferson Station, New York

Dear Ms. Jon:

CDM Federal Programs Corporation (CDM) is submitting the Remedial Action Report for the Lawrence Aviation Industries Site located in Port Jefferson Station, New York.

If you have any questions regarding this submittal, please contact me at (212) 377-4535.

Very truly yours,

CDM FEDERAL PROGRAMS CORPORATION

Demetrios Klerides, PE
Project Manager

PSO: D.S.

Enclosure
cc: F. Rosado, EPA Region 2 (Letter Only)
E. Gallerie, CDM
G. Arsnow, CDM (Electronic Copy)
RAC2 Document Control

Remedial Action Report

Record of Preparation, Review, and Approval

Lawrence Aviation Industries Superfund Site
Port Jefferson Station, New York

This Report has been prepared in accordance with EPA's *Close Out procedures for National Priorities List Sites*, OSWER Directive 9320.2-22, dated May 2011, and serves to document that the remedies discussed herein have been constructed in accordance with the September 29, 2006 Record of Decision (ROD) and all EPA approved plans and specifications prepared thereunder.

RA Report Prepared by:	EPA Contractor Certifying Engineer:	Signature Demetrios Klerides Name/Title Demetrios Klerides, P.E., CDM Date 6/28/11
Approved By:	EPA Region 2 Approving Official:	Signature ______ Name/Title ______ Date ______

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Glossary of Abbreviations

A	amperes
ABS	absolute difference
ADA	Americans with Disabilities Act
ARRA	American Recovery and Reinvestment Act
AOC	area of concern
ASTM	American Society of Testing and Materials
bgs	below ground surface
CCP	coal combustion product
CDM	CDM Federal Programs Corporation
cfm	cubic feet per minute
CLP	Contract Laboratory Program
COC	chemicals of concern
CRQL	contract required quantitation limits
CVOC	chlorinated volatile organic compound
CY	cubic yard
DCE	dichloroethene
DMC	deuterated monitoring compound
DQI	data quality indicator
DQO	data quality objective
ERRS	Emergency Response and Removal Section
EPA	United States Environmental Protection Agency
ERT	Environmental Response Team
EW	extraction well
FCR	field change request
FS	feasibility study
ft	feet
GAC	granular activated carbon
gpm	gallons per minute
g/kg	gram per kilogram
GWTF	groundwater treatment facility
HASP	Health and Safety Plan
H&S	health and safety
HDPE	high density polyethylene
hp	horse power
HRS	hazard ranking system
ISCO	in situ chemical oxidation
ITP	initial testing program
IW	injection well
kg	kilogram
KVA	kilovolt-ampere
kWh	kilowatt-hour
lb	pound
LAI	Lawrence Aviation Industries
LCS	laboratory control sample
LCSD	laboratory control sample duplicate
LIPA	Long Island Power Authority
MCC	motor control center
µg/kg	micrograms per kilograms
µg/L	micrograms per liter

mg/L	milligrams per liter
msl	mean sea level
MS	matrix spike
MSD	matrix spike duplicate
msl	mean sea level
MW	monitoring well
NOD	natural oxidant demand
NPL	National Priorities List
NYCRR	New York Codes, Rules, and Regulations
NYS	New York State
NYSDEC	New York State Department of Environmental Conservation
NYSDOT	New York State Department of Transportation
OIT	operator interface terminal
ORP	oxidation redox potential
O&M	operation and maintenance
OSHA	Occupation Safety and Health Administration
OSWER	Office of Solid Waste and Emergency Response
P&ID	Process and Instrumentation Diagram
PCB	polychlorinated biphenyl
PCE	tetrachloroethene
PID	photo-ionization detector
PLC	programmable logic controller
ppbv	parts per billion by volume
ppm	parts per million
PRG	Preliminary Remediation Goal
PRP	potentially responsible party
PVC	polyvinyl chloride
QA	quality assurance
QAPP	Quality Assurance Project Plan
QC	quality control
RA	remedial action
RAC	Response Action Contract
RCA	recycled crushed aggregate
RAOs	remedial action objectives
RCRA	Resource Conservation and Recovery Act
RD	remedial design
REAC	Response, Engineering, and Analytical Contract
RI	remedial investigation
ROD	Record of Decision
ROW	Right-of-Way
RPD	relative percent difference
RPZ	reduced pressure zone
RL	reporting limit
RVM	room vapor monitor
SCWA	Suffolk County Water Authority
SDG	sample delivery group
SF	square feet
SMP	Site Management Plan
SOP	standard operating pProcedures
SOW	statement of work
SPDES	state pollution discharge elimination system

SY	square yards
TAGM	Technical and Administrative Guidance Memorandum
TCE	trichloroethene
TCLP	toxicity characteristic leaching procedure
TDS	total dissolved solids
TKN	total Kjehldahl nitrogen
TOC	total organic carbon
TOD	total oxidant demand
TSS	total suspended solids
UPS	uninterruptible power supply
VAC	volts alternating current
VOC	volatile organic compound
wc	water column

Section 1
Introduction

1.1 Site Location and Description

The Lawrence Aviation Industries (LAI) site (U.S. Environmental Protection Agency [EPA] identification #NYD002041531) is located in Port Jefferson Station, Suffolk County, New York. A site location map is shown on Figure 1-1. The LAI site encompasses approximately 126 acres and consists of the LAI facility and the LAI Outlying Parcels (the wooded areas located east and northeast of the LAI facility). The Long Island Railroad and Sheep Pasture Road form the northern border of the site, to the east and west are various residential single family houses, and to the south is a wooded area beyond which is a residential area with single family houses. The Village of Port Jefferson and Port Jefferson Harbor lie approximately one mile to the north.

The LAI facility, approximately 42 acres in size, was an active manufacturer of titanium sheeting for the aeronautics industry. The LAI facility consists of ten buildings located in the southwestern portion of the property. An abandoned, unlined earthen lagoon, which formerly received liquid wastes, lies west of the buildings, and a former drum crushing area is situated southeast of the buildings. The northeastern and eastern portions of the property are referred to as the “Outlying Parcels”. These areas are mostly vacant wooded areas and include a few small residential single family houses and three access roads. Figure 1-2 provides a site layout.

1.2 Historic Sources of Groundwater Contamination

The LAI facility was previously part of a turkey farm owned by LAI’s corporate predecessor, Ledkote Products Co. (Ledkote) of New York. Established in Port Jefferson Station in 1951, Ledkote produced items including lead gutters and spouts for roof drains. Since 1959, the 42-acre LAI facility has manufactured products from titanium sheet metal, including golf clubs and products for the aeronautics industry, under the LAI name.

Past disposal practices have resulted in a variety of contaminant releases including trichloroethene (TCE), tetrachloroethene (PCE), acid wastes, oils, sludge, metals, and other industrial plant wastes. Previous investigations in the site’s vicinity suggest that releases of hazardous substances from the facility have affected site soils and groundwater, surface water and sediments downgradient of the site.

Several Suffolk County and New York State (NYS) investigations concerning contamination of the LAI site were conducted during the 1970s and 1980s. Surface samples from sumps, puddles, laboratory cesspools, and surface water run-off at the LAI facility were found to contain high levels of fluoride, toluene, carbon tetrachloride, and heavy metals. Adjacent residential wells were found to be contaminated with fluoride, nitrates, TCE, 1,1-dichloroethene (DCE), cis-1,2- DCE, PCE, and heavy metals. In 1987, as part of a removal action, the EPA provided bottled water to affected residences and subsequently connected those homes with private wells affected by contaminated groundwater to public water supplies. In 1991, the New York State Department of Environmental Conservation (NYSDEC), Region 1 Resource Conservation and Recovery Act (RCRA) Hazardous Substance Group oversaw a major drum removal action. In the 1990s, the Suffolk County Water Authority (SCWA), under contract with the NYSDEC, connected additional homes affected by groundwater contamination attributed to LAI to public water supplies. In 1997, NYSDEC conducted a limited remedial investigation (RI); the results from this limited RI revealed that groundwater and surface water have been affected by elevated concentrations of chlorinated volatile organic compounds (CVOCs).

Based on the above investigations, NYSDEC requested in 1999 that EPA place the site on the National Priorities List (NPL). EPA prepared a hazard ranking system (HRS) report and proposed the site for inclusion on the NPL on October 22, 1999. The site was listed on the NPL on March 6, 2000.

In April 2003, NYSDEC performed a multimedia inspection of the LAI site and found violations of air, soil, solid waste, chemical bulk storage, and hazardous waste regulations. LAI was ordered by the NYSDEC to cease production until all violations were resolved. Currently, the facility is not operating and many of the buildings are vacant and unused.

1.3 Recent Site History and Progress

EPA began RI field activities in summer 2003. In December 2003, EPA personnel noted conditions at the site, including, but not limited to, leaking vats and drums, that warranted the performance of a removal action. In March and April 2004, EPA Region 2's Removal Action Branch unstacked and restaged approximately 1,300 drums, containers, and cylinders containing various flammable solids, acids, bases, gases and unknown compounds, and inventoried the laboratory area, identifying at least 390 containers. Most of the drums and containers were disposed off-site in October and November 2004. In March 2005, a 13.5-ton shipment of transformers and capacitors filled with suspected polychlorinated biphenyl (PCB) liquid was removed from the site and disposed as part of the removal action. During these actions, EPA personnel identified approximately 30 additional electrical transformers in several areas of the site.

Camp Dresser & McKee Inc. (CDM) conducted an RI at the site from August 2003 to May 2005. The RI documented a CVOC plume originating at the LAI site and identified PCB-contaminated soil at the site. CDM's July 2006 feasibility study (FS) presented remedial alternatives for groundwater, soil, surface water and sediment. The Record of Decision (ROD) for the site was signed on September 29, 2006.

Groundwater Remedy:

TCE and PCE were detected at multiple depths in groundwater at levels exceeding cleanup criteria. The ROD groundwater remedy called for area-wide plume/source containment and treatment of contaminated groundwater, which included:

- Construction of a groundwater extraction and treatment system both at the LAI facility and within the plume area near Old Mill Pond
- Application of in situ chemical oxidation (ISCO) injections within the area of high TCE concentrations in groundwater at the LAI facility to potentially reduce the overall groundwater cleanup time
- Imposition of institutional controls
- Development of a Site Management Plan (SMP)

- Long-term groundwater and surface water monitoring to provide an understanding of changes in contaminant concentrations and distribution over time

- Investigation of vapor intrusion into structures within the area that could be potentially impacted by the groundwater contamination plume, and implementation of an appropriate remedy (such as sub slab ventilation systems) based upon the investigation results

The 100% Remedial Design (RD) was completed by CDM for groundwater treatment system construction and ISCO treatment at the LAI facility on April 2009 for EPA Region 2 under the Remedial Action Contract (RAC) 2 Contract No. 68-W-98-210, Work Assignment No. 173-RDRD-02PF. The goal of this design was to maintain hydraulic plume control of the source area by extracting and treating contaminated groundwater and to treat the area with the highest TCE concentrations (greater than 1 milligram per liter [mg/L]) with ISCO to reduce contaminant mass in groundwater.

In May 2009, CDM was tasked by EPA to perform the Remedial Action (RA) for the components specified in CDM's 100% RD under the Region 8 RAC 2 Contract No EP-W-05-049, Work Assignment numbers 234-RARA-02NS (American Recovery and Reinvestment Act [ARRA] funded), 238-RARA-02NS (non-ARRA funded), and 338-RARA-02NS (non-ARRA funded). Construction and ISCO treatment activities were performed from December 2009 to September 2010. The groundwater treatment facility (GWTF) startup testing was performed in September 2010 and operation and maintenance (O&M) activities for the on-site groundwater treatment system remains on-going as part of the one-year O&M period. The construction and start-up activities are discussed in subsequent sections of this report.

The design and installation of the downgradient groundwater treatment system near Old Mill Pond is being conducted by EPA Region 2 Removal Action Branch. In addition, the soil vapor intrusion investigation and mitigation for structures located within the plume area was completed under EPA's Environmental Response Team (ERT) Response, Engineering, and Analytical Contract (REAC).

Soil Remedy:

The ROD soil remedy called for excavation, transport and disposal of on-site LAI facility surface soils exhibiting PCB concentrations greater than the Preliminary Remediation Goal (PRG) of 1 part per million (ppm) (the NYS Technical and Administrative Guidance Memorandum [TAGM] Soil Cleanup Objective) at an off-site regulated waste disposal facility. The ROD remedy included:

- Pre-design investigation

- Excavation of on-site LAI facility surface soils exceeding PRGs

- Post-excavation sampling to verify achievement of soil cleanup objectives

- Disposal of excavated soils at off-site facilities

- Backfilling of excavated areas with clean fill

- Institutional controls consisting of an environmental easement/restrictive covenant filed in the property records of Suffolk County that will limit the use of the active industrial area to commercial and/or industrial uses only

- Evaluation of additional catch basins and removal of sediments

- Evaluation of approximately 30 electrical transformers for leakage of PCBs content and RAs to address these transformers if cleanup objectives are exceeded.

This report included the remediation of the former generator area, designated as Area of Concern (AOC) 2. Soil excavation for PCBs in AOC 2 was performed by the property owner. Post-excavation samples were collected in 2010 by EPA's Emergency Response and Removal Section (ERRS) from the bottom of the excavation. The sample results indicated the presence of PCBs in some areas of the excavation at concentrations greater than 1 ppm. CDM was tasked by EPA to investigate, excavate and dispose of the remaining PCB-contaminated soils under the Region 8 RAC 2 Contract No EP-W-05-049, Work Assignment No. 338-RARA-02NS. The excavation and disposal of the remaining PCB contaminated soil was completed by CDM on March 4, 2011 and is described in further sections of this report.

The catch basin evaluation/sediment removal and the evaluation of electrical transformers was performed by others.

1.4 Purpose of this Report

The purpose of this RA Report is to document the results of the LAI facility soil and groundwater remedies as funded by EPA under the RAC 2 contract. The report was prepared in accordance with EPA's *Close Out Procedures for National Priorities List Sites*, Office of Solid Waste and Emergency Response (OSWER) Directive 9320.2-22, dated May 2011, and includes the following information:

- **Introduction (Section 1)** - Includes a brief description of the site environmental setting and historical operations, site investigations and remedial activities
- **Background (Section 2)** - Summarizes the site groundwater contaminants, the ROD requirements, including significant differences to the ROD, and the remedial design
- **Construction Activities (Section 3)** - Provides a step-by-step summary of activities undertaken to construct and implement the RA
- **Chronology of Events (Section 4)** - Provides a tabular summary of significant project events
- **Performance Standards and Construction Quality Control (Section 5)** - Describes the overall performance of the technology in comparison to the cleanup goals, and discusses the construction quality control (QC) implemented during the RA
- **Final Inspection and Certifications (Section 6)** - Summarizes the RA inspections
- **Operation and Maintenance Activities (Section 7)** - Summarizes the post-construction O&M activities, including routine O&M, monitoring and reporting
- **Summary of Project Costs (Section 8)** - Provides a summary of the ROD, RD and actual RA project costs, and discusses any significant cost differences to the ROD/RD estimates
- **Observations and Lessons Learned (Section 9)** - Provides a description of observations and lessons learned for site construction activities
- **Contact Information (Section 10)** - Provides the contact information for the site, including regulatory agencies and the RD/RA contractors
- **References (Section 11)** - Provides a list of documents relevant to the site RA activities

Section 2
Background

2.1 Site-Specific Geology and Hydrogeology

The following section summarizes the site-specific geology and hydrogeology in order to provide a framework for the RA at the LAI facility. Complete discussion of the regional and site-specific geology and hydrogeology are presented in the RI Report and the LAI Pre-design Investigation Technical Memorandum.

Geology

Three aquifers are present beneath the LAI site: the Upper Glacial aquifer, the Magothy aquifer and the Lloyd sand member of the Raritan Formation (Koszalka 1984). The Magothy and underlying Lloyd sand aquifers are separated by the Raritan Clay member of the Raritan Formation. Consequently, water is interchanged much more readily between the Upper Glacial and Magothy aquifers than between the Magothy and Lloyd aquifers. The presence of the virtually impermeable Raritan Clay, directly underlying the Magothy aquifer, is the lower boundary of the upper flow system. Investigations at the site have only focused on the Upper Glacial and the top of the Magothy aquifers.

Magothy aquifer: Based on the RI, the top of the Magothy formation, which underlies the Upper Glacial Aquifer, was observed at approximately 100 feet below mean sea level (msl).

The Magothy aquifer consists of Upper Cretaceous Magothy deposits to the top of the confining clay unit of the Raritan Formation. The aquifer has a fluvio-deltaic depositional origin, is wedge shaped, and thickens progressively towards the south and southeast. The Magothy deposits were unconformably overlain by a veneer of Pliocene and Pleistocene deposits, chiefly of glacial origin (Franke and McClymonds 1972). Deposition of the glacial deposits left the top of the Magothy aquifer irregular and marked by discontinuous clay bodies within the deposits of the Pliocene-Pleistocene succession (Upper Glacial aquifer), Smithtown Clay Unit, or Magothy formation. This upper portion of the Magothy will be referred to as the reworked Magothy.

Upper Glacial Aquifer: The LAI facility itself is directly underlain by the Pleistocene-age Harbor Hill moraine, a remnant of the most recent glaciation. The moraine and Upper Glacial Aquifer deposits are up to 300 feet thick below the LAI Facility, and are composed primarily of sand and gravel with occasional lenses of silty sand and silt. The moraine deposits thin to the south and to the north.

At the LAI facility, the moraine deposits are underlain by well graded fine to medium grained sands and silts with occasional layers of silt and clay or sand and gravel. The clay rich layers observed in this zone were thin and discontinuous, likely derived from Magothy formation materials (or Smithtown Clays) reworked and then re-deposited during the creation of the local moraine. This localized glacial activity at the site has reworked the upper layers of the Magothy formation and left very complex heterogeneous glacial deposits at the base of the Upper Glacial aquifer, this material is not differentiated from the reworked Magothy material described above.

Hydrogeology

Groundwater Flow: Generally, the aquifer is under unconfined conditions and the upper limit of the aquifer is the water table. Synoptic groundwater elevation data collected in June 2008 was used to prepare a potentiometric surface map for the Upper Glacial aquifer at the LAI site are shown on Figure 2-1. The potentiometric surface map shows that groundwater flow, in the vicinity of the LAI facility, is to the north towards Port Jefferson Harbor.

In June 2008, the depth to the water table was approximately 185 feet at the site and decreased towards Port Jefferson Harbor. There is a downward gradient observed under the moraine, but on moving away from the moraine and towards Port Jefferson Harbor, there is a significant upward hydrologic gradient driving groundwater towards the ground surface (at MPW-09 the Upper Glacial Aquifer is under artesian conditions). These observations are consistent with previous studies.

Estimates of Hydraulic Conductivity and Transmissivity: During the RI/FS, CDM performed a series of packer tests to estimate hydraulic conductivity and transmissivity. Using several different analytical methods, hydraulic conductivity values were calculated to range from less than 0.02 foot/day to 89 feet/day, and transmissivity estimates to range from 12 to 22,200 gallons per day/foot (or 2 to 3,000 square feet [SF]/day). Lithologic logs indicate that the saturated portion of the Upper Glacial and Magothy aquifers at the site, where the multiport wells were screened, generally consisted of a layer of fine to medium sand overlying a silty sand layer.

As part of the RD investigation, aquifer testing was performed in a test well in the vicinity of the proposed extraction wells. A step-drawdown test and a 48-hour constant rate test were conducted, and recovery measurements were collected during the tests in order to characterize the hydraulic properties of the aquifer in this area. Using several different analytical methods hydraulic conductivity estimates ranged from 31 to 63 feet/day and transmissivity estimates ranged from 4,400 to 8,800 SF/day.

The wide range of hydraulic conductivity values is not unexpected considering the heterogeneity of the glacially deposited material encountered in the borings. The results of the packer testing only represent the hydraulic properties of the aquifer material that immediately surrounds the well screen. The results of the 48-hour constant rate test represent the mean hydraulic properties of the material between the pumping well and the piezometers used to measure drawdown. Therefore, the estimates derived from the 48-hour constant rate test are considered to be more representative of the bulk hydraulic properties of the unit in that area.

2.2 Summary of Site-wide Groundwater Contamination

Historically, PCE and TCE were detected in multiple levels of the majority of multiport monitoring wells, with TCE detected most frequently and at the highest concentrations in shallow groundwater samples collected directly below the facility.

The TCE plume, based on the June 2008 groundwater sampling results, is shown on Figure 2-1. Figure 2-2 shows a cross-section of the plume. The TCE plume emanates from the vicinity of MPW-02 and MPW-07, and migrates downgradient to the northwest. In the vicinity of multiport well MPW-10, approximately 1,000 feet from the western boundary of the LAI facility, groundwater flow and the TCE plume bend to the north toward Port Jefferson Harbor. There is an upward hydraulic gradient near MPW-09, indicating that contaminated groundwater is moving upward as it moves northward in the vicinity of this well. The highest onsite TCE groundwater concentrations were at MPW-07 at a depth of approximately 200 to 210 feet below ground surface (bgs) with concentrations of approximately 1,100 micrograms per liter (µg/L).

No CVOCs, including PCE, TCE, DCEs, and vinyl chloride, were detected in residential and public supply wells.

2.3 Summary of Soil Contamination

No soil samples within the LAI facility were found to have chlorinated solvent concentrations greater than the NYS TAGM #4046 soil cleanup objectives. However, residual soil contamination might still exist in low permeability zones serving as sources for groundwater contamination based on the following considerations:

- High TCE concentrations in groundwater were detected at the site more than 20 years after releases of the contaminants had stopped.
- Only a limited number of deep borings/monitoring wells have been advanced at the site, as deep drilling and sampling is difficult and costly. Residual soil contamination may exist in sporadic, thin layers and generally requires unique investigative tools and very closely spaced soil borings for detection.

As discussed previously in Section 1.3, the RI soil sampling results identified PCB concentrations greater than the cleanup criteria of 1 ppm from various on-site areas and the former generator area, which has been designated as AOC 2. Partial soil excavation for PCBs in AOC 2 was performed by the property owner to varying depths ranging from approximately 6 to 24 inches. Post-excavation samples were collected in 2010 by EPA's ERRS from the bottom of the excavation. The sample results indicated the presence of PCBs in areas of the excavation at concentrations greater than the ROD-specified clean-up criteria of 1 ppm. The ERRS post-excavation soil results are summarized in CDM's PCB Soil Excavation Technical Memorandum, which is included in Appendix A. Subsequent PCB soil investigation activities performed by CDM are described in CDM's PCB Soil Excavation Technical Memorandum and summarized in Section 3.5 of this report.

2.4 Summary of ROD Requirements

The Site ROD was signed in September 2006, and the selected ROD remedy addresses soil and groundwater contamination at the site. Although surface water and sediments at Old Mill Pond and Old Mill Creek have been contaminated via discharge of groundwater to these surface water bodies, it is expected that by remediating the groundwater source of contamination, the contamination levels in the surface water and sediments will also be reduced. In addition, a downgradient groundwater extraction and treatment facility will be installed in the vicinity of Old Mill Pond to capture volatile organic compound (VOC)-contaminated groundwater and to prevent contaminant migration towards Port Jefferson Harbor.

2.4.1 Groundwater

The purpose of the selected groundwater remedy is to comply with the ROD's Remedial Action Objectives (RAOs), which are stated below:

- Prevent or minimize potential, current, and future human exposures including inhalation, ingestion and dermal contact with VOC-contaminated groundwater
- Minimize the potential for offsite migration of VOC-contaminated groundwater
- Restore groundwater to levels that meet NYS Groundwater and Drinking Water Quality Standards within a reasonable time frame - the NYS Groundwater and Drinking Water Quality Standards that are currently exceeded at the site are shown in Table 2-1
- Prevent or minimize VOC-contaminated groundwater from discharging into Port Jefferson Harbor

The ROD requirements that are addressed by this report are summarized below:

- Construction and operation of a groundwater extraction and treatment system at the LAI facility with discharge of treated water to groundwater at the southeast corner of the facility
- Long-term groundwater monitoring in the vicinity of the LAI facility treatment system
- Application of ISCO as an initial enhancement within the area of high TCE groundwater concentrations at the facility

The ROD specifies that the groundwater treatment system consist of the following components:

- Influent flow equalization
- Green sand filtration or bag filtration
- Air stripping
- Vapor phase carbon adsorption (if needed)
- Permanganate impregnated zeolite adsorption (optional)

Based upon the results of the pre-design investigation and subsequent design analyses, a number of modifications were proposed to the ROD's conceptual design. These modifications were approved by EPA as part of the Final RD and are summarized below:

- Effluent injection wells were selected as an alternative to an effluent recharge basin at the southeast corner of the site for discharging treated groundwater due to a low permeability layer that was encountered during the recharge basin field investigation activities. Due to the size of the basin that would be required, it was determined that effluent injection wells would be more cost effective.
- Influent flow equalization as part of the groundwater treatment system was eliminated since significant fluctuations in groundwater flow rates and concentrations are not anticipated.
- It was determined that green sand filtration is not required to meet the State Pollutant Discharge Elimination System (SPDES) permit equivalent discharge criteria.
- Additional offgas treatment via permanganate impregnated zeolite adsorption was not required as determined by air modeling performed using the NYSDEC Air Guide 1 program.

The design and implementation of the downgradient groundwater treatment system near Old Mill Pond is currently being conducted by EPA Region 2 ERRS Removal Action Branch. The soil vapor intrusion investigation and mitigation for structures located within the plume area has been completed under EPA's ERT REAC.

2.4.2 Soil

The purpose of the selected soil remedy is to comply with the ROD's RAOs, which are stated below:

- Prevent or minimize human exposure with soils having PCB contaminant concentrations in excess of soil cleanup objective
- Manage ecological risks

The ROD requirements that are addressed by this report include:

- Pre-design investigation
- Excavation of LAI facility surface soils exceeding the PRGs of 1 ppm
- Post remediation sampling to verify achievement of PRGs
- Disposal of excavated soils in accordance with applicable regulatory requirements at off-site facilities
- Backfilling of excavated areas with clean fill

Based upon the results of CDM's pre-design investigation and discussion with EPA and NYSDEC, it was agreed that surface soils to two feet bgs would be remediated to the ROD-specified clean-up criteria of 1 ppm and subsurface soils (greater than two feet bgs) would be remediated to the NYSDEC PCB clean-up criteria of 10 ppm for commercial sites, per 6 New York Codes, Rules, and Regulations (NYCRR) Part 375-6.

2.5 Remedial Design Summary

2.5.1 Groundwater

As part of the RD for the LAI site, performance-based design criteria were developed for the groundwater treatment system and ISCO treatment. This approach excluded a limited number of design elements, such as piezometers and monitoring wells, for which prescriptive design criteria were provided. Design criteria and requirements were developed based upon industry standards and technical considerations that are specific to the site groundwater treatment system construction, start-up, and O&M, and application of the ISCO treatment.

The following are examples of performance-based requirements for the groundwater treatment system included in the RA Subcontract Specifications:

- Extraction well and influent flow rates
- Extraction well performance requirements
- Groundwater effluent and offgas discharge criteria
- Minimum treatment process requirements
- Minimum unit process design and sizing requirements
- Minimum process instrumentation and control requirements
- Minimum construction and/or operation standards for equipment and materials
- Minimum building/enclosure construction requirements
- Construction quality assurance (QA)/QC testing requirements
- Initial startup testing requirements to demonstrate treatment system performance based upon field data and measurements
- Minimum monitoring and reporting requirements for facility O&M
- Minimum percent uptime requirements for system operation

The following are examples of performance based-requirements for the ISCO treatment:

- Minimum ISCO groundwater TCE contaminant reduction requirements
- ISCO sampling, monitoring, and reporting requirements

A baseline configuration was developed for the groundwater treatment system and the ISCO treatment to establish construction standards for bids submitted by RA Subcontractors, and as a basis for construction and O&M cost estimates. The RA Subcontractors had the option to submit bids for the baseline systems or for alternate treatment systems that conform to the performance-based specifications and philosophy of the Subcontract documents.

This subcontracting approach allowed for competitive bidding among a broader spectrum of RA Subcontractors, since performance requirements can be achieved using multiple types and/or combinations of conventional treatment equipment. One RA Subcontract document was prepared for the GWTF and ISCO treatment, due to the potential for chemical oxidant, oxidant bi-products, and mobilized metals from to ISCO injection to impact the groundwater extraction wells.

The baseline design configurations are described below:

- **Groundwater Extraction and Treatment System** - The basis of design included construction of a groundwater extraction and treatment system on the LAI property. The goal of the system is to extract contaminated groundwater to provide hydraulic control of the source area and treat the groundwater for discharge to an upgradient location on the site in accordance with New York State SPDES requirements. The baseline design included air stripping as the primary treatment method for treating VOCs and granular activated carbon (GAC) units for off-gas treatment. In addition, the baseline system included two extraction wells, an effluent discharge pump, two bag filters, five effluent injection wells, system process controls and instrumentation, and a pre-engineered metal building to house the equipment.

  Based on the groundwater modeling performed by CDM during the design, the facility was designed at average and peak design flow rates of 75 and 100 gallons per minute (gpm) for each extraction well, respectively, for a total average and peak design flow of 150 and 200 gpm, respectively. Each effluent injection was designed to accommodate the peak design flow rate of 200 gpm because injection wells will lose capacity over time even after re-development and maintenance. The influent design total VOC concentration was approximately 1,200 µg/L, consisting primarily of TCE.

- **ISCO Treatment** - The basis of design included chemical oxidant injections to the area with high TCE groundwater concentrations within the LAI property. ISCO treatment at the site involved the injection of potassium permanganate into the subsurface to destroy organic contaminants in soil and groundwater. The reaction of potassium permanganate with organic compounds and contaminants produces manganese dioxide and either carbon dioxide or intermediate less toxic compounds. The overall objective of the ISCO treatment was to reduce TCE mass in the groundwater, thereby accelerating the time required to remediate the groundwater and shortening the operation time of the GWTF.

  The baseline design included 13 injection wells or temporary injection points and performance monitoring via five monitoring wells. The baseline design included application of ISCO treatment at the LAI facility within the area where TCE groundwater concentrations exceeded 1,000 µg/L. The "ISCO Treatment Area" was approximately 120 feet by 170 feet and included the area beneath Building 10. The target depth was approximately 200 to 220 feet bgs, which was the depth exhibiting the greatest TCE concentrations. Based on the results of the bench-scale testing performed by CDM, the baseline design estimated that approximately 83,000 kilograms (kg) of potassium permanganate would be required to treat the ISCO Treatment Area.

Due to high vapor concentrations observed in Building G during previous investigations, indicating a possible source below the building, the design specified installation of the borings and groundwater characterization under the building. This area is referred to as "ISCO Study Area". ISCO treatment of the ISCO Study Area would be required if the TCE concentrations observed during the groundwater characterization exceeded the criteria of 1,000 µg/L for TCE.

2.5.2 Soil

As described in Section 2.4.2, for the AOC2 former generator area, it was determined that surface soils to two feet bgs would be remediated to the ROD-specified clean-up criteria of 1 ppm and that subsurface soils (greater than two feet bgs) would be remediated to the NYSDEC PCB clean-up criteria for commercial sites of 10 ppm.

Based on field screening data and analytical data collected during CDM's PCB field investigation activities, excavation limits were established to remove soils exceeding the clean-up criteria. The design included deeper excavation depths in the vicinity of the source area and ranged from 4.5 to 6.5 feet bgs. The deep excavation had an area of approximately 180 square yards (SY) and a volume of 220 cubic yards (CY). The design included excavation of the remainder of the AOC2 area soils to 2 feet bgs with the exception of a small area (approximately 20 SY) in the north corner of the AOC2 area that had been already remediated to 2 feet bgs during the previous removal event performed by the owner. The 2-foot excavation had an area of approximately 270 SY and a volume of 120 CY. Additional details are included in CDM's PCB Soil Excavation Technical Memorandum, which is included in Appendix A. A figure showing the excavation areas and depths is included as Figure 6 of the Memorandum.

Section 3
Construction Activities

EPA funded the LAI groundwater RA under the EPA Region 8 RAC 2 contract in September 2006 as described in Section 1.3. CDM was authorized by EPA to perform associated RA tasks under the Region 2 RAC 2 Contract No. EW-W-09-002, Work Assignment 034-RARA-02PF, which included the remainder of remedy construction and O&M for one year.

CDM's procurement strategy for the LAI site integrated the groundwater treatment system and ISCO designs to permit the issuance of a single solicitation for RA services and the selection of one prime RA Subcontractor. This approach capitalized on economies of scale through administrative efficiencies and cost effectiveness. RA construction and O&M work was awarded to Arrowhead Contracting (CDM's RA Subcontractor), a qualified, small disadvantaged business.

This section summarizes the scope and step-by-step sequence of RA construction activities completed at the site. On-site construction activities were initiated in December 2009.

3.1 Permitting and Property Access

The following permit equivalent applications were prepared and approved:

- NYSDEC SPDES permit equivalent for discharge of the GWTF effluent to groundwater
- NYSDEC Air permit equivalent for discharge of the air-stripper offgas to the atmosphere
- Long Island Well permit equivalents for installation of all wells
- Suffolk County Sewage Disposal permit equivalent for the facility septic tank and leaching pool
- Suffolk County Water permit equivalent for potable water service
- New York State Department of Transportation (NYSDOT) permit equivalent for work performed at the NYSDOT Right-of-Way (ROW)

Copies of the permit equivalents are included in Appendix B. It was determined that building and land use permit equivalents were not required from the Town of Brookhaven because the site is a Superfund project.

Property access agreements were obtained during previous phases of the project. A property contact list is provided in Table 3-1. Copies of the access agreements are included in Appendix C.

3.2 Site Preparation

The following site preparation activities were conducted during the early stage of site construction:

- The existing perimeter chain-link fence for the LAI facility was inspected, and holes that were identified were repaired for security measures. Temporary construction fencing was installed as required.
- The RA Subcontractor worked directly with local regulatory agencies and utility owners to identify underground utilities. Due to the significant underground utilities that exist at the site, a geophysical survey was also performed for utility location using electro-magnetic and ground penetrating radar.
- Temporary construction facilities were put into place including site trailers, storage facilities, construction equipment and a decontamination pad.
- Video-documentation of existing site conditions was performed, included in Appendix D.
- A New York State licensed land surveyor identified the boring locations and set benchmarks for future survey work.
- Necessary clearing, grubbing, and site grading and compaction were performed.
- Soil erosion and sediment control measures were installed including installation of silt fencing along the steep sloped area by the GWTF.
- Temporary site access roads were installed using recycled crushed aggregate (RCA).
- The PCB excavation area (west of Building 10) that was previously excavated by the site owner was backfilled with RCA for drilling equipment access to perform well installation.

3.3 Groundwater Treatment System

The RA includes construction of a groundwater treatment system on the southwest corner of the LAI property as shown on Figure 3-1. The primary equipment for the system is shown on Figures 3-2 and 3-3 and summarized in Table 3-2. The As-built Drawings are included in Appendix E. Select as-built drawings have been included in this report as follows:

- **Figure 3-1** - Groundwater Treatment Plant Project Site Plan
- **Figure 3-2** - Groundwater Treatment Plant Building Plan
- **Figure 3-3** - Groundwater Treatment Plant Treatment Equipment Mechanical Plan
- **Figure 3-4** - Groundwater Treatment Plant Process and Instrumentation Diagram

3.3.1 Well Installation

Two extraction wells, five effluent injection wells, and seven piezometers were installed as part of the groundwater treatment system construction. Well construction diagrams and boring logs are included in Appendix F. Well construction details are summarized below.

3.3.1.1 Groundwater Extraction Wells

Two groundwater extraction wells (EW-01 and EW-02) were installed at the west property boundary of the LAI Facility, in the vicinity of MPW-02. The locations of the wells are shown on Figure 3-1. The wells were installed using mud rotary drilling method. A well construction summary is provided in Table 3-3.

A test boring was performed in the vicinity of each extraction well (TB-01 and TB-02) to provide lithologic data for determining the hydraulic capacity of the soils at the well locations and to determine if there are any lower permeable lenses that would impact the screened interval of each well. Split spoon samples were collected every 10 feet from ground surface to five feet above the top of the target well screen interval (180 to 240 feet bgs) and then continuously to a depth of approximately 260 feet bgs. Twenty-six samples for grain size analysis were collected throughout the target screen interval from EW-01. Gamma logging was also performed over the length of each borehole. Each extraction well was designed to have a 10-inch stainless steel casing and 0.025 vee-wire stainless steel slotted screen. The design for extraction well EW-01 consisted of casing down to 182 feet bgs, slotted screen from 182 to 222 feet bgs, a screen blank (due to an observed impermeable layer) from 222 to 238 feet bgs, slotted screen from 238 to 248 feet bgs, and a 2-foot sump from 248 to 250 feet bgs, for a total screened interval of 50 feet. EW-02 was designed with casing down to 182 feet bgs, slotted screen from 182 to 214 feet bgs, a screen blank from 214 to 229 feet bgs (due to an observed impermeable layer), slotted screen from 229 to 240 feet bgs, and a 10-foot sump from 240 to 250 feet bgs, for a total screened interval of 42 feet. A #1 Filpro gravel pack was installed around the well screen and extends five feet above the top of the screen. A two-foot #00 sand seal was placed above the gravel pack and cement bentonite grout was placed above the sand seal to groundwater surface. Plumbness and alignment testing was performed at the completion of each well. The extraction well test borings, grain size analyses, well design/construction and plumbness testing results are included in Appendix F.

Each extraction well is equipped with a Grundfos Model 85S100-9, variable-speed submersible pump capable of producing a yield of 100 gpm. The extraction well pumps were placed within the screen blank interval at each well. The wells are equipped with transducers within a sounding tube to record continuous water level measurement to provide alarms for fault conditions and control the speed for the pump.

Three-inch galvanized steel pipe is used to convey groundwater from the pump to the top of the well head at each extraction well. Groundwater is transported from the extraction well to the GWTF through individual high density polyethylene (HDPE) influent headers.

The well heads for EW-01 and EW-02 are enclosed in insulated water tight vaults. The vaults are supported on a layer of gravel and have a locking vault door flush with the ground surface. The extraction well vaults also include a pressure indicator, sample port, and isolation valve. The vaults and vault doors are designed for an H-20 load rating.

EW-01 and EW-02 were developed to remove drilling fluids, solids, or other particulates that may have been introduced into the formation or deposited on the boring walls during drilling and installation activities in order to obtain maximum specific capacity. Development was performed for approximately 10 hours at each well, until turbidity, pH, temperature, conductivity, and dissolved oxygen stabilized (within 10 percent for successive measurements) and the water was clear. A water sample was collected from each well at the end of well development and analyzed for sand content. The results meet the specification requirements. The results are included in Appendix F. Water generated during well development was either disposed offsite or treated by a temporary treatment system as described in Section 3.6.

Upon completion of well construction, drawdown testing was performed to determine well productivity. Baseline yield and specific capacity were established by performing step-drawdown tests at EW-01 and EW-02.

The purpose of the step-drawdown tests were to ensure that the wells have the capacity to handle the designed flow rate and confirm that the wells are properly installed. The step-drawdown test consisted of four steps, each pumping at a higher rate than the previous, with each step lasting two hours. The pumping rates for each step were 0.5, 0.75, 1 and 1.25 times the peak design flow rate (50 gpm, 75 gpm, 100 gpm, and 125 gpm), respectively. Recovery between steps was not allowed. Water generated during step testing was treated by a temporary onsite treatment system in accordance with the Site's SPDES and air permit equivalents as described in Section 3.6. Based on the results of the drawdown testing, it was determined that the capacity of EW-01 and EW-02 exceed the required design capacity of 100 gpm per well. Step drawdown testing results are included in Appendix F.

3.3.1.2 Effluent Injection Wells

Five effluent injection wells (IW-01 to IW-05) were installed approximately 1,000 feet southeast of the GWTF within the LAI property boundary and east of the NYSDOT ROW using reverse recirculation drilling. The locations of the wells are shown on Figure 3-1, and a well construction summary is provided in Table 3-3.

One test boring (TB-03) was performed at the effluent injection well field to provide lithologic data for determining the hydraulic capacity of the soils and to determine if there are any lower permeable lenses that would impact the well capacity. Split spoon samples were collected every 10 feet from ground surface to approximately the top of the target well screen interval (218 feet bgs) and then continuously to a depth of approximately 295 feet bgs. Twenty-nine samples for grain size analysis were collected throughout the target screen interval. Gamma logging was also performed over the length of the borehole. The injection wells were originally proposed to be installed from 221 to 286 feet bgs. However, because a silty-clay layer was encountered at approximately 265 feet bgs, the top of the screens were moved to the top of the water table at 182 feet bgs while maintaining the specified 65 foot screened interval above the silty-clay unit.

Each effluent well was installed with a 6-inch stainless steel casing and 65 feet of 0.025 vee-wire stainless steel slotted screen. A 10-foot blank sump was installed below the screen for a total depth of 258 feet bgs. A #1 Filpro gravel pack was installed around the well screen and extends 5 feet above the top of the screen. A two foot #00 sand seal was placed above the gravel pack and cement bentonite grout was placed above the sand seal to groundwater surface. The injection well test boring, grain size analyses and well design/construction are included in Appendix F.

HDPE liners were installed in each injection well recirculation pit to eliminate the potential for downward migration of any remaining contaminants from surface soil deeper into the vadose zone through infiltration of water from an unlined pit. Due to debris found at the site, test pits were performed at the injection wells prior to well installation to confirm the soils were clean because significant excavations were required for drilling mud pits. During test pit excavation, green discolored soil was encountered. The green soil was sampled for VOCs, semi-VOCs, pesticides, PCBs, metals, toxicity characteristic leaching procedure (TCLP) and total organic carbon (TOC). The results indicated that the soils were non-hazardous. The sample results are included in Appendix G. It is likely that the green soils are a manufacturing process precipitate that was buried at the site. The excavated material was disposed off site. No further characterization was performed.

Each well uses schedule 80 polyvinyl chloride (PVC) pipe to convey the effluent water to a point below the water table. The pipes were installed to extend to approximately 200 feet bgs. A level transducer within a 1-inch PVC sounding tube was installed in each injection well to continuously records the water level and indicate potential fouling of the wells.

The well heads for the injection wells are each enclosed in a water tight vault. Each well vault is equipped with an air release valve. The injection well vaults are supported on a layer of gravel and have a locking vault door flush with the ground surface. The vaults and vault doors are designed for a H-20 load rating.

The injection wells were developed to remove drilling fluids, solids, or other particulates that may have been introduced into the formation or deposited on the boring walls during drilling and installation activities, and to obtain maximum injection rate. Development was performed for approximately 10 hours at each well, until turbidity, pH, temperature, conductivity, and dissolved oxygen stabilized (within 10 percent for successive measurements) and the water was clear. Water generated during well development was either disposed offsite or treated by a temporary treatment system as described in Section 3.6.

Baseline yield and specific capacity were established by performing step-drawdown tests at IW-01 through IW-05. The step-drawdown test consisted of 3 steps, each pumping at a higher rate than the previous, with each step lasting 2 hours. The pumping rates for each step were 100 gpm, 200 gpm and 300 gpm, respectively. Recovery between steps was not allowed. Water generated during step testing was discharged through a temporary onsite treatment system in accordance with the site's SPDES permit equivalent as discussed in Section 3.4, except for water generated during development and step testing of IW-04 because the temporary treatment system was not in place yet. Based on the results of the drawdown testing, it was determined that the capacity of each effluent injection well exceeds 300 gpm. Well development results and drawdown testing data are included in Appendix F.

3.3.1.3 Piezometers

Seven flush mount piezometers PZ-01 to PZ-07 were installed in the vicinity of the LAI facility. The piezometers are used to collect manual water level measurements during facility operations to evaluate whether the extraction wells are maintaining required capture zone. The piezometers were installed using the mud rotary drilling method. The piezometer locations are shown on Figure 3-1.

The piezometers were installed with 2-inch Schedule 40 PVC casing with 2-inch 0.010-inch-slot stainless steel screens that are 10 feet in length. The piezometers were screened from approximately 200 to 210 feet bgs targeting the interval of approximately 30 to 20 feet amsl. A #1 Filpro gravel pack was installed around the well screen ranging from approximately two to five feet above the top of the screen. A two to three-foot #00 sand seal was placed above the gravel pack and cement bentonite grout was placed above the sand seal to groundwater surface.

The piezometers were developed to remove drilling fluids, solids, or other particulates that may impact the wells connectivity with the aquifer. A summary of the piezometer well construction is included in Table 3-3. Boring logs, additional construction details and well development forms are included in Appendix F.

3.3.2 Site Work

3.3.2.1 Granular Materials

The following granular materials were used during GWTF site work activities:

- **RCA** - Used for the temporary and permanent access roads and parking area. RCA was also used for backfill of the AOC2 soil excavation. The RCA material was imported from offsite. The gradation and chemical analyses performed to ensure that the imported material meets the NYSDEC TAGM 4046 recommended soil cleanup objectives is included in Appendix H.

- **Common Fill** – Used for backfill of the pipe-trenches and site grading. All common fill material used was from the site so import of material was not required.

- **Pea Gravel** – Used underneath the GWTF foundation as part of the sub-slab ventilation system. The gradation of the gravel was inspected upon arrival to the site and accepted.

- **Rip Rap** – Used to stabilize the significant slopes on the west and south sides of the GWTF.

- **Topsoil** – Used for establishment of vegetation in disturbed areas. Topsoil was re-used from the site, and was therefore not required to be imported.

3.3.2.2 Yard Piping

Yard piping and trenching for the GWTF consisted of the following. The locations of the yard piping are shown on Figure 3-1.

- Two 3-inch HDPE groundwater influent headers from the extraction well to the GWTF with associated power and control wiring

- Five 4-inch HDPE groundwater effluent lines from the GWTF to the effluent injection well field with associated control wiring

- One 2-inch polyethylene potable water service from the property boundary to the GWTF

- Primary electrical service and telephone service from the property boundary to the GWTF

Asphalt demolition was required for trenching that occurred at the northwest corner of the site. The potable water service and electrical/telephone service was installed in parallel with a minimum 5-foot separation. Once the water and electrical/telephone service reached the extraction wells, the two groundwater influent lines were combined into the same trench as the potable water line.

Due to historical soil contamination at the site, a soil investigation was performed along the trench paths to determine if the excavated material was suitable for backfilling the trench. Soil borings were installed approximately every 50 feet along the trenches using a Geoprobe. A composite sample was collected from each boring from a depth of 0 to 6 feet bgs and each sample was analyzed for lead and PCBs. The analytical sample results and a figure summarizing the results are included in Appendix G. All lead and PCB sample results were below the EPA residential cleanup criteria of 400 micrograms per kilogram (µg/kg) and 1,000 µg/kg, respectively. Trenches were therefore backfilled using the excavated material with the exception of the trenching that runs through the NYSDOT ROW as described later in this section.

Water lines were buried a minimum of 4.5 feet deep except for piping within the NYSDOT ROW where 10 feet of cover was placed above the top of pipe to accommodate the future construction of a bike path. Electric and control lines were buried a minimum of 2.5 feet deep and 10 feet below grade within the NYSDOT ROW. Warning tape was installed in all trenches. Compaction in the pipe trench was performed in 1-foot lifts using a vibratory foot compactor. Fill material was compacted to a minimum of 90 percent of its maximum dry density (per American Society of Testing and Materials [ASTM] D1556 Standard Proctor), which the exception of the first 360 feet of the groundwater effluent trench, which was backfilled and compacted without testing. However, this trench is located in a landscaped area and the procedure used was the same as other areas that were tested and met the required criteria. A summary of the compaction testing is included in Section 5.2.2. One set of clean-outs was installed on the influent line and three sets of clean-outs were installed on the effluent line to facilitate maintenance during facility operations.

During excavation of the effluent piping trench, wood and metal debris was encountered within the NYSDOT ROW. The material is likely from a former building located at the site that was destroyed by fire. It was determined that the material was not suitable for backfilling and the material was disposed of offsite. The TLCP sample results failed the non-hazardous disposal criteria for lead, and the soils were therefore disposed of as hazardous material. EnviRite of Pennsylvania transported 440.47 tons of lead-contaminated hazardous soil for disposal at their EPA approved facility. This area of trench was backfilled with extra fill material that was generated during site re-grading.

3.3.2.3 Building Foundation

Site grading was performed as required for construction of the GWTF building foundation. Prior to the site preparation, two geotechnical borings were installed and associated testing was performed within the footprint of the building to confirm the bearing capacity of the soils. The results of the geotechnical investigation are included in Appendix I. The subgrade below the footers was compacted to 95 percent of its maximum dry density (per ASTM D1556 Standard Proctor). The compaction tests for the building foundation are summarized in Section 5.2.2. The area in between the footers was backfilled with flowable fill. Twelve inches of pea gravel was placed above the flowable fill as part of the vapor barrier and associated passive venting system to prevent VOC soil vapors from entering the building, and a 10 mil plastic vapor barrier was installed between the pea gravel and the foundation slab.

The 24-inch wide and 12-inch high foundation footers were installed to a depth of approximately four feet below grade directly on the compacted subgrade. The foundation walls are 12 inches thick and the thickness of the concrete slab ranges from 8 to 14 inches. Two inches of polystyrene insulation was placed along the interior of the foundation walls prior to backfilling.

3.3.2.4 Slope Stabilization

Due to the steep slopes on the west and south side of the GWTF, this area was stabilized with geotextile fabric, and approximately one foot of 4-inch rip-rap. The geotextile fabric was anchored at the top and bottom of the slope in accordance with the manufacturer’s instructions.

3.3.2.5 Sanitary Septic System and Leaching Field

The three borings used for assessing site soil conditions as part of the foundation design were also used for design of the sanitary septic system and leaching field to determine the permeability of the soils. The boring logs are shown on As-built Drawing C-08, which is included in Appendix E. During excavation for installation of sanitary system leaching pool, soils containing significant clay content were observed at the bottom of excavation, which was performed to 25 feet bgs. The clay-rich soils were excavated and the area around the leaching pool was backfilled with native sandy soils at the site. Additional details for the septic system and leaching pool are included in Section 3.3.5.

3.3.3 Treatment System Process Equipment

The treatment equipment was fabricated off-site at H2KTechnologies. The treatment facility equipment was delivered to the site on August 6, 2010. On-site fabrication included the installation of all system equipment at the treatment facility including mounting, piping and wiring of all system equipment and controls. Process piping in the facility was constructed of schedule 80 PVC, except for flexible hose that is used to connect the GAC units, as described in Section 3.3.3.2. Appropriate bracing and pipe supports were installed. Equipment, valves and pipes were labeled according to the design specifications.

3.3.3.1 Air Stripper Treatment System

Groundwater is pumped by the extraction well pumps via individual influent piping to the flow meters located within the GWTF building. After the flow meters, the flow is combined to a common header and discharged to the air stripper. The air stripper blower induces clean air flow upward through the trays, while the groundwater influent trickles downward through perforated trays by gravity. The trays serve to maximize the contact area between the air and water. The air stripper is rated for 250 gpm, and has 10 removable trays (5 layers of 2 trays) to facilitate routine O&M. Trays can be readily switched out for cleaning or replacement following scale accumulation. The 20 horse power (hp) centrifugal pressure blower capacity is 1,300 cubic feet per minute (cfm) at 46 inches of water column (wc), which includes suction of air through the air stripper and conveyance of air through two GAC vessels. The blower is piped in an induced-draft configuration. The VOC-rich air flow exits through the top of the air stripper while the treated water accumulates in the air stripper sump and then pumped using a discharge pump through the particulate filtration system and to the injection wells.

3.3.3.2 Off-gas Treatment System

The off-gas treatment system includes two vapor-phase units operated in series for removal of VOCs from the air stripper discharge. Each unit contains 3,000 pound (lb) GAC material. The GAC vessels are 6 feet in diameter and approximately 7 feet in height. When breakthrough occurs at the lead unit, it will be bypassed, changed out and brought back on line as the secondary unit in the series. The treated air effluent is discharged to the atmosphere through a stack with a height of approximately 19 feet. Based on estimates generated during the RD, it is anticipated that each units would become saturated with CVOCs and require change-out after approximately 90 days. However, the groundwater influent concentrations observed during the Initial Testing Program (ITP) are much lower than estimated during the RD so the units are expected to last much longer before change-out is required. The GACs are connected by flexible hose with quick connects to facilitate change-out of the carbon vessels.

3.3.3.3 Effluent Discharge System

The effluent discharge pump, which has a capacity of 200 gpm, transports treated water from the air-stripper sump through a particulate filtrations system prior to discharge through the effluent yard piping and to the effluent injection wells. The discharge pump is equipped with a VFD and the level controls installed in the air-stripper sump dictate the on/off status of the pump as well as the pump speed based on the height of water in the sump. The effluent is pumped through two bag filters to reduce the amount of fine particulates entering the injection wells, which can reduce the efficiency of the injection wells over time. Each bag filter unit includes a rigid, flow-through vessel that houses four disposable 10 micron fabric filters. The disposable filters are routinely changed out when they become filled with particulates as part of routine O&M. The facility effluent is transported to the injection well field by five individual 4-inch HDPE pipes.

3.3.4 Instrumentation and Power Supply

The groundwater treatment facility contains a 120 volts alternating current (VAC) main control panel that includes the following:

- A flat-screen display Operator Interface Terminal (OIT)
- A programmable logic controller (PLC) that records data/information from process instrumentation (e.g., instantaneous rate and totalized flow) and equipment, monitors the operational status of process equipment (e.g., on/off), performs limited changes in process operations (e.g., pumps on/off, system shutdown), and initiates communications (internal/external) to convey operational status information within the programmed constraints. The as-built Process and Instrumentation Diagram (P&ID) is included as Figure 3-4.

- An autodialer that executes PLC-initiated communications via annunciator and phone
- Capabilities to allow for remote operational status inquiries and programming changes
- Uninterruptible Power Supply (UPS) to provide power to the control panel during a power outage

The facility receives incoming power at 400 amperes (A), 480/277 VAC, 3 phase from Long Island Power Authority (LIPA) pad-mounted transformer located adjacent to the treatment plant. The electrical service feeds a current transformer cabinet and the main electrical disconnect switch mounted on the south side of the building. Power is first brought into the building through a 400A, 480/277 VAC, 3 phase distribution panel H1. This panel supplies power to the 400 A, 480 VAC, 3 phase motor control center (MCC) and a 25 kilovolt-ampere (KVA) transformer. The 25-KVA transformer provides 120/240 volt single phase power to a 100 A panelboard (P1) for building lighting, receptacles, exhaust fan and other building 120 or 240 loads. Panel P1 also provides 120 volt single-phase power to the control panel including the OIT, PLC and other equipment provided in the control panel. The control panel is equipped with an UPS which maintains power to the OIT, PLC and all input and output circuits for at least 30 minutes following a power outage.

Utility poles and electrical services were installed by LIPA. All on-site electrical connections were installed by a licensed electrician.

3.3.5 Groundwater Treatment Facility Building

The groundwater treatment system is housed in a pre-engineered metal building manufactured by American Buildings Company. The building is approximately 1,000 square feet in area. The concrete floor slab includes a 6 inch concrete berm along its perimeter providing approximately 2,500 gallons of secondary containment capacity with associated sump and sump pump. A vapor barrier and passive venting system was installed under the building as described in Section 3.3.2.3. The GWTF building exterior is secured by 8 foot high chain-link fence equipped with locking gates. The location of the building is shown on Figure 3-1.

The treatment building consists of a process room and an electrical control room. The process room contains the influent and effluent pipe entrances and treatment system equipment. The room is accessible from the building exterior by a 3-foot wide pedestrian door and two roll-up steel doors with one for primary access to the air-stripper (8 feet wide by 10 feet tall) and one for primary access to the vapor phase GAC units (14 feet wide by 9 feet tall). All three doors are insulated. The process room is equipped with louvers and a wall mounted exhaust fan to provide cross flow ventilation. The process room includes a geothermal heat pump for heating during normal operations. The heat pump also contains an internal electric heater to provide heat during system shutdowns as required. Interior lighting, electrical outlets, sink, and hose station are also included to facilitate routine maintenance activities.

The control room contains electrical and telephone service entrances, control panels, MCC and office furnishing. A heat pump air conditioner is included for operator comfort and to provide acceptable temperatures for the electrical and control equipment. The fully-enclosed electrical control room has an Americans with Disabilities Act (ADA) compliant bathroom facility. The bathroom facility is connected to an onsite sewage discharge system which consists of a 1,200 gallon septic tank and 10-foot diameter leaching pool.

Potable water is provided to the building via connection to the SCWA's public water supply. A water meter and reduced pressure zone (RPZ) device (with hot box) was installed at the property boundary in accordance with SCWA requirements.

The building has been designed in accordance with Occupational Safety and Health Administration (OSHA) requirements, and includes an eyewash station, a room vapor monitor (RVM), fire extinguisher, fire blanket, and first aid kit.

3.3.6 Green Remediation Practices

"Green Remediation" is the practice of considering all environmental effects of the implementation of a remedy and incorporating options to maximize the net environmental benefit of cleanup actions. During procurement of the RA Subcontractor, the bidder's approach for complying with EPA Region 2's "Clean & Green" policy and implementing additional green remediation strategies was included as one of the evaluation criteria. In addition, financial incentives were included in the subcontract documents for implementing selected green remediation practices. Green remediation practices accounted for 35 percent of the total incentive pool.

The following green practices were implemented at the site during GWTF construction:

Energy

- 100 percent of electricity purchased during the treatment facility construction and operations came from renewable sources available through a green power program for the local utility company, LIPA (Renewable Energy Certificates). Approximately 26,000 kilowatt-hours (kWhs) were used during site construction.
- A geothermal heat pump was installed in the treatment facility to circulate treated effluent water under an open loop system. The heat pump serves as a renewable energy source for heating the process area of the building. The heat pump contains an internal electric heater to provide heat during system shutdowns as required.
- Industrial grade insulation curtains were installed on the inside of the treatment facility building roll-up doors to improve the low "R" value of the doors. The insulation curtains will save energy and reduce heating costs.
- Skylights were utilized in the facility process equipment area to minimize use of electrical lighting.
- High efficiency lighting was used in the treatment facility.
- High efficiency motors were used for all process equipment where possible.
- The treatment facility PLC has remote alarm acknowledgement and programming capabilities to reduce fuel consumption associated with driving to the site.
- The tankless hot water heater was installed for the bathroom sink and emergency shower which can have an energy efficiency of up to 99.5 percent.

Fuel

- Ultra-low sulfur diesel was used for all construction vehicles. A total of 2,500 gallons of ultra-low sulfur diesel was used over the course of site construction.
- Equipment idling time during construction was held to five minutes or less to reduce fuel consumption.
- 100 percent of the craft labor for this project was local to the area to reduce fuel consumption associated with driving to the site.

Material Re-Use and Recycling

- Soil Re-use - Soils excavated during trenching was used as trench backfill material rather than importing new material from offsite. Existing topsoil was stripped during clearing and used to re-establish vegetation in disturbed areas. In addition, approximately 200 tons of drill cuttings were shipped to Soil Safe facility in Logan Township, New Jersey, which operates under a redevelopment plan which approves use of waste soils as fill material and qualifies as a beneficial re-use of the waste.

- Coal Combustion Products in Concrete - The concrete poured at the site used coal combustion product (CCP) materials such as fly ash to replace a portion of traditional cement. The mix for structural concrete that was used for the building foundation contains 122 lbs of fly ash per CY of concrete. A total of 3 tons of fly ash was used.

- Recycled Steel – Approximately 70 percent of the pre-engineered metal building consists of recycled steel, which equates to 5.1 tons of recycled material.

- Recycled Concrete Aggregate - RCA was used in place of crushed stone for the treatment facility access roads and parking areas, for the temporary access roads, and backfilling the AOC 2 excavation. The total quantity of RCA placed was 320 tons.

- Asphalt - Approximately 60 tons of demolition asphalt for the pipe trenching was transported for off-site recycling. Asphalt using recycled materials was used to restore the asphalt that was demolished.

- Cleared Vegetation - Chipping of cleared vegetation was performed by the neighboring local commercial tree chipping facility instead of disposing the material offsite. Approximately 75 CY of cleared material was chipped.

- Re-usable Concrete Form Work – Approximately 1,000 SF of re-usable concrete forms were used during pouring of concrete for the GWTF foundation.

Sustainable Site Practices

- Site Re-Use - The groundwater treatment facility was constructed on a previously developed site (at the LAI facility), which minimizes habitat destruction and minimizes the amount of infrastructure required to service the facility.

- Vegetation Protection - Vegetation was cleared only as required for construction activities, and yard piping was routed to minimize the clearing required.

- Stormwater Runoff Quantity /Quality and Aquifer Recharge - Groundwater from the extraction well and effluent injection well step tests and from well development was treated on site and disposed in the effluent injection wells to recharge the aquifer and minimize offsite disposal. Approximately 770,000 gallons of wastewater were treated and discharged to injection wells.

The following green remediation practices will be performed during facility operations:

- 100 percent of the energy used during facility O&M will be purchased through a green power program for the local utility company, LIPA (Renewable Energy Certificates).

- Spent GAC from the vapor phase granular activated carbon units will be replaced with regenerated carbon.

- Pending waste disposal sampling results, spent carbon will be disposed of at a carbon regeneration facility.
- In addition, several technologies implemented during facility construction will reduce the energy used during facility operations including using high efficiency lighting, installation of a geothermal heat pump, use of high efficiency motors, installation of skylights, installation of a high efficiency hot water heater, and installation of an insulation curtain at the roll-up doors.

3.4 ISCO Treatment

ISCO treatment at the site involved the injection of potassium permanganate into the subsurface to destroy organic contaminants in soil and groundwater. The reaction of potassium permanganate with organic compounds and contaminants produces manganese dioxide and either carbon dioxide or intermediate less toxic compounds. The overall objective of the ISCO treatment was to reduce TCE mass in the groundwater, thereby accelerating the time required to remediate the groundwater and shortening the operation time of the GWTF. ISCO treatment was applied to the area with TCE groundwater concentrations greater than 1,000 µg/L. Work was performed by the RA Subcontractor's lower tier ISCO subcontractor, Panther Technologies, Inc. (Panther).

Acceptance criteria were established during the RD to measure the achievement of the RAO. The design specified that three performance monitoring events be performed for ISCO monitoring wells MW-ISCO-01 to MW-ISCO-05:

- **Baseline** – Samples were collected prior to the initiation of chemical injection to establish baseline conditions in June 2010
- **Pre-final** – Samples were collected in September 2010, approximately 30 days after completion of the ISCO treatment
- **Final** – Samples were collected in January 2011 approximately 180 days after completion of the ISCO treatment.

The acceptance criteria specified in the RD for the Pre-final and Final sampling events included the following:

- Concentrations of TCE in groundwater samples collected from the 5 monitoring wells (MW-ISCO-1, MW-ISCO-2, MW-ISCO-3, MW-ISCO-4, and MW-ISCO-5) shall be averaged and the average shall not exceed the target treatment goal of 100 µg/L by more than 50 percent.

3.4.1 ISCO study area

During a previous sampling event, a soil vapor sample with TCE results greater than 100,000 parts per billion by volume (ppbv) was observed in the southeast side of Building G. Building G is hydrogeologically upgradient of the area with high CVOC concentrations near MPW-07 and was therefore investigated as a likely upgradient source of contamination. Three soil borings (ISCO-SB-01 to ISCO-SB-03) were proposed within Building G in January 2010 to a depth of approximately 230 feet bgs and groundwater and soil screening was performed. The field activities and results are described in Panther's ISCO Study Area Technical Memorandum, which is included in Appendix J.

The soil borings were installed using mud-rotary methods. A very permeable gravel or void area was encountered in ISCO-SB-01 at 98 feet bgs which resulted in loss of circulation. Elevated readings were noted on the photo-ionization detector (PID) in the soil intervals from 60 to 90 feet bgs. Follow-up attempts to reconfirm these readings were unsuccessful. Based on low groundwater VOC readings in ISCO-SB-02 and ISCO-SB-03 and the inability to re-establish mud circulation in ISCO-SB-01, this borehole was abandoned. Mud circulation could have been re-established by installing casing in the borehole past the permeable/void area. This approach was determined to be costly and with expected low benefit as results from ISCO-SB-02 and ISCO-SB-03 already indicated that there was no additional contamination source under Building G.

Soil borings ISCO-SB-02 and ISCO-SB-03 were advanced to approximately 50 feet below the groundwater table. Split spoon samples were collected at a frequency of one sample every 10 feet in the vadose zone for field screening and lithologic logging. Within the groundwater table, a total of 6 saturated soil samples and 5 groundwater grab samples were collected from ISCO-SB-02, and 5 saturated soil samples and 7 groundwater grab samples were collected from ISCO-SB-03. All samples were sent to Arrowhead's subcontract laboratory, Test America, for trace VOC analyses. Each boring was abandoned with bentonite grout to the surface. The boring logs, analytical results, and validation reports are included in Panther's ISCO Study Area Technical Memorandum.

No detections with the PID were encountered within the vadose zone in ISCO-SB-02 and ISCO-SB-03. In addition, the extremely low detections for VOCs in soil and groundwater laboratory analytical results indicate the lack of a definitive source of VOCs impacting the saturated zone. It was therefore decided in agreement with EPA that no ISCO treatment would be performed within the ISCO Study Area.

3.4.2 ISCO Treatment Area

ISCO treatment was applied to the area with TCE groundwater concentrations greater than 1,000 µg/L, which was presumed to extend underneath Facility Building 10. The "ISCO Treatment Area" is approximately 120 feet by 170 feet and has a target depth of approximately 20 feet, the zone between 200 to 220 feet bgs, which is the depth exhibiting the greatest TCE concentrations.

3.4.2.1 Well Installation

For the ISCO remedy, Panther installed thirteen ISCO injection wells (IW-ISCO-01 to IW-ISCO-13) at the LAI facility as shown on Figure 3-1. Ten of the injection wells were installed in between Building 10 and Building G, and three wells were installed to the west of Building 10. Each of these wells is constructed with 20-foot stainless screens from approximately 200 to 220 feet bgs and Schedule 40 PVC risers. A total of five ISCO monitoring wells (MW-ISCO-01 to MW-ISCO-05) were installed for monitoring effectiveness of the ISCO treatment. As shown on Figure 3-1, these wells were installed within the source area (MW-ISCO-04), sidegradient of the source area (MW-ISCO-03 and MW-ISCO-05) and downgradient of the source area (MW-ISCO-01 and MW-ISCO-02). These wells were installed with 10-foot stainless steel screens from approximately 207 to 217 feet bgs. A summary of the ISCO injection well and monitoring well construction is presented in Table 3-3. Boring logs are included in Appendix F. The wells were developed prior to implementing the ISCO treatment to remove silt and construction materials from the boreholes and to improve the hydraulic connection between the well and the aquifer.

3.4.2.2 Bench-scale Treatability Study and Pilot Study

A bench scale treatability study was performed to determine the details of the field pilot study design. Soil samples were collected and composited from five soil borings including ISCO-SB-02, ISCO-SB-03, MW-ISCO-03, MW-ISCO-04 and MW-ISCO-05 for natural oxidant demand (NOD) testing. To mimic the worst case groundwater impacts onsite, water was collected from MW-ISCO-04 from the interval designated for ISCO treatment (200 to 220 feet bgs) for use in the treatability study. An average NOD of 1.7 gram per kilogram (g/kg) was reported for the composited soil samples. Reactors were setup using water from MW-ISCO-04, and composited soil samples from the source area and dosed at three delivery concentrations consisting of 1.5, 1.75 and 2.0 percent permanganate at 50 and 105 percent of the total oxidant demand (TOD). The results of the treatability study indicated a TOD of approximately 1 g/kg was sufficient to destroy all of the organics present with significant potassium permanganate residual. The treatability study testing and results are summarized in Panther's ISCO Pilot Testing and Full-Scale ISCO Treatment Area Work Plan Modifications Technical Memorandum, which is included in Appendix J.

Results from the bench-scale testing were utilized to scale-up and implement the field pilot test. The purpose of the pilot test was to evaluate the scale-up parameters utilized to transition from the laboratory treatability study to full scale injections across the ISCO treatment area. Downhole dataloggers were installed in MW-ISCO-04, MW-ISCO-05 and IW-ISCO-06 to log water elevations, temperature and conductivity prior to and post injections. IW-ISCO-05 was used for injections and wells MW-ISCO-01, MW-ISCO-04, MW-ISCO-05, IW-ISCO-04, IW-ISCO-06 and IW-ISCO-07 were used for daily field monitoring. During the pilot test, a total of 33,580 gallons of a 1.5 percent potassium permanganate solution were injected over a four day injection period into IW-ISCO-05 at approximately 14 gpm. Pre- and post-pilot groundwater sampling was performed at MW-ISCO-01, MW-ISCO-04, IW-ISCO-05 and IW-ISCO-06. The pilot test results indicated a successful test of oxidants and the delivery system on its capability to reduce the CVOCs in target wells in addition to influencing downgradient wells as far as MW-ISCO-01.

3.4.2.3 Full Scale Treatment Activities

The ISCO treatment wells included thirteen injection wells (IW-ISCO-01 through IW-ISCO-13) and five monitoring wells (MW-ISCO-01 to MW-ISCO-05). The well construction details are discussed in Section 3.4.2.1. A high flow injection trailer was equipped with both magnetic drive pumps and larger double diaphragm chemically resistant positive displacement pumps, multiple 21,000-gallon stainless steel tanks and secondary containment, off-road forklifts, piping and miscellaneous valves, fittings, meters, generators, air compressors, etc. to facilitate installation of the batching and injection system. Specialized 2-inch diameter wellheads were installed on IW-ISCO-01 to IW-ISCO-13 to facilitate injections. The wellheads were connected to the injection pumps via Schedule 80 PVC manifolds and clear PVC braided hose rated for greater 100 psi.

Prior to injections, a baseline monitoring event was performed on June 24 and 25, 2010 to be used for comparison to the Pre-Final and Final Sampling Events to determine the effectiveness of the remedy. ISCO monitoring wells (MW-ISCO-01 to MW-ISCO-05) were sampled and analyzed for VOCs, metals, and selected wet chemistry parameters. The results are included in Panther's 30-Day Post Treatment Results Technical Memorandum, which is included in Appendix J.

During the full-scale ISCO field activities, potassium permanganate and potable water were mixed in 21,000-gallon tanks to form a nominal 1.5 percent potassium permanganate solution. In each tank, one 2,000 lb supersack of potassium permanganate was loaded into epoxy coated dumping hoppers and mixed with potable water. The frac tanks were aggressively aerated during both mixing and injection activities to maintain a homogeneously mixed solution and prevent incomplete mixing of the permanganate.

A total of 354,000 gallons of the 1.5 percent solution was initially injected. ISCO monitoring wells were monitored during injections to evaluate water level increases, changes in geochemical conditions and field parameters to determine influence during injections.

During this initial phase of full scale injections, a significant influence was noted within source area monitoring wells MW-ISCO-04 and MW-ISCO-05 and significant geochemical shifts were noted with the presence of permanganate in the monitoring wells during injections, verifying the pilot study radius of influence data. However, limited to no indicators were present in down gradient wells MW-ISCO-01 and MW-ISCO-02, or side gradient well MW-ISCO-03, seemingly due to influence caused by variable hydraulic conductivities and subsurface channeling. Therefore it was elected to increase the mass of permanganate injected through mixing and injection of an additional 30,300 lbs of potassium permanganate (additional 252,500 gallons of 1.5 percent solution) in an attempt to overcome these subsurface anomalies. The additional 30,300 lbs of potassium permanganate increased the total volume of oxidant solution injected to 645,000 gallons of solution (includes the pilot study and full-scale treatment).

The Pre-final groundwater monitoring event was performed on September 18 and 19, 2010. VOC concentrations reductions were observed in MW-ISCO-01 and MW-ISCO-02 as compared to the ISCO Baseline Sampling Event, with concentrations decreasing in MW-ISCO-01 from 110 to 70 µg/L and in MW-ISCO-02 from 490 to 0 µg/L. However, increases in VOC concentrations were observed in MW-ISCO-03, MW-ISCO-04, and MW-ISCO-05. The results are included in Panther's 30-Day Post Treatment Results Technical Memorandum.

The following items can be noted or concluded from the results of the full-scale treatment activities:

- Greater than 67 percent of the pore volume of the ISCO Treatment Area at a 1.5 percent potassium permanganate solution was injected. This is dramatically higher than typical injection programs that recommend injecting greater than 20 percent of the pore volume. An added concern for the LAI site based on the extremely heterogeneous nature of the site is if too much oxidant solution is injected without being able to track where it is going, then oxidant transport may migrate to either extraction wells or down gradient receptors unknowingly.

- Following the completion of injections and within the 30-day monitoring timeframe, MW-ISCO-02 changed to a deep purple with very high ORPs (greater than 500 mV). MW-ISCO-01 and MW-ISCO-02 are only approximately 30 feet apart and the lack of indicators in MW-ISCO-01 and significant geochemical shifts in MW-ISCO-02 likely indicate preferential pathway exists from the source area, bypassing MW-ISCO-01 that passes through MW-ISCO-02.

- Throughout the duration of injections it was noted no influence was observed in MW-ISCO-03. During the second round of injections, it was attempted to influence MW-ISCO-03 by injecting in the wells only immediately adjacent to it (IW-ISCO-03, -07, -08, -09 and -10) while extracting groundwater at approximately 10 to 15 gpm from MW-ISCO-03 in an attempt to hydraulically force permanganate migration into the area of MW-ISCO-03. Even under hydraulic influenced conditions influencing of MW-ISCO-03 was unsuccessful.

- The potential for channel flow and highly variable hydraulic conductivities has been noted in other areas of the site during drilling operations as evidenced by problems with boulder layers and circulation losses in the groundwater extraction and treatment system well installation, and variation in final constructed well specific capacities for wells located only a short distance from each other.

- Significant rebound was noted in MW-ISCO-04 and MW-ISCO-05 during the 30-Day Sampling Event (increase of over an order of magnitude). Based on the historical downward trend in CVOC concentrations from the Pre-Pilot Sampling Event (April 2010) through the Interim Groundwater Grab Sampling Event in (July 2010) to the trend reversal following completion of injections, it appears that a saturated zone source area, or an area of higher dissolved phase groundwater previously unknown, is causing increasing concentrations within the source area.

Based on the sheer volume of permanganate injected into the source area, the significant variation in subsurface hydrologic conditions and significant channeling, a potential saturated source beneath Building 10, and a decrease in concentrations observed in the area of the highest TCE concentrations, it was determined that the injection of additional oxidant to the aquifer would not prove to be beneficial and the introduction of additional oxidant to the aquifer could risk residual permanganate preferentially migrating into unknown areas. In addition, hydraulic control of the source area is being controlled by the groundwater extraction and treatment system at the site. It was therefore agreed with EPA that no additional injections would be performed. A summary of the full-scale ISCO treatment activities and results is included in Panther's 30-Day Post Treatment Results Technical Memorandum, which is included in Appendix J.

3.4.2.4 180-day Post-Treatment Monitoring

A final groundwater monitoring event was performed on January 19 and 20, 2011 to determine longer term impacts of the ISCO treatment activities. ISCO monitoring wells MW-ISCO-01 through MW-ISCO-05 were sampled for VOCs, select wet chemistry and metals. A summary of the monitoring results in included in Panther's 180-Day Post Treatment Monitoring Technical Memorandum, which is included in Appendix J. Significant reduction in VOC concentrations was observed and is summarized below:

- Concentrations of TCE in MW-ISCO-01 decreased from 110 µg/L during the baseline monitoring event to approximately 0.067 µg/L, which is reduction of approximately 99.94 percent.
- TCE was reduced at MW-ISCO-02 by approximately 80 percent, down from 490 µg/L to 100 µg/L.
- Monitoring location MW-ISCO-03 showed an approximate 99.99 percent reduction of TCE, decreasing from 460 µg/L to 0.068 µg/L.
- MW-ISCO-04 noted lower concentrations of TCE, PCE, and cis-1,2- DCE from the baseline sampling event. VOC levels decreased by 99.97 percent, from 240 µg/L to 0.072 µg/L.
- MW-ISCO-05 demonstrated significant decreases in TCE, PCE, and chloroform. TCE levels decreased from 82 µg/L to 0.075 µg/L, which is reduction of approximately 99.90 percent.

The average VOC concentration during the 180 day groundwater monitoring event was 20 µg/L which is below the RA objective of 100 µg/L. Average VOC concentrations were reduced by approximately 92 percent.

3.5 PCB Soils

PCB contaminated soils were identified in the former generator area or AOC 2 of the site. Partial excavation of these soils was completed by the site owner. Subsequent soil sampling by ERRS and CDM confirmed the presence of PCBs in soils at concentrations exceeding the ROD-specified clean-up criteria of 1 ppm.

CDM was tasked to perform a field investigation for characterization of the PCB soils in the AOC 2 area, and excavate and dispose of soils exceeding the clean-up criteria. The field investigation work was performed by CDM's RA Subcontractor, Arrowhead Contracting, Inc., on September 1, 2010 and February 10, 2011. CDM personnel were on site to supervise the investigation activities. Soil samples were collected utilizing a Geoprobe direct-push drilling unit at 15 locations within AOC 2, designated as B-1 to B-15 as shown on Figure 5 of CDM's PCB Soil Excavation Technical Memorandum, which is included in Appendix A. Arrowhead had previously backfilled the excavation performed by the owner with RCA in order to provide a level surface for well installation performed in that area. Geotextile fabric was installed below the RCA material in order to delineate the limits of the clean fill material. The depth of the RCA fill material/geotextile fabric was noted in each boring during the ingestigation. Continuous soil samples were collected at each boring ranging from a depth of 6 to 9 feet below the geotextile fabric. Field screening samples were performed for PCBs at one-foot intervals using an SDIX Ensys PCB test kit via EPA Method 4020. Selected samples were then sent for laboratory analyses for PCBs from depths just below the deepest interval where field screening depths indicated PCB exceedances, or for intervals where odors were observed. A summary of the field screening data and analytical results is summarized in CDM's PCB Soil Excavation Technical Memorandum.

After the field investigation activities were completed, it was agreed by EPA and NYSDEC that surface soils to 2 feet bgs would be remediated to the ROD-specified clean-up criteria of 1 ppm and that subsurface soils (greater than 2 feet bgs) would be remediated to the NYSDEC PCB clean-up criteria for commercial sites of 10 ppm, per 6 NYCRR Part 375-6. Subsurface excavation limits were based on sample results collected by ERRS that exceeded 10 ppm. The excavation design is summarized in Section 2.5.2 and is described in detail in CDM's PCB Soil Excavation Technical Memorandum.

Soil excavation activities were performed by the RA Subcontractor from March 1 to March 4, 2011. CDM personnel were onsite to supervise the excavation activities. Initially, all RCA material was excavated and stockpiled for reuse during backfilling, and the geotextile fabric was removed. PCB contaminated soil was then excavated, transported, and disposed in an approved, non-hazardous waste disposal facility, Commonwealth Environmental Systems in Pennsylvania. Approximately 550 tons of soil was disposed offsite.

A total of 7 post-excavation samples designated as CS-1 to CS-7 were collected from the bottom of the excavations and sent for confirmatory laboratory analyses for PCBs to Arrowhead's subcontract laboratory, Test America, Inc. The location of the post-excavation samples is shown on Figure 6 of CDM's PCB Soil Excavation Technical Memorandum included in Appendix A. The excavation was backfilled with the stockpiled RCA material and additional clean RCA material was brought from a local facility to backfill the excavation to grade. The RCA brought from offsite was sampled to ensure that the imported material meets the NYSDEC TAGM 4046 recommended soil cleanup objectives as described in Section 3.3.2.1. The excavation was backfilled prior to receipt of the confirmatory sample results because the Period of Performance for the work assignment was ending.

All post-excavation sample results were below the clean-up criteria except for surface sample CS-1 and subsurface sample CS-6. CS-1, which is located in the 2-foot excavation area "D", had a total PCB sample result of 1.73 ppm, which exceeds the ROD-specified surface soil cleanup criteria of 1 ppm. However, no additional excavation in this area is required because this sample is located in the shallow excavation area and surface soils are only required to be excavated to 2 feet bgs. Sample CS-6, which was located in the 4.5 feet excavation area "A", had a total PCB concentration of 100 ppm, which exceeds the NYSDEC subsurface remediation criteria of 10 ppm. A summary of the post-excavation samples results is included in CDM's PCB Soil Excavation Technical Memorandum.

3.6 Construction Derived Waste

Construction derived waste that was generated during construction and the method of treatment and/or disposal is described below:

- Soil cuttings from the GWTF and ISCO well installation were stored in roll-off containers lined with plastic sheeting. One composite sample was collected from the roll-off containers on March 18, 2010. The sample results indicated that the soil was non-hazardous and a total of 193.63 tons of non-hazardous soil was disposed of at Soil Safe, Inc. The waste characterization sample results and waste manifests are included in Appendix K.

- Wastewater from drilling, steam cleaning and well development that occurred prior to the completion of effluent injection well IW-04 was stored in roll-off containers, and approximately 214,600 gallons of wastewater was transported by Aqua-Tex Transport, Inc. for disposal at Environmental Recovery Corporation. A sample was collected on March 30, 2010 for waste characterization purposes. After IW-04 was completed, wastewater was treated by a temporary treatment system and discharged to this well as described below. Another 40,000 gallons of wastewater from the second phase of well development at IW-3 was also shipped via Aqua-Tex Transport, Inc. to the same facility under the same waste profile because the temporary treatment system had been removed from the site. The waste characterization sample results and waste manifests are included in Appendix K.

- Once IW-04 was operational, wastewater from drilling, steam cleaning, well development, and step testing were treated by a temporary treatment system and discharged to this injection well. The treatment system consisted of a filter box and a 21,000 gallon tank for storing of water and initial removal of sediments. The water was treated by two sets of bag filters and two liquid phase GAC units in series. The treatment system was designed for a flow rate of 500 gpm. Five effluent samples were collected over the course of the treatment system operations, and all sample results met the site SPDES permit equivalent criteria. A total of approximately 770,000 gallons were treated by the temporary treatment system. Treatment system analytical results are included in Appendix K.

- Lead contaminated soils discovered in the vicinity of the effluent pipe yard within the NYSDOT ROW was excavated and disposed off-site. EnviRite of Pennsylvania transported 440.47 tons of lead-contaminated hazardous soil to be disposed off-site at their EPA approved facility. Additional details are included in Section 3.3.2.2. The waste characterization sample results and waste manifests are included in Appendix K.

- PCB contaminated soils identified in AOC2 were excavated and disposed off-site at an EPA approved facility. Waste characterization of the soil determined it to be non-hazardous. A total of 550 tons of PCB contaminated soil was disposed in an approved, non-hazardous waste disposal facility, Commonwealth Environmental Systems in Pennsylvania. Waste sampling and disposal is described in CDM's PCB Soil Excavation Technical Memorandum, which is included in Appendix A.

- Approximately 60 tons of demolition asphalt for the pipe trenching was transported for off-site recycling.

- Chipping of miscellaneous trees removed as part of clearing for installation of the GWTF was performed by the neighboring local commercial tree chipping facility. It is estimated approximate 75 CY of cleared material was delivered to the facility for chipping.

- All other non-contaminated general construction debris was disposed of offsite as municipal waste.

3.7 Site Restoration and Demobilization

Site restoration activities and demobilization activities included the following:

- Topsoil was placed and seeding was performed in grassed areas that were disturbed.

- Asphalt that was demolished as part of the utility trenching was restored using recycled asphalt materials.

- The GWTF parking area and access road was constructed with four inches of RCA. Geotextile fabric was placed underneath the RCA to prevent separation of the granular materials.

- An 8-foot high chain-link fence with barbed wire was installed around the GWTF. The fencing included two vehicular gates and one pedestrian gate.

- Bollards were installed at the GWTF roll-up doors, extraction well and effluent injection well vaults, and clean-outs.

- A project sign was installed in accordance with EPA requirements.
- Removal of temporary construction facilities and equipment was performed.
- General cleaning and removal of construction derived waste was performed.
- A site survey was completed to document the as-built conditions of all newly installed wells and surface/subsurface features of the treatment facility. The survey was performed by a New York State licensed surveyor.
- Video documentation of the final site conditions was performed and is included in Appendix D.

Section 4
Chronology of Events

The following summarizes the major events that occurred during the LAI RA construction:

Date	Event
September 29, 2006	▪ ROD signed by EPA
April 2009	▪ Completed Final RD for LAI facility groundwater treatment system and ISCO Remedies
May 2009	▪ EPA issued RAC 2 (Region 8) Base Period Work Assignment 234-RARA-02NS to CDM for implementation of the RA
May 2009 to September 2009	▪ CDM performed project planning and RA Subcontractor procurement activities
October 2009	▪ CDM awarded the RA Subcontract
November 2009	▪ Initiated review of construction submittals
December 2009	▪ Initiated site mobilization and preparation ▪ Initiated well installation
January 2010	▪ Performed ISCO Study Area investigation
March 2010	▪ Performed ISCO Treatability Study
April 2010	▪ Initiated GWTF site work
April and May 2010	▪ Performed ISCO Pilot Study
June 2010	▪ Performed ISCO baseline groundwater monitoring
July 2010	▪ Completed GWTF building foundation and initiated erection of the pre-engineered metal building ▪ Completed well installation and testing ▪ Initiated ISCO full-scale treatment injections

Date	Event
August 2010	▪ GWTF equipment delivered to the site on August 6 and initiated equipment installation on August 19, 2010 ▪ Completed yard piping ▪ Performed GWTF baseline groundwater monitoring ▪ Completed ISCO full-scale treatment injections
September 2010	▪ Completed on-site treatment system assembly, interior finishing work, and equipment shakedown testing ▪ Completed site restoration activities ▪ Conducted Pre-final Inspection with EPA and NYSDEC on September 20, 2010 ▪ Performed Initial Testing Program from September 15 to September 25, 2010 ▪ Performed AOC2 PCB soil investigation activities (first round) ▪ Performed ISCO 30-day confirmatory sampling event
September 28, 2010	▪ Initiated GWTF routine O&M, performance/compliance monitoring, and reporting
December 2010	▪ Performed the GWTF Final Inspection on December 9, 2010
January 2011	▪ Completed ISCO 180-day confirmatory sampling event
February 2011	▪ Performed AOC2 PCB soil investigation activities (second round)
March 2011	▪ Completed AOC2 PCB soil excavation and disposal
Ongoing	▪ Perform GWTF routine O&M, performance/compliance monitoring, and reporting ▪ Perform quarterly groundwater monitoring and reporting

Section 5
Performance Standards and Construction Quality Control

5.1 Performance Standards

The RA performance standards specified in the September 2006 ROD are presented in Section 2.2. This section describes the overall performance of the technology in comparison to the cleanup goals.

5.1.1 Groundwater Treatment Facility

Prior to system startup, groundwater monitoring was performed in the vicinity of the site to establish the baseline conditions for evaluating remedial system performance and progress over time. The baseline results are presented in Section 5.1.1.1. In addition, an ITP was completed following initial startup of the treatment facility to verify that the treatment system was operable in accordance with the performance-based requirements specified in the RA Subcontract. The results of the ITP are summarized in Section 5.1.1.2.

5.1.1.1 Baseline Monitoring

One round of baseline groundwater level measurements was collected on September 15, 2010 prior to system start-up. In addition, transducers with data loggers were installed in seven piezometers to collect continuous groundwater level data. These data were used to assess changes in groundwater flow direction and hydraulic gradient across the site. The well locations and groundwater elevations are illustrated on Figure 5-1.

Baseline groundwater samples were collected from August 18 to August 31, 2010 and analyzed for VOCs, metals, and wet chemistry analysis (alkalinity, hardness, total dissolved solids [TDS], total suspended solids [TSS], TOC, sulfate, chloride, fluoride, ammonia, and total Kjehldahl nitrogen [TKN[). Groundwater samples were collected using EPA Region 2's Low Flow Groundwater Sampling Procedures. Field measurements for pH, dissolved oxygen, temperature, conductivity, turbidity and oxidation redox potential (ORP) were also collected as part of the groundwater monitoring event. The purpose of this sampling event was to establish the baseline conditions for evaluating remedial system performance and progress over time. The analytical results for site-related CVOC contaminants, metals and wet chemistry parameter are summarized in Table 5-1. The total CVOC results and CVOC iso-contours are shown on Figure 5-2. Full tables of the baseline monitoring results are included in Appendix L. The purge data forms are included in Appendix M. A Data Usability Summary Report was performed for the baseline groundwater sampling event, and is included in Appendix N. All data was determined to be usable with the exception of selected TKN sample results, which were rejected due to low matrix spike (MS)/matrix spike duplicate (MSD) recoveries. The rejected data does not significantly affect the data set because data from previous sampling rounds may be used as required.

5.1.1.2 System Performance

Once the installation of the system was complete, a "shakedown" period occurred where system equipment was field tested prior to the start of the ITP to resolve any potential problems. The ITP was performed from September 15 to 25, 2010. The ITP results confirmed that the following performance standards were met during the initial startup period. A summary of ITP operating parameters is included in Table 5-2. ITP analytical data packages and validation reports are included in Appendix O.

- Achieved hydraulic control of the LAI source area- Extraction well EW-01 and EW-02 each operated at an average flow rate of 75 gpm for approximately the first seven days of operation. This flow rate is consistent with the RD specifications. On September 22, the flow rates for each well were decreased to 65 gpm, and were further decreased to 55 gpm on September 23 due to problems associated with aluminum precipitation as described later in this section. The extraction well pumps were operated in flow control mode. A figure showing drawdown results in extraction wells and surrounding piezometers is included as Figure 5-3. The extraction wells reached steady state conditions within a few hours, as shown on Figure 5-4, which is consistent with results previously seen at the site. Initial drawdown results for EW-01 and EW-02 were 1.5 and 1.3 feet, respectively. Downgradient monitoring wells MPW-03-A and MPW-04-A were used to monitor background groundwater elevations. The water levels in each of the background wells increased by about 0.4 feet over the duration of the ITP.

  The maximum drawdown levels at the site occurred on September 21 and 22 prior to reduction of the extraction well flow rates. Adjusting for background water levels, the maximum drawdown at EW-01 and EW-02 reached 2.1 and 2.3 feet, respectively. Water levels collected on September 21 are shown on Figure 5-5. Drawdown depths observed on September 21, adjusting for background levels, are shown on Figure 5-6. The drawdown results for the extraction wells are slightly greater than those observed during the extraction well step testing, which is not abnormal because greater drawdown is expected with both wells pumping. Drawdown was observed in surrounding piezometers PZ-PD-01, PZ-PD-03, PZ-06, and MPW-07. Adjusting for background levels, it appears that drawdown was observed as far as PZ-05 and PZ-07. However this data is inconclusive because an alternate explanation is that the wells are not impacted by background conditions. The radius of influence can be estimated as at least 300 feet, possibly more, indicating that hydraulic control of the source area is being achieved.

  Because the water levels of PZ-02, PZ-03, and PZ-04 are consistent with the levels observed in the background wells, it does not appear that mounding at the effluent injection wells occurred during the ITP.

- Initiated contaminant mass removal from the saturated-zone CVOC source- During the ITP, approximately 2,410,000 gallons of water were extracted from the ground, treated and discharged to the injection well field. Extraction wells EW-01 and EW-02 each operated at an average flow rate of 71 gpm. The mass of CVOCs removed per day for both extraction wells ranged from 0.2 to 0.4 lbs per day for a total of approximately 2.7 lbs of contaminant mass removed over the 11 day ITP period (based on air-stripper removal rates of greater than 99.9 percent). A summary of recovery well influent CVOC data and mass removal estimates is provided in Table 5-3.

- Achieved treatment requirements for groundwater effluent discharge to subsurface in accordance with NYSDEC SPDES permit equivalency criteria- All criteria were met for groundwater effluent discharges to subsurface. A summary of SPDES permit equivalency compliance data is included in Table 5-4.

- Achieved treatment requirements for vapor effluent discharge to the atmosphere in accordance with NYSDEC Air Pollution Control permit equivalency requirements- All criteria were met for vapor effluent discharge to the atmosphere. A summary of air pollution control permit equivalency compliance data is included in Table 5-5.

The following information was also gained or observed during initial startup testing, which is pertinent to decisions regarding system operation and optimization:

- Process sampling was performed for the extraction wells, combined influent header, after the air-stripper (pre-bag filter), and facility effluent (post-bag filter) to provide data to refine operational parameters and support decisions regarding facility operations and optimization. Samples were analyzed for VOC, metals, and wet chemistry parameters. A summary of the results is included in Appendix O.

- CVOC groundwater influent concentrations averaged approximately 200 µg/L over the first two days of the ITP and averaged approximately 160 µg/L over days 4 and 5. The decrease in concentrations is consistent with start up conditions at groundwater treatment facilities, where influent concentrations typically decrease over time. The groundwater influent concentrations are much lower than the values specified during the design, which was expected because the design used the maximum concentrations observed on site in the vicinity of MPW-07 as a conservative estimate, and this well is not located close to the extraction wells.

- In the early stage of the ITP, the treatment system operated intermittently due to difficulties encountered with aluminum precipitation in the bag filters. Bag filter fouling from aluminum precipitation appears to be a result of water extracted from EW-01. The aluminum precipitation is possibly due to the presence of potassium permanganate that was injected in the aquifer during the ISCO treatment, which can cause the mobilization of metals in groundwater. The extraction well flow rates were eventually decreased on September 22 and 23 to minimize change-out of the bag filters. Further evaluation and remedy of the aluminum precipitation issue will be performed during the O&M period.

- The total uptime for the 11 day ITP period was 83 percent, with the majority of the downtime being associated with the aluminum precipitation across the bag filters, which resulted in high differential pressure and system shutdowns.

The GWTF will operate until groundwater cleanup goals are achieved. During the RD, it was assumed that O&M activities and long term monitoring for the GWTF will be performed for approximately 30 years.

5.1.2 ISCO Treatment

Prior to the ISCO injections, groundwater monitoring was performed to establish the baseline conditions for evaluating effectiveness of the ISCO treatment. Confirmatory sampling events were performed after completion of the ISCO injections (Pre-final Sampling Event) and approximately 180 days after the ISCO injections (Final Sampling Event).

- Baseline, pre-final 30-day post injection and final 180-day post injection monitoring was conducted on the ISCO monitoring wells (MW-ISCO-01 to MW-ISCO-05).

- The average VOC concentration during the 180 day groundwater monitoring event was 20 µg/L which is below the RA objective of 100 µg/L.

- The ISCO program met the intended goal of mass reduction and decreased concentrations in the former source area by 92 percent.

5.1.3 Soils

Per discussions with EPA and NYSDEC, it was agreed that surface soils to 2 feet bgs would be remediated to the ROD-specified PCB clean-up criteria of 1 ppm, and that subsurface soils (greater than 2 feet bgs) would be remediated to the NYSDEC PCB clean-up criteria for commercial sites of 10 ppm, per 6 NYCRR Part 375-6.

A total of 7 post-excavation samples designated as CS-1 to CS-7 were collected from the bottom of the excavations for confirmatory PCBs analyses. All post-excavation sample results were below the clean-up criteria except for surface sample CS-1 and subsurface sample CS-6. CS-1, which is located in the 2-foot excavation, had a total PCB sample of 1.73 ppm, which exceeds the ROD-specified surface soil cleanup criteria of 1 ppm. However, no additional excavation in this area is required because this sample is located in the area of shallow excavation, and surface soils are only required to be excavated to 2 feet bgs. Sample CS-6, which was located at 4.5 feet bgs, had a total PCB concentration of 100 ppm, which exceeds the NYSDEC subsurface remediation criteria of 10 ppm. If future invasive work is planned at the site, institutional controls will be maintained. A summary of the post-excavation samples results is included in CDM's PCB Soil Excavation Technical Memorandum, which is included in Appendix A.

5.2 Construction Quality Control

The QA/QC program requirements for the RA construction were specified in the EPA-approved RA Construction QAPP and RA data QAPP. The program allowed for the verification of the following:

- Construction was completed in accordance with the RA Subcontract requirements and industry standards
- Data collected as part of RA construction are useable as per the data quality objectives (DQOs) established in the RA data QAPP
- The QA/QC requirements specified in the RA QAPPs were followed during the course of the RA construction, with no significant deficiencies identified. Minor deviations from these requirements were evaluated and approved on a case-by-case basis and are documented in the Field Orders and Field Change Requests (FCRs). A summary of the QA/QC activities completed during construction is provided below. The QA/QC program remains on-going as part of the RA performance, compliance and environmental monitoring program.

5.2.1 Construction Submittal Reviews

CDM reviewed all RA Subcontractor submittals for conformance to the RA subcontract requirements and industry standards. The following activities were included as part of this process:

- Review of project plans
- Review of construction shop drawing submittals
- Review of construction QC test procedures and results
- Review of as-built documentation
- Verification that all submittal requirements were met

5.2.2 Field Inspection and Testing

CDM performed full-time resident engineering/inspection during RA construction from December 2009 through September 2010 to verify that all work was completed in accordance with the requirements specified in the RA Subcontract, RA QAPPs, and approved project plan and shop drawing submittals. The following activities were included as part of this process:

- Planning and coordination of work activities
- Inspection of materials and equipment upon delivery to the site
- Inspection of construction activities and workmanship
- Observation of construction QC test procedures and acceptance of results
- Inspection of environmental sampling procedures and equipment calibration
- Inspection for health and safety procedures
- Review of field documentation
- Coordination and documentation of field changes
- Work coordination with local regulators and property owners

The results of field construction QC tests are presented at the following locations in this report:

- Soil compaction test results are included in Table 5-6. Copies of the compaction test results are included in Appendix P.
- Slump and compressive strength test results for concrete are presented in Table 5-7. Copies of the concrete compressive strength test results are included in Appendix Q.
- Hydrostatic tests were performed for all process equipment and piping. The absence of leakage was also visually verified by the Resident Engineer.
- Electrical QC tests were performed for all incoming electrical service, transformers, and motors by a licensed electrician.
- The Pre-final Inspection, ITP, and Final Inspection are covered under Section 6.

5.2.3 Modifications

5.2.3.1 Field Change Requests

Field change requests are required for deviations from the site's data QAPP. The following field change requests were enacted during construction. Copies of the Field Change Requests are included in Appendix R.

- **FCR-1** - In order to reduce costs, PVC riser pipe was used instead of stainless steel in piezometers. The use of cement/bentonite grout mixture generates hydration heat and could result in weakened casings and potential collapse. Hence, the grout material was changed to a 30 percent bentonite material to prevent PVC collapse by reducing heat stress on the PVC.

- **FCR-2** - In order to reduce costs, PVC riser pipe was used instead of stainless steel in monitoring wells. The grout material was changed to a 30 percent bentonite material to prevent PVC collapse by reducing heat stress on the PVC as described above.

- **FCR-3** - Due to low recovery yields for split spoon samples from 0 to 120 feet bgs at ISCO-SB-03, lithological logging was suspended from 130 to 150 feet bgs. Lithological logging via split spoons resumed at 160 feet bgs and deeper depths at ISCO-SB-03 when geological conditions improved.

- **FCR-4** - The QAPP incorrectly stated that three samples would be collected from each multiport well during the GWTF baseline sampling event. However the number of ports in each well ranges from three to five. One sample was collected per port during the event. In addition, several samples could not be collected during the event due to three defective sampling ports and potassium permanganate that was observed in two of the monitoring wells.

5.2.3.2 Field Orders

Field orders were issued to document approval for all minor changes in work, which did not impact the RA Subcontract price. A summary of the field orders is provided in Table 5-8. Copies of the Field Orders are included in Appendix S.

5.2.3.3 Change Orders

Change orders were issued to document approval for changes in work, which involved significant changes in RA Subcontract scope or any changes to RA Subcontract schedule or price. A summary of the change orders is provided in Table 5-9. Copies of the change orders are included in Appendix T.

5.2.4 Documentation

Both CDM and the RA Subcontractor maintained accurate and comprehensive records of all RA construction activities in accordance with the RA Subcontract and RA QAPP requirements. A summary of the record documents is provided below.

- **Log Book Notes –** Log book notes were maintained for all site activities. Pertinent information regarding personnel on site, weather conditions, health and safety, and daily site activities was recorded on a daily basis.

- **Construction Progress Reports –** Daily construction QC reports were completed by both CDM and the RA Subcontractor to document daily site conditions and construction activities. Bi-weekly Field Oversight Progress Reports were prepared by CDM and submitted to EPA. Copies of CDM's Bi-weekly Field Oversight Progress Reports are included in Appendix U.

- **Progress Photographs –** Progress of site activities was photographically documented on a routine basis as per the RA Subcontract. Copies of the progress photographs are included in CDM's Bi-weekly Field Oversight Progress Reports, which are included in Appendix U.

- **As-Built Drawings -** A working set of the final construction shop drawings were maintained in the field to document field modifications and for use in preparing the Record As-Built Drawings. The As-Built Drawings are included in Appendix E.

5.2.5 Data Quality

Environmental sampling and field measurement activities were completed to ensure that the data were usable as per the corresponding DQOs. The types of data collected during RA construction are summarized below.

Definitive Data:

- Groundwater monitoring well sampling performed as part of the GWTF baseline groundwater monitoring event
- ITP GWTF facility process and permit compliance data
- Groundwater monitoring well sampling that was performed as part of baseline and confirmatory sampling events for the ISCO pilot study and full scale application (Baseline, Pre-final, and Final Sampling Events)
- Confirmatory post-excavation samples for the PCB soil removal event
- Soil and groundwater laboratory analytical results from the ISCO Study Area borings

Screening-level Data:

- Water quality parameter measurements taken during well development, groundwater monitor events and from the GWTF sample ports
- Air VOC concentrations that were routinely measured as part of health and safety monitoring to verify the absence of VOCs above action levels for Level D protection.
- PCB field investigation sample results
- ISCO bench-scale testing
- Field screening samples performed in the ISCO Study Area borings
- Interim ISCO groundwater sampling and monitoring that was performed by the lower tier ISCO subcontractor to monitor process and effectiveness of the remedy
- Imported granular material characterization
- Waste characterization sampling
- Effluent samples collected for the temporary treatment system used for treatment of construction derived wastewater
- Pipe trenching and test pit soil characterization

The data quality was acceptable for the intended data use.

Section 6
Final Inspections, Initial Testing Program and Project Certification

6.1 Pre-Final Inspection

A pre-final inspection for the GWTF was held on September 20, 2010 to verify that Substantial Completion of construction was achieved and included the following representatives: Maria Jon and Cecilia Echols (EPA); Steven Scharf, John Conover, and Nick Acampora (NYSDEC); Demetrios Klerides and Stephen Mirabello (CDM); and Doug Ronk (Arrowhead Contracting, Inc.). A punch list of incomplete work items was generated based on the results of this inspection. A copy of the Pre-final Inspection Memorandum and punch list are included in Appendix V. It was determined that the construction was substantially complete and the Certificate of Substantial Completion is included in Appendix W.

6.2 Initial Testing Program

The ITP for the GWTF was completed to confirm achievement of the treatment system performance requirements specified in the RA Subcontract and approved shop drawing submittals, and to obtain useful data for supporting decisions regarding treatment system operation and optimization. ITP activities were completed from September 15 to September 25, 2010. Baseline monitoring was performed prior to initiating the ITP, as discussed in Section 5.1.1.1.

As per Section 5.1.1.2, the results of the ITP confirmed that the groundwater treatment system is operating in accordance with performance requirements and is operational and functional.

6.3 Final Inspection

A Final Inspection was conducted by CDM in January 2011 to verify that final completion of construction was achieved. All incomplete work items from the pre-final inspection were verified to be complete with the exception of a few minor items that will be addressed during the O&M period. The Final Inspection Memorandum is included in Appendix X.

6.4 Certification of Completion

Based on the results of the GWTF Final Inspection, it was determined that construction completion of the GWTF had been achieved. Final completion for the ISCO treatment was based on CDM's approval of the RA Subcontractor's Post 30 Day Injection Technical Memorandum, which is included in Appendix J. The Certificates of Final Completion for the GWTF and ISCO treatment are provided in Appendix W.

In addition, a certification statement regarding remedy construction and performance is included inside the cover page of this report.

6.5 Institutional Controls

As per the September 2006 ROD, the following institutional controls consisting of existing regulations and permit requirements are required for the site:

- Groundwater institutional controls will be maintained by NYSDEC to restrict drilling, well installation and groundwater use at the Site. EPA concurrence is required before approving such activities.
- Institutional controls for soil will consist of an environmental easement/restrictive covenant filed in the property records of Suffolk County that will limit the use of the active industrial area to commercial and/or industrial uses only.

6.6 Health and Safety

- No health and safety incidents occurred during RA construction. Activities were performed in accordance with the site-specific Health and Safety Plan (HASP). Level D PPE was required for all site personnel who came into direct contact with contaminated soil or groundwater. Level C PPE was used by site personnel who mixed and injected potassium permanganate during the ISCO treatment. Breathing zone air quality was routinely monitored for VOCs using a PID during intrusive construction activities.
- A Health and Safety (H&S) Audit was conducted at the site by CDM on Tuesday June 15th to assess CDM (RA Contractor), Arrowhead Contracting Inc (RA Subcontractor), and lower-tier subcontractor adherence to H&S procedures, policies, and overall compliance in the field. The results were verbally conveyed during and immediately after the audit and quickly resulted in positive changes. Many of the action items were addressed within days, and overall safety program engagement and performance improved across the team, including CDM, Arrowhead, and lower-tier subcontractors.

Section 7
Operation and Maintenance

Operation, maintenance, and monitoring activities as part of the one year O&M period began on September 28, 2010. Routine O&M includes sampling and monitoring of the facility and site monitoring wells to verify that the treatment system is operational and maintained as per the RA Subcontract requirements. Any deficiencies identified during the one year O&M period are covered under the RA Subcontractor's warrantee and will be corrected. These activities are further described below.

7.1 Routine Operation and Maintenance

Routine operation activities during this period include:

- Operation of all equipment, systems, processes and appurtenances in accordance with the contract documents and manufacturers specifications
- Extraction of groundwater on a continuous basis to achieve hydraulic control and discharge of treated groundwater to the aquifer in accordance with discharge limits
- Procurement, management and maintenance of all equipment, spare parts, supplies and services required for continuous operation with minimal downtime
- Optimization of process equipment to minimize operational costs
- Maintenance of treatment plant uptime in excess of 90 percent during the first year of operation
- Monitoring of treatment system performance, permit compliance and remedial progress by collecting samples and field measurements in accordance with the contract requirements
- Containment, characterization, transport and disposal of all process and sampling waste in accordance with the subcontract documents and State and Federal regulations.
- Determining frequency of vapor phase carbon change-out

Routine preventative and corrective maintenance of the treatment facility, including all processes, equipment, controls, facilities and appurtenances, includes but is not limited to:

- Change-out of bag filters
- Change-out of vapor phase GAC units
- Cleaning of process equipment as often as necessary to prevent plugging, etc.

- Wash-down of process equipment
- Lubrication of process equipment
- Cleanout of process and yard piping
- Alignment of pump and blower shafts
- Instrumentation cleaning and calibration
- Periodic cleaning of the air-stripper trays
- Maintenance and re-development of the extraction wells and effluent injections wells as required
- Routine inspections and maintenance of exterior facilities, equipment, grounds, including fencing, locks, vegetation, touch-up painting, well vault leaks, structural support systems, and building openings and access ways

7.2 Environmental Sampling and Monitoring

The following environmental sampling will be performed as part of the O&M activities:

- Performance monitoring of the groundwater treatment system to verify that the system and individual components are operating properly and that hydraulic control is being maintained. A summary of the performance monitoring schedule is provided in Table 7-1.
- Compliance monitoring to demonstrate conformance with the SPDES and air pollution control permit equivalency criteria. A summary of the compliance monitoring schedule is provided in Table 7-1.
- Routine monitoring of site groundwater to provide data to be used to verify remedy effectiveness and to monitor remedial progress. A summary of the groundwater monitoring program is provided in Tables 7-1 and 7-2. The locations of the site monitoring wells can be found on Figure 5-2.

7.3 Reporting

Information and data collected during O&M and environmental sampling/ monitoring activities will be routinely evaluated and documented by CDM as part of Monthly O&M Report and quarterly Remedial Action Progress Report submittals.

Monthly O&M Reports will be submitted to EPA and NYSDEC and will present a summary of all pertinent operations, maintenance, and monitoring activities completed and all pertinent operational conditions for the reporting period, including, without limitation:

- Representative extraction well flow rates, volume of groundwater treated, and operational uptime percent
- Performance, compliance and environmental monitoring activities completed and copies of chain-of-custody forms and tabulated monitoring results
- Routine and non-routine O&M activities completed
- Any health and safety activities that occurred or issues that were identified

- Waste disposal quantities and copies of characterization sample results and disposal records/manifests

Remedial Progress Reports will be prepared by CDM for submittal to EPA and NYSDEC on a quarterly basis. The reports will include a detailed summary and analysis of remedy performance, including, without limitation:

- Tabulated summary tables for groundwater data and field measurements
- Tabulated summary table of compliance sampling and monitoring results to demonstrate conformance with the NYSDEC SPDES and air discharge criteria
- Tabulated/graphed summary of GWTF performance, including average flow rates and cumulative volume of groundwater extracted, mass removal rates and cumulative mass removed, and percent operational uptime
- Groundwater elevation iso-contour maps and capture zone estimates
- Groundwater contamination iso-concentration maps
- Graphs for updated groundwater contamination concentration trend analyses
- Written summary, assessment, and discussion of remedial action progress for the reporting period
- Recommendations regarding future O&M activities
- A data usability summary for the quarterly groundwater sampling events

Pursuant to EPA requirements, a Five Year Review of the site will be performed after five years of facility operations and will consist of a comprehensive evaluation of the groundwater remedy.

Section 8
Summary of Project Cost

Table 8-1 summarizes the RA construction and annual O&M costs estimated in RD and incurred under the RA Subcontract.

The base RA Subcontract capital costs for construction of the LAI facility groundwater treatment facility and ISCO groundwater remedies were $3,651,666 and $1,865,778 respectively, for a total of $5,517,444. These quantities reflect the revised unit prices and cost savings for Subcontract Modification #2, which substituted PVC for stainless steel riser casing for the piezometers, ISCO monitoring wells, and ISCO injections wells. An additional $268,354 ($263,457 for the GWTF and $4,897 for ISCO) was incurred during construction as a result of RA Subcontract modifications to complete value added field changes and address unforeseen conditions for total GWTF and ISCO costs of $3,915,123 and $1,870,675, respectively. In addition, CDM was tasked to remediate PCB contaminated soils at AOC2, which cost $128,884. The total RA construction costs for the work performed is $5,914,682. Including the financial incentives of $120,000 for schedule and implementation of green remediation practices, the total amount paid to the RA Subcontractor was $6,034,682. A description of the RA Subcontract modifications is provided in Table 5-9.

As shown on Table 8-1, even with the excavation of the PCB contaminated soils, the final construction cost was significantly less than the original RD cost estimate of $8,153,204. The Subcontract bids came in significantly less than the RD cost estimate particularly relating to the GWTF site work and the ISCO treatment. Additional cost saving were incurred by not executing optional ISCO treatment items for the ISCO Study Area.

A comparison to the ROD cost estimate could not be performed because only part of the ROD remedy was implemented under this RA, including the construction of the GWTF and implementation of ISCO at the LAI facility, and removal of PCB contaminated soil in AOC2. The following ROD RA activities were performed or are being performed by others: the design and implementation of the downgradient groundwater treatment system near Old Mill Pond; soil vapor intrusion investigation and mitigation for structures located within the plume; catch basin evaluation/sediment removal; evaluation and potential remediation of electrical transformers; and soil excavation and offsite disposal performed at other areas of the site.

A detailed RA construction cost breakdown is included in the Cost and Performance Report, provided in Appendix Y.

Section 9
Observations and Lessons Learned

The following provides a summary of significant observations and lessons learned during the ISCO treatment and GWTF construction activities:

- The performance based subcontracting approach allowed for competitive bidding among a broader spectrum of RA Subcontractors, since performance requirements can be achieved using multiple types and/or combinations of conventional treatment equipment. Common design components were integrated for Value Engineering purposes. This approach capitalized on economies of scale through administrative efficiencies and cost effectiveness.

- One RA Subcontract document was prepared for the GWTF and ISCO treatment, due to the potential for chemical oxidant, oxidant bi-products, and mobilized metals due to ISCO injections to impact the groundwater extraction wells.

- Performance based designs must be reviewed in detail by the RA Subcontractor and all details clarified prior to price negotiations. Any items identified in the performance based specifications and/or RFP documents that are deemed unnecessary should be raised by the RA Subcontractor during the planning stages.

- RA construction and O&M work was awarded to and performed by a qualified, small disadvantaged business.

- Lead times for subcontractors must be identified and reflected in the updated project schedules.

- Identification of key local subcontractors who are familiar with suppliers and other small subcontractors within the community allows for assessment of local market conditions and quick procurement of miscellaneous equipment and services.

- Significant green remediation practices were implemented due to the subcontracting approach by providing financial incentives and including green remediation as an evaluation criteria during evaluation of the bidders' proposals. Allowing the subcontractor to have the flexibility in choosing the green practices resulted in implementation of practices that were most cost-effective to the government. Based on costs obtained from the RA Subcontractor, it was determined that several green practices implemented for the site cost less than or were comparable to conventional non-green practices, including use of high efficiency lighting, CCP products in concrete, recycled steel in the pre-engineered building, re-usable concrete form work, RCA in place of crushed stone, furnishing of regenerated carbon in the GAC vessels, and disposal of spent GAC at a regeneration facility. In addition, several technologies that have minimal upfront capital costs can increase project savings over time by reducing the energy required during facility operations. These technologies include the installation of a geothermal heat pump, skylights, high efficiency hot water heater, and installation of an insulation curtain at the roll-up doors. In the future, green practices should be evaluated on a case by case basis during the design phase and items that do not significantly increase project costs should be included in the subcontract documents as requirements.

- Hydrogeological conditions can lead to unanticipated preferential flow of ISCO solution. A detailed characterization of subsurface conditions and an assessment of the appropriateness of using in-situ remedies should be performed prior to the implementation of ISCO treatment.

- For sites where the groundwater remedy combines both ISCO treatment and a groundwater extraction and treatment system, more time should be allowed for completion of the ISCO remedy prior to GWTF start up or pumping enhanced ISCO should be considered.

- Unexpected aluminum precipitation was observed in the air stripper during facility startup. The aluminum precipitation was possibly caused by ISCO treatment, which can mobilize metals.

- Generic laboratory glassware should be maintained onsite during construction activities to address unanticipated sampling activities to avoid schedule delays.

- Significant cost savings were incurred by utilizing PVC riser pipe for the monitoring wells and piezometers instead of stainless steel casing.

- Significant security issues occurred during site construction. Frequent break-ins by teenagers in the neighborhood occurred. Holes in the LAI facility perimeter chain-link fencing were identified and repaired as required. Security services were obtained for non-working hours (night and weekend) to prevent break-ins and damage to the site.

- The property owner/potentially responsible party (PRP) often tried to access the construction areas and gain unauthorized information about the site. A Chain of Command should be established regarding interactions with the property owner or PRP.

- Safety issues occurred due to the dilapidated nature of the existing LAI facility buildings. Wind caused damage to building #10, where some fiberglass wall panels and a top of a roof ventilator came off the building. No personnel were injured. Inspection and potential repair/demolition of unsafe structures prior to initiating RA construction activities should be considered.

- Significant snowfall events occurred during site construction. Snow plowing services were obtained by the RA Subcontractor. The overall schedule was not impacted.

Section 10
Contact Information

A summary of the key project personnel contacts is presented below.

EPA Project Manager:
Maria Jon
U.S. EPA Region 2
290 Broadway, 20th Floor
New York, NY 10007-1866
(212) 637-3967

RA Contractor:
CDM Federal Programs
Demetrios Klerides, P.E. - Project Manager
Ellen Gallerie, P.E. - Project Engineer
14 Wall Street, Suite 1702
New York, NY 10005
(212) 785-9123

RA Construction Subcontractor:
Arrowhead Contracting
Doug Ronk - Project Manager
Joe Cotter – Project Coordinator
12920 Metcalf, Suite 150
Overland Park, KS 33213
(913) 814-9994

NYSDEC Project Coordinator:
Steve Scharf
Division of Environmental Remediation
625 Broadway
Albany, NY 12233
(518) 402-9620

A detailed project contact list of site Contractors and regulatory agencies is provided in Table 10-1.

Section 11
References

CDM Federal Programs Corporation (CDM). 2006a. Final Remedial Investigation Report, Lawrence Aviation Industries Site, Port Jefferson Station, New York. March.

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U.S. Environmental Protection Agency (EPA).1995. Remedial Design/Remedial Action Handbook, EPA 540/R-05/059, 9355.0-04B. June.

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Tables

Table 2-1
NYSDEC Drinking Water and Groundwater Quality Standards
Remedial Action Report
Lawrence Aviation Industries Superfund Site, Port Jefferson Station, New York

CVOCs	NYSDEC Drinking Water and Groundwater Quality Standards (µg/L)[1]
Tetrachloroethene	5
Trichloroethene	5

Notes:
1. NYSDEC Drinking Water and Groundwater Quality Standards January 17, 2008, 6 NYCRR Section 703.5.

Acronyms:
CVOC - Chlorinated volatile organic compounds
µg/L - microgram per liter
NYSDEC - New York State Department of Environmental Conservation
NYCRR - New York Codes, Rules and Regulations

Table 3-1
Property Access Contact Information
Remedial Action Report
Lawrence Aviation Industries Superfund Site, Port Jefferson Station, New York

General Area	Well Location	Parcel	Property Owner	Mailing Address	Phone	Access Agreement
361 Sheep Pasture Road	MW-PD-11	22489	BASF (Thomas Seagraves-Site Manager)	BASF Beauty Care Solutions LLC 361 Sheep Pasture Road East Setauket, NY 11733	(631) 380-2660	X
1-66 Pinnacle Drive	MW-PD-12	23459	Fairfield Properties	66 Commack Road Commack, NY 11725	(866) 311-7333	X
ROW adjacent to 123 Wilson Drive and 209 Owasco Drive and 53 Woodchuck Hollow Court	MW-PD-13		Village of Port Jefferson	Village of Port Jefferson Engineer 121 West Broadway Port Jefferson, NY 11777	(631) 473-4744	X
Street	MW-05	33386	Town of Brookhaven	Office of the Town Attorney 3222 Route 112 Medford, NY 11763	(631) 451-6500	X
In empty lot along Katherine Street, between Paul and Washington Streets	MPW-01	29719	Town of Brookhaven	Office of the Town Attorney 3222 Route 112 Medford, NY 11763	(631) 451-6500	X
Street	MPW-03	33386	Town of Brookhaven	Office of the Town Attorney 3222 Route 112 Medford, NY 11763	(631) 451-6500	X
Nothern corner of Church property	MPW-04	24891	Greek Orthodox Church	430 Sheep Pasture Road Port Jefferson, NY 11777	(631) 473-0894	X
Street	MPW-10	1424	Village of Port Jefferson	Village of Port Jefferson Engineer 121 West Broadway Port Jefferson, NY 11777	(631) 473-4744	X

Acronyms:
MW - Monitoring well
PD - Pre-design
ROW - Right-of-way

Table 3-2
Groundwater Treatment System Components
Remedial Action Report
Lawrence Aviation Industries Superfund Site, Port Jefferson Station, New York

Item	Number of Units	Model	Size/Capacity
Extraction well pumps (EW-01 and EW-02)	2	Grundfos Model 85S150-10 (15hp) 6 inch nom. dia. Retrofitted to operate as VFD.	100 gpm each
Bag filters	2	Krystil Klear model 2424, four 10 micron fabric filter bags	100 gpm each
Sump pump (SMP-1)	1	120 VAC (1 hp), 3450 rpm motor	75 gpm
Discharge pump	1	Summit 316 SS ANSI end suction centrifugal pump, 10 hp, 230/460 VAC, 3 phase, TEFC motor. Retrofitted to operate as VFD.	200 gpm
Vapor phase GAC	2	H2K Model VC-028 vapor phase carbon vessels, dia.= 72 inches, height = 81.5"	3,000 pound coconut GAC per vessel
Air stripper system and Blower	1	QED model 24.6 EZ-Tray low profile air stripper, 10 removable aeration trays; Centrifugal pressure blower, NY blower model 2412A, 20hp, 230/460 VAC, 3 phase, TEFC motor.	AS flow rate: 250 gpm Blower flow rate: 1,300 cfm @ 46 inches wc (induced draft configuration)

Acronyms:
cfm - cubic feet per minute
dia.- diameter
gpm - gallons per minute
hp- horsepower
nom.-nominal
AS- air stripper
GAC- granular activated carbon
ANSI - American National Standards Institute
TDH- total dynamic head
TEFC- totally enclosed fan cooled
V - volts
VFD- variable frequency drive
wc - water column
SS- stainless steel
rpm - revolutions per minute
psi - pound per square inch

Table 3-3
Summary of Well Construction
Remedial Action Report
Lawrence Aviation Industries Superfund Site
Port Jefferson Station, New York

Well ID	Port	Surface Elevation (ft amsl)	Top of Casing (ft amsl)	Total Depth (ft bgs)	Port Elevation (ft amsl)	X Coordinate [1]	Y Coordinate [1]	Diameter of Well (inches)	Top of Screened Interval (ft bgs)	Bottom of Screened Interval (ft bgs)	Top of Screened Interval (ft amsl) [1]	Bottom of Screened Interval (ft amsl) [1]
EXISTING WELLS												
MPW-01	A	183.40	N/A	165	18.4	277,475	1,242,101	4	160	170	23.4	13.4
MPW-01	B	183.40	N/A	190	-6.6	277,475	1,242,101	4	185	195	-1.6	-11.6
MPW-01	C	183.40	N/A	215	-31.6	277,475	1,242,101	4	210	220	-26.6	-36.6
MPW-02	A	221.02	N/A	195	26.0	279,050	1,241,241	4	190	200	31.0	21.0
MPW-02	B	221.02	N/A	217	4.0	279,050	1,241,241	4	215	225	6.0	-4.0
MPW-02	C	221.02	N/A	245	-24.0	279,050	1,241,241	4	240	250	-19.0	-29.0
MPW-02	D	221.02	N/A	270	-49.0	279,050	1,241,241	4	265	275	-44.0	-54.0
MPW-03	A	189.73	N/A	180	9.7	280,018	1,241,316	4	175	185	14.7	4.7
MPW-03	B	189.73	N/A	202	-12.3	280,018	1,241,316	4	195	205	-5.3	-15.3
MPW-03	C	189.73	N/A	220	-30.3	280,018	1,241,316	4	215	225	-25.3	-35.3
MPW-03	D	189.73	N/A	240	-50.3	280,018	1,241,316	4	235	245	-45.3	-55.3
MPW-04	A	177.23	N/A	155	22.2	279,965	1,240,441	4	150	160	27.2	17.2
MPW-04	B	177.23	N/A	175	2.2	279,965	1,240,441	4	170	180	7.2	-2.8
MPW-04	C	177.23	N/A	205	-27.8	279,965	1,240,441	4	200	210	-22.8	-32.8
MPW-04	D	177.23	N/A	222	-44.8	279,965	1,240,441	4	220	230	-42.8	-52.8
MPW-04	E	177.23	N/A	245	-67.8	279,965	1,240,441	4	240	250	-62.8	-72.8
MPW-07	A	229.11	N/A	206	23.1	278,813	1,241,498	4	200	210	29.1	19.1
MPW-07	B	229.11	N/A	225	4.1	278,813	1,241,498	4	220	230	9.1	-0.9
MPW-07	C	229.11	N/A	255	-25.9	278,813	1,241,498	4	250	260	-20.9	-30.9
MPW-10	A	170.73	N/A	165	5.7	280,641	1,240,276	4	160	170	10.7	0.7
MPW-10	B	170.73	N/A	190	-19.3	280,641	1,240,276	4	185	195	-14.3	-24.3
MPW-10	C	170.73	N/A	222	-51.3	280,641	1,240,276	4	215	225	-44.3	-54.3
MPW-10	D	170.73	N/A	238	-67.3	280,641	1,240,276	4	235	245	-64.3	-74.3
MW-05	N/A	-	220 *	192	N/A	279,606	1,241,539	4	180	195	40	25
MW-PD-11	N/A	164.42	164.90	205	N/A	280,312	1,239,753	4	195	205	-30.6	-40.6
MW-PD-12	N/A	143.08	142.70	160	N/A	280,706	1,240,645	4	150	160	-6.9	-16.9
MW-PD-13	N/A	177.30	177.30	185	N/A	281,371	1,241,575	4	175	185	2.3	-7.7
NEWLY INSTALLED WELLS												
MW-ISCO-1	N/A	228.6 *	228.11	217 *	N/A	278,874	1,241,384	4	206 *	216 *	22.6 *	12.6 *
MW-ISCO-2	N/A	227.7 *	227.24	216	N/A	278,908	1,241,408	4	205	215	22.7 *	12.7 *
MW-ISCO-3	N/A	229.0 *	228.50	217.25	N/A	278,850	1,241,527	4	205.75	215.75	23.25 *	13.25 *
MW-ISCO-4	N/A	229.1 *	228.58	218 *	N/A	278,808	1,241,504	4	207 *	217 *	22.1 *	12.1 *
MW-ISCO-5	N/A	228.9 *	228.43	217	N/A	278,760	1,241,499	4	206	216	22.9 *	12.9 *

Table 3-3
Summary of Well Construction
Remedial Action Report
Lawrence Aviation Industries Superfund Site
Port Jefferson Station, New York

Well ID	Port	Surface Elevation (ft amsl)	Top of Casing (ft amsl)	Total Depth (ft bgs)	Port Elevation (ft amsl)	X Coordinate [1]	Y Coordinate [1]	Diameter of Well (inches)	Top of Screened Interval (ft bgs)	Bottom of Screened Interval (ft bgs)	Top of Screened Interval (ft amsl) [1]	Bottom of Screened Interval (ft amsl) [1]
NEWLY INSTALLED WELLS												
IW-ISCO-1	N/A	229.0 *	228.5 *	221 *	N/A	278,742	1,241,495	2	200 *	220 *	29.0 *	9.0 *
IW-ISCO-2	N/A	229.0 *	228.5 *	221 *	N/A	278,784	1,241,522	2	200 *	220 *	29.0 *	9.0 *
IW-ISCO-3	N/A	229.0 *	228.5 *	221 *	N/A	278,807	1,241,536	2	200 *	220 *	29.0 *	9.0 *
IW-ISCO-4	N/A	229.0 *	228.5 *	221 *	N/A	278,769	1,241,454	2	200 *	220 *	29.0 *	9.0 *
IW-ISCO-5	N/A	229.0 *	228.5 *	221 *	N/A	278,796	1,241,487	2	200 *	220 *	29.0 *	9.0 *
IW-ISCO-6	N/A	229.0 *	228.5 *	221 *	N/A	278,811	1,241,462	2	200 *	220 *	29.0 *	9.0 *
IW-ISCO-7	N/A	229.0 *	228.5 *	221 *	N/A	278,834	1,241,505	2	200 *	220 *	29.0 *	9.0 *
IW-ISCO-8	N/A	229.0 *	228.5 *	221 *	N/A	278,870	1,241,501	2	200 *	220 *	29.0 *	9.0 *
IW-ISCO-9	N/A	229.0 *	228.5 *	221 *	N/A	278,864	1,241,537	2	200 *	220 *	29.0 *	9.0 *
IW-ISCO-10	N/A	229.0 *	228.5 *	221 *	N/A	278,897	1,241,521	2	200 *	220 *	29.0 *	9.0 *
IW-ISCO-11	N/A	228.6 *	228.1 *	221 *	N/A	278,842	1,241,382	2	200 *	220 *	28.6 *	8.6 *
IW-ISCO-12	N/A	228.1 *	227.6 *	221 *	N/A	278,884	1,241,408	2	200 *	220 *	28.1 *	8.1 *
IW-ISCO-13	N/A	227.7 *	227.2 *	221 *	N/A	278,926	1,241,436	2	200 *	220 *	27.7 *	7.7 *
PZ-01	N/A	224.5 *	224.04	209	N/A	278,999	1,242,210	2	198	208	26.5 *	16.5 *
PZ-02	N/A	227.5 *	226.99	209	N/A	278,477	1,241,653	2	198	208	29.5 *	19.5 *
PZ-03	N/A	228.4 *	227.90	209	N/A	278,321	1,242,063	2	198 *	208 *	30.4 *	20.4 *
PZ-04	N/A	225.1 *	224.63	211	N/A	278,687	1,241,743	2	201	211	24.1 *	14.1 *
PZ-05	N/A	227.3 *	226.81	207	N/A	278,576	1,241,082	2	196	206	31.3 *	21.3 *
PZ-06	N/A	230.7 *	230.20	212.5	N/A	279,038	1,241,414	2	201.5	211.5	29.2 *	19.2 *
PZ-07	N/A	218.4 *	217.88	201	N/A	279,410	1,241,606	2	190	200	28.4 *	18.4 *
EW-01	N/A	220.8 *	219.30	252	N/A	278,985	1,241,214	10	182 * 238 *	222 * 248 *	38.8 * -17.2 *	-1.2 * -27.2 *
EW-02	N/A	224.1 *	222.61	250	N/A	279,181	1,241,367	10	182 * 229 *	214 * 240 *	42.1 * -4.9 *	10.1 * -15.9 *
IW-01	N/A	226.3 *	225.99	258	N/A	278,205	1,241,694	6	183	248	43.3 *	-21.7 *
IW-02	N/A	225.6 *	225.27	258	N/A	278,227	1,241,767	6	183	248	42.6 *	-22.4 *
IW-03	N/A	225.3 *	224.99	258	N/A	278,192	1,241,790	6	183	248	42.3 *	-22.7 *
IW-04	N/A	226.0 *	225.68	258	N/A	278,167	1,241,826	6	183	248	43.0 *	-22.0 *
IW-05	N/A	224.8 *	224.48	258	N/A	278,151	1,241,758	6	183	248	41.8 *	-23.2 *

Notes:
1. Coordinates based on Horizontal Datum : NAD'83, SPC (3104 NY L); Vertical Datum: NAVD 88
* Elevations are estimated.

Acronyms:
bgs - below ground surfaces
ft - feet
MPW- multi port well
IW- injection well
N/A - Not Applicable
EW- extraction well
ISCO- in-situ chemical oxidation
amsl- above mean sea level
NAVD - North American Vertical Datum

Table 5-1
Summary of Baseline Sample Results
Remedial Action Report
Lawrence Aviation Industries Superfund Site, Port Jefferson Station, New York

Sample ID		ISCO-MW2-BL	ISCO-MW5-BL	MPW-01-A-BL	MPW-01-B-BL	MPW-01-B-BL-DUP	MPW-01-C-BL	MPW-02-B-BL	MPW-02-C-BL	MPW-02-D-BL	MPW-03-A-BL	MPW-03-B-BL	MPW-03-C-BL	MPW-03-D-BL	MPW-04-A-BL
Well ID		ISCO-MW2	ISCO-MW5	MPW-01-A	MPW-01-B	MPW-01-B-DUP	MPW-01-C	MPW-02-B	MPW-02-C	MPW-02-D	MPW-03-A	MPW-03-B	MPW-03-C	MPW-03-D	MPW-04-A
sample_date		8/25/2010	8/26/2010	8/27/2010	8/27/2010	8/27/2010	8/27/2010	8/18/2010	8/18/2010	8/19/2010	8/19/2010	8/19/2010	8/19/2010	8/19/2010	8/23/2010
Parameters	**Unit**														
Volatile Organic Compounds	ug/L														
1,1,1-Trichloroethane		0.061 J	NS	0.5 U	0.36 J	0.36 J	1	1.1	0.75	0.54	0.036 J	0.5 U	0.45 J	0.27 J	0.5 U
1,1-Dichloroethane		0.5 U	NS	0.5 U	0.11 J	0.11 J	2.5	1.8	1.2	0.64	0.07 J	0.5 U	0.54	1.2	0.034 J
1,1-Dichloroethene		0.5 U	NS	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Chloroform		0.5 U	NS	0.42 J	0.82	0.79	0.65	0.59	0.85	0.68	0.11 J	0.18 J	0.38 J	0.15 J	0.5 U
cis-1,2-Dichloroethene		0.5 U	NS	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.73	0.5 U	0.5 U	0.16 J	0.31 J	1.1
Tetrachloroethene		8.4	NS	0.062 J	0.12 J	0.11 J	0.07 J	0.45 J	0.44 J	6.7	0.091 J	0.39 J	0.41 J	0.14 J	14
Trichloroethene		69 D	NS	0.5 U	0.5 U	0.5 U	0.36 J	2.1	34 D	180 D	2.3	5.3	4.9	1.5	24 D
Vinyl Chloride		0.5 UJ	NS	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Total CVOCs[1]		**77.5**	**-**	**0.5**	**1.4**	**1.4**	**4.6**	**5.6**	**37.2**	**189.3**	**2.6**	**5.9**	**6.8**	**3.6**	**39.1**
Metals	ug/L														
Aluminum		9770	NS	200 UJ	200 UJ	200 UJ	375 J	200 UJ	257 UJ	200 UJ	200 UJ	1710 J	200 UJ	300 J	200 U
Antimony		60 U	NS	60 UJ	60 UJ	60 UJ	60 UJ	60 UJ	60 UJ	60 UJ	60 UJ	60 UJ	60 UJ	60 UJ	60 U
Arsenic		10 U	NS	10 UJ	10 UJ	10 UJ	10 UJ	10 UJ	10 UJ	10 UJ	10 UJ	10 UJ	10 UJ	10 UJ	10 U
Barium		43.1 J	NS	103 J	151 J	152 J	31.2 J	80.6 J	77.5 J	135 J	21.2 J	34.2 J	79.6 J	37.8 J	24 J
Beryllium		1.5 J	NS	0.32 J	5 UJ	5 UJ	5 UJ	0.36 J	5 UJ	5 UJ	5 UJ	0.42 J	5 UJ	5 UJ	5 U
Cadmium		5 U	NS	0.86 J	5 UJ	5 UJ	5 UJ	5 UJ	5 UJ	5 UJ	5 UJ	5 UJ	5 UJ	5 UJ	5 U
Calcium		19400	NS	19500 J	18300 J	18600 J	27800 J	19700 J	17700 UJ	24900 J	11900 J	12200 J	19800 J	11800 J	27800
Chromium		132	NS	136 J	1.4 J	1.3 J	4.2 J	3.2 J	6.4 J	3.4 J	1.1 J	2.7 J	1.9 J	13.9 J	1120
Cobalt		1.2 J	NS	5.5 J	50 UJ	50 UJ	50 UJ	50 UJ	50 UJ	50 UJ	50 UJ	1.2 J	50 UJ	50 UJ	50.5
Copper		25.6	NS	25 UJ	25 UJ	7 J	25 UJ	25 UJ	25 UJ	25 UJ	25 UJ	25 UJ	25 UJ	25 UJ	25 U
Iron		854 J	NS	3280 J	100 UJ	100 UJ	445 J	100 UJ	378 J	100 UJ	1080 J	8530 J	100 UJ	7880 J	59500 J
Lead		10 U	NS	10 UJ	10 UJ	10 UJ	10 UJ	10 UJ	10 UJ	10 UJ	10 UJ	10 UJ	10 UJ	10 UJ	5 J+
Magnesium		8650	NS	7010 J	8950 J	9100 J	12300 J	9920 J	8320 J	9480 J	4880 J	5060 J	7410 J	2810 J	15800
Manganese		2350	NS	826 J	8.3 J	7.2 J	29.4 J	0.53 J	4.2 J	18 J	418 J	689 J	170 J	464 J	851
Mercury		0.63	NS	0.2 UJ	0.2 UJ	0.2 UJ	0.2 UJ	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Nickel		289	NS	409 J	40 UJ	40 UJ	40 UJ	14.1 J	6.9 J	4.2 J	2.4 J	8.6 J	219 J	14.1 J	5570
Potassium		20600	NS	5330 J	2720 J	2740 J	1900 J	1730 J	3610 J	3320 J	1610 J	2130 J	2080 J	1830 J	13800
Selenium		35 U	NS	35 UJ	35 UJ	35 UJ	35 UJ	35 UJ	35 UJ	35 UJ	35 UJ	35 UJ	35 UJ	35 UJ	35 U
Silver		10 UJ	NS	10 UJ	10 UJ	10 UJ	1.4 J	10 UJ	10 UJ	10 UJ	10 UJ	10 UJ	10 UJ	10 UJ	10 UJ
Sodium		32000	NS	27000 J	29900 J	30500 J	17200 J	22000 J	14800 J	23300 J	11600 J	13200 J	20300 J	17800 J	25600
Thallium		25 U	NS	25 UJ	25 UJ	25 UJ	25 UJ	25 UJ	25 UJ	25 UJ	25 UJ	25 UJ	25 UJ	25 UJ	25 U
Vanadium		50 U	NS	50 UJ	50 UJ	50 UJ	50 UJ	50 UJ	4.4 J	2.5 J	50 UJ	50 UJ	50 UJ	50 UJ	50 U
Zinc		72.4	NS	60 UJ	60 UJ	60 UJ	60 UJ	3.7 J	5.6 J	3.8 J	2.7 J	13.4 J	2.6 J	12.3 J	60 U
Wet Chemistry	mg/L														
Alkalinity, Total (as CaCO3)		41.6	35.3	15.6	10.7	11.8	71.1	30.2	35.2	58.4	44.7	23.5	54.4	25.2	131
Hardness As CaCO3		96.3	104	120	80.2	80.2	112	100	56.2	100	56.2	64.2	92.3	60.2	530
Total Dissolved Solids		267	239	270	230	214	192	216	156	186	89	110	162	111	364
Total Suspended Solids		38	5	5 U	6.5	8	25.5	5 U	19.5	7	12	270	9.5	28.5	8.5
Total Organic Carbon		1.9	1 U	4.1	1 U	1 U	1 U	1 U	1 U	0.51 J	1 U	1 U	1 U	1.1	5.2
Sulfate		31.2 J	43.2 J	28.7 J	30 J	29.6 J	15.7 J+	29.2 N	15	23.1	14.3	21.3	20.1 N	20	59.7
Chloride		28.6 J	40.3 J	43.8 J	42.1 J	42.2 J	16.3 J+	26.9	21	25.4	10	13.5	22.3	26.5	74.4
Fluoride		28.9 J	2.1 J	1 UJ	1 UJ	1 UJ	1 UJ	1 U	4.6	1 U	1 U	1 U	1 U	1 U	1 U
Ammonia as N		0.12	0.05 U	0.19	0.098	0.092	0.092	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.19	0.12
Nitrogen, Total Kjeldahl		0.38 R	0.2 R	1.1 R	1.2 R	0.22 R	0.44 R	0.2 U	0.21	0.2 U	0.2 U	0.2 U	0.2 U	0.63	0.63 R

Notes:
1. Non-detects were assumed to have a value of 0.

Acronyms:

NS- not sampled
NA- not applicable
MPW - multi-port well
ISCO - in-situ chemical oxidation
MW - monitoring well
J - estimated value
U- not detected
D - dilution sample
R- rejected value
CVOC - chlorinated volatile organic compound
BL- baseline
DUP - duplicate
ug/L - microgram per liter
mg/L - milligram per liter
CaCO3 - calcium carbonate
ID - identification
N - nitrogen

Table 5-1
Summary of Baseline Sample Results
Remedial Action Report
Lawrence Aviation Industries Superfund Site, Port Jefferson Station, New York

Sample ID		MPW-04-B-BL	MPW-04-C-BL	MPW-04-D-BL	MPW-04-E-BL	MPW-07-B-BL	MPW-10-A-BL	MPW-10-B-BL	MPW-10-C-BL	MPW-10-D-BL	MW-PD-11-BL	MW-PD-12-BL	MW-PD-13-BL	MW-05-BL	MW-05-BL-DUP
Well ID		MPW-04-B	MPW-04-C	MPW-04-D	MPW-04-E	MPW-07-B	MPW-10-A	MPW-10-B	MPW-10-C	MPW-10	MW-PD-11	MW-PD-12	MW-PD-13	MW-05	MW-05-DUP
sample_date		8/23/2010	8/31/2010	8/24/2010	8/24/2010	8/26/2010	8/30/2010	8/30/2010	8/30/2010	8/30/2010	8/23/2010	8/24/2010	8/25/2010	8/26/2010	8/26/2010
Parameters	**Unit**														
Volatile Organic Compounds	ug/L														
1,1,1-Trichloroethane		0.025 J	0.085 J	0.34 J	2.1	NS	0.22 J	0.23 J	0.51 J	1.2 J	0.081 J	0.1 J	0.089 J	0.033 J	0.029 J
1,1-Dichloroethane		0.5 U	0.09 J	0.36 J	3.1	NS	0.2 J	0.14 J	0.36 J	1.4 J	0.051 J	0.6 U	0.5 U	0.5 U	0.5 U
1,1-Dichloroethene		0.5 U	0.5 U	0.5 U	0.5 U	NS	0.5 UJ	0.5 UJ	0.5 UJ	0.5 UJ	0.5 U	0.6 U	0.5 U	0.5 U	0.5 U
Chloroform		0.33 J	0.25 J	0.42 J	0.81	NS	0.3 J	0.38 J	0.5 J	0.65 J	1.1	0.6 U	0.5 U	0.37 J	0.36 J
cis-1,2-Dichloroethene		0.58	0.34 J	0.26 J	0.5 U	NS	0.98 J	0.87 J	1 J	0.064 J	0.5 U	1.2	0.5 U	0.5 U	0.5 U
Tetrachloroethene		21 D	2.5	5.5	0.82	NS	20 J	20 J	13 J	1.1 J	0.5 U	4.2	0.5 U	0.11 J	0.12 J
Trichloroethene		38 D	16	11	0.88	NS	50 J	53 J	42 J	1.7 J	0.5 U	230 D	0.5 U	0.63	0.7
Vinyl Chloride		0.5 U	0.5 U	0.5 U	0.5 U	NS	0.5 UJ	0.5 UJ	0.5 UJ	0.5 UJ	0.5 U	0.6 U	0.5 U	0.5 U	0.5 U
Total CVOCs[1]		**59.9**	**19.3**	**17.9**	**7.7**	**NS**	**71.7**	**74.6**	**57.4**	**6.1**	**1.2**	**235.5**	**0.1**	**1.1**	**1.2**
Metals	ug/L														
Aluminum		200 U	200 UJ	109 J	200 U	NS	200 UJ	200 UJ	200 UJ	200 UJ	210	1810	93.8 J	91.2 J	200 U
Antimony		60 U	60 UJ	60 U	60 U	NS	60 UJ	60 UJ	60 UJ	60 UJ	60 U	60 U	60 U	60 U	60 U
Arsenic		10 U	10 UJ	10 U	10 U	NS	10 UJ	10 UJ	10 UJ	10 UJ	10 U	10 U	10 U	10 U	10 U
Barium		89.2 J	55.8 J	39.4 J	102 J	NS	112 J	98.8 J	151 J	43.6 J	124 J	44.3 J	113 J	28.9 J	29.4 J
Beryllium		5 U	5 UJ	5 U	5 U	NS	5 UJ	5 UJ	5 UJ	5 UJ	5 U	1.1 J	5 U	5 U	5 U
Cadmium		5 U	5 UJ	5 U	5 U	NS	5 UJ	5 UJ	5 UJ	5 UJ	5 U	5 U	5 U	5 U	5 U
Calcium		26000	25800 J	17300	20400	NS	31200 J	38700 J	21100 J	15100 J	19400	15000	18100	11700	11900
Chromium		6.1 J	12.5 J	4.3 J	7.1 J	NS	10 UJ	2 J	5.8 J	22.6 J	19	22.5	342	7.1 J	6.3 J
Cobalt		50 U	50 UJ	50 U	50 U	NS	21.7 J	50 UJ	50 UJ	50 UJ	32.9 J	13.7 J	4.4 J	50 U	50 U
Copper		25 U	25 UJ	25 U	25 U	NS	25 UJ	25 UJ	25 UJ	25 UJ	7.2 J	9.3 J	21.4 J	4.3 J	25 U
Iron		100 UJ	10.6 J	100 U	100 UJ	NS	100 UJ	100 UJ	100 UJ	100 UJ	539 J	422 J	1790 J	179 J	182 J
Lead		10 U	10 UJ	10 U	10 U	NS	10 UJ	10 UJ	10 UJ	10 UJ	10 U	10 U	10 U	10 U	10 U
Magnesium		11900	13800 J	8570	10100	NS	17000 J	21300 J	10800 J	7800 J	6930	7050	9080	6130	6300
Manganese		9.5 J	2 J	14.8 J	15 U	NS	199 J	37.9 J	3.7 J	0.66 J	1270	246	78	7.5 J	5.4 J
Mercury		0.2 U	0.2 UJ	0.2 U	0.2 U	NS	0.2 UJ	0.2 UJ	0.2 UJ	0.2 UJ	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Nickel		40 U	40 UJ	74.7	40 U	NS	40 UJ	40 UJ	13.2 J	40 UJ	15.8 J	23.8 J	288	5.3 J	4.3 J
Potassium		21100	38900 J	20700	23400	NS	26500 J	32500 J	48800 J	30400 J	12400	14200	1440 J	1610 J	1500 J
Selenium		35 U	35 UJ	35 U	35 U	NS	35 UJ	35 UJ	35 UJ	35 UJ	35 U	35 U	4.9 J	35 U	35 U
Silver		10 UJ	10 UJ	10 UJ	10 UJ	NS	1.1 J	10 UJ	10 UJ	10 UJ	10 UJ	10 UJ	10 UJ	10 UJ	10 UJ
Sodium		24800	29000 J	24000	25000	NS	29600 J	38300 J	27200 J	23700 J	18400	23200	25700	12800	13100
Thallium		25 U	25 UJ	25 U	25 U	NS	25 UJ	25 UJ	25 UJ	25 UJ	25 U	25 U	25 U	2.3 J	25 U
Vanadium		50 U	2.2 J	50 U	3.3 J	NS	50 UJ	50 UJ	50 UJ	6.3 J	2.4 J	1.8 J	1.8 J	50 U	50 U
Zinc		60 U	60 UJ	60 U	60 U	NS	60 UJ	60 UJ	60 UJ	60 UJ	60 U	60 U	60 U	60 U	60 U
Wet Chemistry	mg/L														
Alkalinity, Total (as CaCO3)		61.3	64.2	26.6	54.7	113	93.6	94.6	67.5	36.9	44.7	28.1	28.2	10.8	10.3
Hardness As CaCO3		124	NS	96.3	88.3	923	119	169	108	96.2	80.2	72.2	76.2	56.2	60.2
Total Dissolved Solids		261	283	210	256	1300	304	403	289	224	170	174	181	129	110
Total Suspended Solids		5 U	7	5 U	5 U	9.5	39.5	5 U	8.5	5 U	27.5	12	10.5	20 J	5 U
Total Organic Carbon		1.2	NS	1 U	1 U	13.6	3.3	2	1 U	1 U	1.9	1 U	1 U	1 U	1 U
Sulfate		36.8	54.3 J	36.2	25.6 N	26 J	53.1 J	97.2 J	58.1 J	31.7 J	18.1	30.2 J	23.7 J	19.6	19.6
Chloride		32.9	37.8 J	34	29.6	21.9 J	44.9 J	53.9 J	34.5 J	31 J	26.4	19.8 J	46.6 J	18.2	18.3
Fluoride		1.3	2.5 J	1.5	1 U	391 J	1 UJ	1 UJ	1.2 UJ	1 UJ	1 U	4.3 J	1 UJ	1 U	1 U
Ammonia as N		0.13	NS	0.15	0.09	0.25 U	0.24	0.087	0.086	0.12	1.2 N	0.22	0.068	0.05 U	0.05 U
Nitrogen, Total Kjeldahl		0.3 R	NS	0.25 R	1.1 R	0.72 R	0.58 R	0.44 R	0.2 R	0.22	1.3 R	0.41 R	0.2 R	0.2 U	0.22

Notes:
1. Non-detects were assumed to have a value of Cvalue of 0.

Acronyms:
NS- not sampled
NA- not applicable
MPW - multi-port well
ISCO - in-situ chemical oxidation
MW - monitoring well
J - estimated value
U- not detected
D - dilution sample
R- rejected value
CVOC - chlorinated volatile organic compound
BL- baseline
DUP - duplicate
ug/L - microgram per liter
mg/L - milligram per liter
CaCO3 - calcium carbonate
ID - identification
N - nitrogen

Table 5-2
ITP Operating Parameters
Remedial Action Report
Lawrence Aviation Industries Superfund Site, Port Jefferson Station, New York

Day	ASB_FR max scfm	ASB_FR avg scfm	ASB_P max in WC	ASB_P avg in WC	EFF_PH max pH units	EFF_PH min pH units	EFF_PH avg pH units	EW1_FR max gpm	EW1_FR avg gpm	EW1_WTE max ft, amsl	EW1_WTE avg ft, amsl	EW2_FR max gpm	EW2_FR avg gpm	EW2_WTE max ft, amsl	EW2_WTE avg ft, amsl	IW1_FR max gpm	IW1_FR avg gpm	IW1_WTE max gpm	IW1_WTE avg gpm
9/15/11	1419	1255	15.69	10.10	7.54	7.12	7.27	75	47	40.71	39.13	75	47	39.18	37.75	10	0	46.17	43.67
9/16/11	1530	1254	15.94	10.02	7.43	7.12	7.24	87	27	40.80	39.93	88	27	39.15	38.36	24	1	138.20	45.48
9/17/11	1543	1281	14.84	10.05	7.52	6.98	7.27	194	28	40.83	39.92	75	26	39.19	38.33	14	0	51.51	43.61
9/18/11	1277	1259	10.05	9.87	7.26	7.22	7.23	75	75	38.26	38.20	75	75	36.76	36.70	79	6	89.68	60.66
9/19/11	1472	1249	12.99	9.97	7.39	7.22	7.24	75	72	40.32	38.21	75	72	38.60	36.71	36	3	169.15	53.19
9/20/11	1351	1232	11.79	9.86	7.37	7.21	7.25	87	75	40.13	38.02	88	75	38.43	36.49	0	0	43.73	43.67
9/21/11	1268	1243	10.13	9.99	7.36	7.26	7.28	76	76	37.94	37.90	76	76	36.46	36.39	88	2	59.28	48.10
9/22/11	1329	1263	11.25	10.38	7.44	7.28	7.34	76	62	40.23	38.33	76	62	38.61	36.82	31	3	66.79	52.16
9/23/11	1339	1280	11.51	10.63	7.44	7.34	7.38	66	56	40.17	38.50	66	56	38.55	36.98	0	0	45.78	44.32
9/24/11	1312	1284	11.01	10.72	7.44	7.41	7.43	55	53	38.78	38.67	55	53	37.28	37.19	0	0	46.05	45.84
9/25/11	1388	1250	13.09	10.33	7.44	7.32	7.39	75	59	40.24	38.47	75	59	38.61	36.96	30	7	108.75	70.26

Legend:

ASB_FR	Air stripper blower B-1 flow rate	P1_FR	Discharge pump P-1 flow rate	ITP	initial testing period
ASB_P	Air stripper blower B-1 pressure	EFF_PH	Effluent pH	in	inches
EW1_FR	Extraction well EW-01 flow rate	scfm	standard cubic feet per minute	min	minimum
EW1_WTE	Extraction well EW-01 water table elevation	gpm	gallons per minute	max	maximum
EW2_FR	Extraction well EW-02 flow rate	WC	water column	avg	average
EW2_WTE	Extraction well EW-02 water table elevation	ft, amsl	feet above mean sea level		
EW2_WTE	Extraction well EW-02 water table elevation	ft, amsl	feet above mean sea level		

Table 5-2
ITP Operating Parameters
Remedial Action Report
Lawrence Aviation Industries Superfund Site, Port Jefferson Station, New York

Day	IW2_FR max gpm	IW2_FR avg gpm	IW2_WTE max gpm	IW2_WTE avg gpm	IW3_FR max gpm	IW3_FR avg gpm	IW3_WTE max gpm	IW3_WTE avg gpm	IW4_FR max gpm	IW4_FR avg gpm	IW4_WTE max gpm	IW4_WTE avg gpm	IW5_FR max gpm	IW5_FR avg gpm	IW5_WTE max gpm	IW5_WTE avg gpm	P1_FR max gpm
9/15/11	6	0	43.65	43.45	66	1	43.88	43.63	76	30	100.78	61.80	137	63	95.27	62.17	164
9/16/11	46	0	45.08	43.44	26	5	158.96	68.11	78	21	104.57	57.91	156	30	120.38	65.07	186
9/17/11	105	11	56.66	44.67	10	0	58.62	43.95	66	18	106.50	57.14	80	29	152.39	74.64	163
9/18/11	147	86	161.60	92.63	0	0	100.78	44.70	83	36	109.74	70.97	85	23	163.59	79.54	175
9/19/11	145	48	189.39	124.84	78	9	156.64	85.29	137	65	124.77	91.60	113	21	153.99	90.60	173
9/20/11	36	22	168.05	121.96	16	9	144.60	97.80	125	90	152.66	126.22	48	31	174.41	120.77	195
9/21/11	29	20	168.06	127.42	14	7	87.19	83.05	119	96	173.75	158.86	46	30	177.80	132.84	178
9/22/11	38	22	186.95	142.76	8	3	90.75	42.39	112	79	185.04	157.03	55	21	183.85	120.23	178
9/23/11	34	20	179.93	142.61	0	0	bv	bv	102	72	181.34	146.97	45	20	167.88	112.30	147
9/24/11	30	19	163.01	153.73	0	0	bv	bv	77	58	156.86	132.40	39	25	185.51	141.64	121
9/25/11	26	18	172.98	144.12	0	0	bv	bv	95	69	168.92	143.25	48	24	200.72	146.33	158

Legend:

ASB_FR	Air stripper blower B-1 flow rate	P1_FR	Discharge pump P-1 flow rate	ITP	initial testing period
ASB_P	Air stripper blower B-1 pressure	EFF_PH	Effluent pH	in	inches
EW1_FR	Extraction well EW-01 flow rate	scfm	standard cubic feet per minute	min	minimum
EW1_WTE	Extraction well EW-01 water table elevation	gpm	gallons per minute	max	maximum
EW2_FR	Extraction well EW-02 flow rate	WC	water column	avg	average
EW2_WTE	Extraction well EW-02 water table elevation	ft, amsl	feet above mean sea level		
EW2_WTE	Extraction well EW-02 water table elevation	ft, amsl	feet above mean sea level		

Table 5-3
Summary of Extraction Well Groundwater Influent CVOC Data and Estimated Mass Removal Rates
Remedial Action Report
Lawrence Aviation Superfund Site, Port Jefferson Station, New York

Sampling Date	Extraction Well	Avg Flow Rate (gpm)	Concentration of CVOCs (µg/L) 1,1,1-TCA		1,1-DCA		1,1-DCE		Chloroform		cis-1,2-DCE		PCE		TCE		VC		Total CVOCs[1] (µg/L)	Mass Removal Rate (lb/d)[2]	No of days	Total Mass (lb)
9/15/10	EW-01	81	0.32	J	0.20	J	0.75	U	0.38	J	0.95		9.5		240	D	0.75	U	251	0.2	1	0.2
	EW-02	82	0.12	J	0.50	U	0.50	U	0.28	J	0.43	J	3.5		150	D	0.50	U	154	0.2		0.2
	Total	163	-		-		-		-		-		-		-		-		-	0.4		0.4
9/16/10	EW-01	75	0.33	J	0.20	J	0.75	U	0.44	J	1.0		9.1		270	J	0.75	U	281	0.3	3	0.8
	EW-02	75	4.6	J	0.068	J	0.50	U	0.29	J	0.37	J	2.9		140	J	0.50	U	148	0.1		0.4
	Total	150	-		-		-		-		-		-		-		-		-	0.4		1.2
9/19/10	EW-01	75	0.29	J	0.22	J	0.50	U	0.41	J	0.81		6.7		180	D	0.50	U	188	0.2	1	0.2
	EW-02	75	0.094	J	0.50	U	0.50	U	0.50	U	0.35	J	2.7		110	D	0.50	U	113	0.1		0.1
	Total	150	-		-		-		-		-		-		-		-		-	0.3		0.3
9/20/10	EW-01	75	6.4	U	6.4	U	0.50	U	0.38	J	0.83	JD	5.9	JD	160	JD	0.50	U	167	0.2	6	0.9
	EW-02	75	3.8	U	3.8	U	0.50	U	0.50	U	3.8	U	2.0	JD	88	JD	0.50	U	90	0.1		0.5
	Total	150	-		-		-		-		-		-		-		-		-	0.2		1.4
	Total for ITP		-		-		-		-		-		-		-		-		-	-	11	**3.2**
	Total for ITP - adjusted for 83% uptime																					**2.7**

Notes:
1. Assumes non-detects have a value of 0.
2. The mass removal rate was calculated using the following formula:
Groundwater Influent Concentration (µg/L) x Groundwater Flow Rate (gpm) x 1440 min/day x 3.79 L/gal x 1 lb/453,600,000µg

Acronyms:

PCE - tetrachloroethene
TCE - trichloroethene
DCE -Dichloroethene
VC - vinyl chloride
ITP- initial testing period

DCA- dichloroethane
TCA- trichloroethane
CVOCs - chlorinated volatile organic compounds
lb/d - pound per day
µg/L - microgram per liter

gpm- gallon per minute
U - not detected
D - dilution sample
J - estimated value
Avg - average

Table 5-4
Summary of SPDES Permit Equivalent Compliance Data
Remedial Action Report
Lawrence Aviation Industries Superfund Site, Port Jefferson Station, New York

Sampling Date		9/15/2010 (Day 1)		9/16/2010 (Day 2)		9/19/2010 (Day 4)		9/20/2010 (Day 5)	
CVOCs	SPDES Discharge Criteria	EFF-02 (facility effluent)		EFF-02 (facility effluent)		EFF-02 (facility effluent)		EFF-02 (facility effluent)	
1,1-DCA	5 µg/L	0.50	U	0.50	U	0.50	U	0.50	U
cis-1,2-DCE	5 µg/L	0.50	U	0.50	U	0.50	U	0.50	U
PCE	5 µg/L	0.50	U	0.50	U	0.50	U	0.50	U
1,1,1-TCA	5 µg/L	0.50	U	0.50	U	0.50	U	0.50	U
TCE	5 µg/L	0.50	U	0.068	J	0.11	J	0.19	J
Aluminium	monitor mg/L	1,460	J	1,320	J	1,300	J	1,450	J
Chromium	100 µg/L	11.5	J	12.6	J	12	J	11.3	J
Fluoride	monitor mg/L	5.2		5.1		6		5.4	
Iron	600 µg/L	100	UJ	100	UJ	100	UJ	100	UJ
Lead	50 µg/L	10	UJ	10	UJ	10	UJ	10	UJ
Manganese	600 µg/L	35.6	J	36.6	J	38.1	J	36.5	J
Nickel	200 µg/L	37.2	J	37.3	J	35.9	J	36.8	J
Sum of Iron & Manganese	< 1000 µg/L	< 135.6	J	< 136.6	J	< 138.1	J	< 136.5	J
pH[1]	5.8 to 8.5 SU	7.35		7.38		7.38		7.40	

Notes:
1. Reported values are representative of average operating conditions. pH is monitored on a continuous basis via an in-line pH meter.

Acronyms:
PCE - tetrachloroethene
TCE - trichloroethene
DCE - dichloroethene
DCA - dichloroethane
TCA - trichloroethane
SU - standard unit
CVOCs - chlorinated volatile organic compounds
µg/L - microgram per liter
mg/L - milligram per liter
SPDES - State Pollutant Discharge Elimination System
U - non detect
D- diluted result
J - result is estimated
ITP - Initial Testing Program

Table 5-5
Summary of Air Pollution Control Permit Equivalent Compliance Data
Remedial Action Report
Lawrence Aviation Industries Superfund Site, Port Jefferson Station, New York

Sampling Date	CVOC	Effluent Air Concentration (ppbv)[1]		Molecular Weight (g/mol)	Air Flow Rate (cfm)	Emissions Rate (lb/day)[2]	Permit Equivalent (lb/day)
9/15/2010 (Day 1)	PCE	<0.20	U	165.82	1,255	<0.00015	0.0055
	TCE	<0.20	U	131.38	1,255	<0.00012	0.132
9/16/2010 (Day 2)	PCE	<0.20	U	165.82	1,254	<0.00015	0.0055
	TCE	<0.20	U	131.38	1,254	<0.00012	0.132
9/19/2010 (Day 4)	PCE	<0.20	U	165.82	1,259	<0.00015	0.0055
	TCE	<0.20	U	131.38	1,259	<0.00012	0.132
9/20/2010 (Day 5)	PCE	<0.20	U	165.82	1,262	<0.00015	0.0055
	TCE	<0.20	U	131.38	1,262	<0.00012	0.132
9/25/2010 (Day 10)	PCE	<0.20	U	165.82	1,284	<0.00016	0.0055
	TCE	<0.20	U	131.38	1,284	<0.00012	0.132

Notes:
1. Data was obtained via TO-15 analysis during ITP.
2. The emmission rate was calculated using the formula:
Effluent Air Concentration (ppbv) x Molecular Weight (g/mol) x Air Flow Rate (cfm) x (1440 min/day) x (1 lb/453.6 g) x (1 mol/24.47 L at STP) x (1 L/0.0353 cf) x 1/10^9

Acronyms:
CVOC - chlorinated volatile organic compound
ppbv - parts per billion by volume
g - grams
mol - mole
cfm - cubic feet per minute
PCE - tetrachloroethene
TCE - trichloroethene
J - result is estimated
lb/d - pounds per day
ITP - Initial Testing Program
min/day - minimum per day
L - liter
STP - standard temperature and pressure

Table 5-6
Summary of Quality Control Test Results - Soil Compaction
Remedial Action Report
Lawrence Aviation Industries Superfund Site, Port Jefferson Station, New York

Date	Location	Optimum Moisture	% Compaction Required [1]	% Compaction [1]	% Moisture [2]	Passed Compaction Requirement
GWTF footer construction						
4/30/2010	Pipe trench westside, 4 ft east of west footing, 2 ft below subgrade	7.8	95	97.6	5.2	Y
4/30/2010	Northeast corner footing bottom	7.8	95	96.4	4.6	Y
4/30/2010	Southeast corner footing bottom	7.8	95	97.0	4.6	Y
4/30/2010	Southwest corner footing bottom	7.8	95	95.8	5.1	Y
4/30/2010	Northwest corner footing bottom	7.8	95	95.9	5.1	Y
Effluent Yard Pipe Trench [3]						
5/25/2010	460 ft south of GWTF, 1 ft above electrical & water pipes	11.9	90	95.2	5.2	Y
5/25/2010	560 ft south of GWTF, 1 ft above electrical & water pipes	11.9	90	95.0	5.2	Y
5/25/2010	410 ft south of GWTF, 1 ft above electrical & water pipes	7.8	90	97.5	8.0	Y
5/25/2010	465 ft south of GWTF, 2 ft above electrical & water pipes	11.9	90	95.9	4.6	Y
5/25/2010	565 ft south of GWTF, 2 ft above electrical & water pipes	11.9	90	98.5	4.6	Y
5/25/2010	465 ft south of GWTF, 3 ft above electrical & water pipes	11.1	90	95.0	8.0	Y
5/25/2010	565 ft south of GWTF, 3 ft above electrical & water pipes	11.1	90	95.4	8.0	Y
5/25/2010	465 ft south of GWTF, 4 ft above electrical & water pipes	9.3	90	95.0	8.0	Y
5/25/2010	565 ft south of GWTF, 4 ft above electrical & water pipes	9.3	90	95.7	8.0	Y
5/25/2010	466 ft south of GWTF, 5 ft above electrical & water pipes	9.3	90	95.0	10.4	Y
5/25/2010	566 ft south of GWTF, 5 ft above electrical & water pipes	9.3	90	95.2	10.4	Y
Influent Yard Pipe Trench						
7/19/2010	192 ft south of service connection, 2 ft below existing grade	7.8	90	95.7	7.4	Y
7/19/2010	279 ft south of service connection, 2 ft below existing grade	7.8	90	95.6	7.4	Y
7/19/2010	397 ft south of service connection, 2 ft below existing grade	7.4	90	95.7	4.7	Y
7/19/2010	497 ft south of service connection, 2 ft below existing grade	7.4	90	95.9	6.2	Y
7/19/2010	598 ft south of service connection, 2 ft below existing grade	7.4	90	95.1	6.2	Y
7/19/2010	99 ft north of water treatment building, 2 ft below existing grade	7.4	90	95.8	4.2	Y
7/19/2010	199 ft north of water treatment building, 2 ft below existing grade	7.4	90	96.3	6.0	Y
7/19/2010	299 ft north of water treatment building, 2 ft below existing grade	7.4	90	95.2	6.0	Y
7/19/2010	195 ft south of service connection, 1 ft below existing grade	6.8	90	95.3	6.3	Y
7/19/2010	280 ft south of service connection, 1 ft below existing grade	6.8	90	95.9	6.3	Y
7/19/2010	396 ft south of service connection, 1 ft below existing grade	6.8	90	95.2	6.8	Y
7/19/2010	496 ft south of service connection, 1 ft below existing grade	6.8	90	96.2	6.2	Y
7/19/2010	597 ft south of service connection, 1 ft below existing grade	6.8	90	96.0	6.2	Y

Notes:
1. Compaction as determined by ASTM D1556 Standard Proctor.
2. Although not all moisture readings met the specification requirements of -2/+3 of the optimum moisture content, the moisture results were accepted in the field.
3. First 360 feet of GWTF effluent trench had already been backfilled and compacted upon Inspector's arrival. No compaction tests were performed in this area of the trench.

Acronyms:
PE - Professional Engineer
RA - remedial action
GWTF - groundwater treatment facility
ASTM - American Society for Testing and Materials
Ft - feet

Table 5-7
Summary of Quality Control Test Results - Concrete Slump and Compressive Strength
Remedial Action Report
Lawrence Aviation Industries Superfund Site, Port Jefferson Station, New York

Pour Date	Description	Slump Test Results[1]		Compression Test Results[2]																	
		Slump (inches)	Passed Spec's	Required Strength (psi)[2]	2 Day Test Date	2 Day Test Result	3 Day Test Date	3 Day Test Result	4 Day Test Date	4 Day Test Result	7 Day Test Date	7 Day Test Result[1]	14 Day Test Date	14 Day Test Result	21 Day Test Date	21 Day Test Result	28 Day Test Date	28 Day Test Result[1]	28 Day Test Result[2]	28 Day Test Result[3]	Passed Spec
6/10/10	Footings for groundwater treatment plant	4.5	Y	4,000	-	-	-	-	6/14/10	2,370	6/17/10	2,829	-	-	-	-	07/08/10	4,810	5,093	-	Y
6/22/10	Groundwater treatment building foundation walls	4.5	Y	4,000	6/24/10	2,101	6/25/10	2,546	-	-	6/29/10	3,038	7/6/10	3,537	7/13/10	4,315	07/20/10	4,415	4,520	4,480	Y
7/9/10	Groundwater treatment building slab	5.5	N [3]	4,000	-	-	-	-	-	-	7/16/10	2,964	-	-	-	-	08/06/10	5,199	5,129	5,093	Y
9/16/10	Driveways	5.0	Y	3,000	-	-	-	-	-	-	9/23/10	2,971	-	-	-	-	10/14/10	3,720	3,731	3,473	Y

Notes:

1. The specifications require a slump measurement in the range of 3-5 inches.
2. The specifications require a minimum concrete compressive strength of 4,000 psi for structural concrete and 3,000 psi for non-structural concrete.
3. The slump results of 5.5 inches was accepted in the field.

Acronyms:

GWTF - groundwater treatment facility
psi - pounds per square inch
Spec - Contract Specifications

Table 5-8
Field Orders
Remedial Action Report
Lawrence Aviation Industries Superfund Site, Port Jefferson Station, New York

#	Date	Subject	Location	Description
1	1/13/10	Elevations reference	NA	Specification 01550- Surveying, states to reference survey elevations to NGVD 1929. Elevations should be referenced to NAVD 1988.
2	1/14/10	Well centralizers	Extraction wells	The number of centralizers in each of the extraction wells was reduced to 3; to allow access for the tremie pipe and pevent potential damage to the well riser piping or loss of drilling equipment.
3	1/19/10	Extraction well and injection well test borings	Test borings	The sampling intervals for three test borings in the vicinity of EW-01, EW-02 and injection wells, respectively, was reduced from one sample every 5 ft to one sample every 10 ft from ground surface to 5 ft above the top of the screen.
4	4/21/10	Step testing injection wells	Injection wells	The step test rates were changed to 100 gpm, 200 gpm and 300 gpm and a maximum rate to be determined in the field.
5	4/21/10	Offsite chipping	GWTF	In lieu of mobilizing a chipper to the Site, the chipping of miscellaneous trees removed as part of clearing for installation of the GWTF was performed by the neighboring local commercial tree chipping facility.
6	5/6/10	Welding of riser pipe	Extraction wells riser pipe	Riser pipes were joined using weld rings and welding the riser pipes since the tolerance capabilities of threaded joints by Johnson screens would not meet alignment testing.
7	5/11/10	In-place density testing of soil	Site work	In-place density testing was performed via ASTM Method D1556-07 (Standard Test Method for Density and Dry Weight of Soil in Place by the Sand-Cone Method) instead of ASTM D2922 since it was determined that sand cone and balloon methods produce consistently accurate data in testing loose sandy soils.
8	5/10/10	Exterior electrical enclosures-rating change	NA	NEMA 3R rated electrical enclosures were accepted in lieu of NEMA 4 rated electrical enclosures for exterior use.
9	5/6/10	Step test timing requirement	Injection wells	Step testing of the five injection wells was performed consecutively over 10 days to better manage step test water handling.
10	5/11/10	Injection well development time requirement	Injection wells	Water quality parameters was the determining factor in ending well development instead of a time requirement.
11	5/21/10	Step test timing requirement	Injection wells	CDM approved step testing in 3 steps for 2 hours each instead of 4 steps at 2 hours each. The rates were at 100 gpm, 200 gpm and 300 gpm. The step tests would establish the specific capacity of the injection wells and these rates were sufficient for that purpose.
12	6/2/10	Relocation of IW-03	Injection wells	CDM approved relocation of IW-03, to approximately 90 ft southwest of the current location since drilling at current location was impeded by presence of gravel layer at 79 ft bgs.
13	8/10/10	Plumbness of Injection field wells	Injection wells	Due to the difficulties encountered during installation of Injection wells IW-01, -02, -03 and -05, resultant plumbness was greater than the tolerances described in Specification 02525. Effluent water was reinjected through gravity, where the existing plumbness was acceptable for the designed well function.
14	8/10/10	Density testing for non-structural fill	Trenches	In-place soil density testing for non-structural fill to be placed in work areas located within open fields was not required since all previous soil in-place density testing met specifications.

Acronyms:
ft - Feet
GWTF - Groundwater treatment facility
NA - Not applicable
EW - Extraction Well
IW - Injection Well
gpm - Gallons per minute
bgs - Below grade surface
NEMA - National Electrical Manufacturers Association
NAVD - North American Vertical Datum
NGVD - National Geodetic Vertical Datum
ASTM - American Society for Testing and Materials

Table 5-9
Change Orders
Remedial Action Report
Lawrence Aviation Industries Superfund Site, Port Jefferson Station, New York

Subcontract Modification #	Subject	Location	Description
Subcontract Modification #1	ISCO Injection Well Surface Casing	IW-ISCO-2	ISCO injection well IW-ISCO-2 was located directly adjacent to a concrete cistern. A 10" diameter steel surface casing from ground surface to a depth of 30 ft bgs was installed to protect existing utilities.
Subcontract Modification #2	Well material modification	ISCO Area	Stainless steel sch 5S was substituted with sch 40 PVC riser pipe for ISCO monitoring wells, piezometers and ISCO injection wells as a means to reduce project costs.
Subcontract Modification #5	Riprap protection	GWTF	Riprap stabilization of a slope along the south and westside of the GWTF to prevent runoff by placement of geotechnical fabric (Mirafi 140N) and 4-6" rip-rap along the slope.
Subcontract Modification #6	Polyethylene liner injection well pits	GWTF Injection wells	The addition of polyethylene liners in recirculation pits at the injection well field due to the discovery of previously unknown potentially contaminated soil in the area of the temporary pits.
Subcontract Modification #7	Security Services	LAI facility	Security services were provided during non-working hours (5PM-7AM) Monday through Friday and 24 hours per day on weekends due to site intrusions during non-working hours.
Subcontract Modification #8	ROW trench excavation	NYSDOT ROW	The effluent piping transects the NYSDOT ROW in order to reach the injection well field. The NYSDOT ROW excavation was deepened to provide a minimum of 10 feet of cover to accommodate future construction of a bike path.
Subcontract Modification #9	PCB excavation	Former generator area	Characterization, excavation, off-site tansportation and disposal of PCB impacted soils in the former generator area.
Subcontract Modification #10	Hazardous lead soil disposal	Effluent pipe yard	Soils excavated in the effluent pipe yard were found to contain wood and metal fill debris, likely due to a former building fire on the Site. Subsequent soil analysis showed that the material contained hazardous lead concentrations. Approximately 200 tons of material was transported and disposed at an approved hazardous waste disposal facility. This modification also included the excavation, transportation and disposal of an additional 156 tons of material.
Subcontract Modification #11	Schedule extension	GWTF	A 17-day period of extension was obtained for construction of the GWTF following delays associated with review and approval of the GWTF structural design.
Subcontract Modification #12	NYSDOT ROW additional lead excavation	Effluent pipe yard	Approximately 300 additional tons of hazardous lead impacted material was estimated to be present adjacent to the effluent pipe trench in the NYSDOT ROW. The NYSDEC requested that the material be further delineated and removed. This work was however determined not to be required and was not performed.

Notes:
Subcontract Modification #3, #4 and #12 were not authorized and therefore not implemented.

Acronyms:
IW - Injection well
ft - Feet
bgs - Below ground surface
Sch - schedule
NYSDOT- New York State Department of Transportation
ROW - Right of way
LAI- Lawrence Aviation Industries
GWTF - Groundwater treatment facility
NYSDEC- New York State Department of Environmental Conservation
PCB - Polychlorinated BiPhenyls
ISCO - In-situ chemical oxidation
PVC - Poly vinyl chloride

Table 7-1
Sampling and Monitoring Schedule
Remedial Action Report
Lawrence Aviation Industries Superfund Site, Port Jefferson Station, New York

System or Wells	Sampling and/or Monitoring Activity	Location	Sampling or Monitoring Frequency [1]							GW Samples												Air Samples	Water Quality Parameters (in field)						GW	Process Monitoring			Notes
			As Required	Weekly	Monthly	Quarterly	Semi-Annual	Annual	Contin.	VOCs	Metals	TOC	TSS	TDS	Fluoride	Sulfate	Ammonia	Chloride	Hardness	TKN	Alkalinity	TO-15	DO	Conductivity	Tempurature	Turbidity	pH	ORP	Groundwater level	VOCs - PID	Pressure/ Vacuum	Temperature	
GWTF	Water level monitoring	EW-01, EW-02							■																				■				2
GWTF	Water level monitoring	IW-01 to IW-05							■																				■				2
GWTF	Influent sampling	EW-01, EW-02 and influent header			■					■	■																						3
GWTF	Influent sampling	EW-01, EW-02 and influent header				■						■	■	■	■	■	■	■	■	■	■												3
GWTF	Influent monitoring	EW-01, EW-02 and influent header	■			■																	■	■	■	■	■	■					
GWTF	Process sampling	After air stripper (before bag filter)	■								■		■						■		■												4
GWTF	Process sampling	After bag filter	■			■						■	■	■	■	■	■	■	■	■	■												4
GWTF	Process monitoring	After bag filter	■																				■	■	■	■	■	■					
GWTF	Process monitoring	Location varies monthly		■																											■	■	
GWTF	Effluent compliance sampling	After bag filter			■					■	■				■																		4
GWTF	Effluent compliance monitoring	After bag filter (via in-line pH meter)							■																		■						
GWTF	Effluent compliance monitoring	After bag filter (from effluent sample port)		■																							■						
GWTF	Offgas system monitoring	All offgas system sample ports		■																										■			
GWTF	Offgas system sampling	All GAC ports			■																	■											
GWTF	Air discharge compliance sampling	Discharge stack sample port			■																	■											
GWTF	Spent GAC	N/A	■																														5, 6
GW Monitoring Wells	Site-wide GW sampling and monitoring	Refer to list of wells, Table 7-2.				■				■	■	■	■	■	■	■	■	■	■	■	■		■	■	■	■	■	■	■				
GW Monitoring Wells	Site-wide Piezometers monitoring	Refer to list of wells, Table 7-2.				■																							■				

Notes:
1. It is anticipated that the sampling frequency may be reduced after the first year of operations.
2. Continuous water level measurements will be recorded using a pressure transducer installed in the well.
3. To be performed concurrently with effluent sampling.
4. Pre- and post-bag filters to be collected concurrently.
5. Analyses as required for disposal.
6. Spent GAC will be analyzed for TCLP VOCs.

Acronyms:
DO - dissolved oxygen
GW - groundwater
GWTF - groundwater treatment facility
EW - extraction well
IW - injection well
PID - photoionization detector
TCLP - toxicity characteristic leaching procedure
GAC - granular activated carbon
VOCs - volatile organic compounds
TKN - total Kjeldahl nitrogen
TOC - total organic carbon
ORP - oxidation reduction potential
TDS - total dissolved solids
TSS - total suspended solids

Table 7-2
Site-wide Groundwater Monitoring Schedule
Remedial Action Report
Lawrence Aviation Industries Superfund Site, Port Jefferson Station, New York

Well Location Name[6]	Sampling[1, 2] Quarterly[3]	Groundwater Level Measurements Quarterly[4]	Groundwater Level Measurements Continuously[5]
EW-01			X
EW-02			X
IW-01			X
IW-02			X
IW-03			X
IW-04			X
IW-05			X
MPW-02[7]	X	X	
MPW-07[7]	X	X	
MPW-01	X	X	
MW-05	X	X	
MPW-03	X	X	
MPW-04	X	X	
MW-PD-11	X	X	
MPW-10	X	X	
MW-PD-12	X	X	
MW-PD-13	X	X	
PZ-01		X	
PZ-02		X	
PZ-03		X	
PZ-04		X	
PZ-05		X	
PZ-06		X	
PZ-07		X	
MW-ISCO-2	X	X	
MW-ISCO-5	X	X	

NOTES:

1. Samples will be collected for volatile organic compounds, metals, and wet chemistry parameters. Wet chemistry parameters include alkalinity, sulfate, hardness, chloride, fluoride, total Kjeldahl nitrogen, total organic carbon, total suspended solids, total dissolved solids and ammonia.
2. Field measurements shall be collected for water level, dissolved oxygen, temperature, conductivity, pH, turbidity, and oxidation reduction potential at all wells during sampling.
3. It is anticipated that the frequency of monitoring may be changed from quarterly to semi-annual or annual sampling after the first year of operations.
4. It is anticipated that groundwater levels will be collected during groundwater sampling events.
5. Continuous water level measurements will be recorded using a pressure transducer installed in the well
6. MPW denotes multiport wells. Samples to be collected from all ports unless otherwise noted.
7. MPW-02-Port A, MPW-07-Port A and MPW-07-Port C are currently defective.

Table 8-1
Cost Summary
Remedial Action Report
Lawrence Aviation Industries Superfund Site, Port Jefferson Station, New York

Cost Item		ROD Cost Estimate[1]	RD Cost Estimate[2]	Estimated Subcontract Cost[3]	Actual Subcontract Cost[4]	Subcontract Modifications[5]		Total Cost
RA Capital Cost	Groundwater Treatment Facility	-	$4,627,511	$3,562,346	$3,651,666	#5:	$25,104	$3,915,123
						#6:	$6,600	
						#7:	$81,862	
						#8:	$22,514	
						#10:	$63,980	
						#10A:	$63,397	
	In-situ Chemical Oxidation Remedy	-	$3,525,693	$2,496,333	$1,865,778	#1:	$4,897	$1,870,675
	AOC2 PCB Removal	-	-	-	-	#9:	$128,884	$128,884
	Total	**-**	**$8,153,204**	**$6,058,679**	**$5,517,444**		**$397,238**	**$5,914,682**
Estimated Annual O&M Costs[6]		-	$749,619	$442,586				

Notes:
1. Comparison to the ROD costs could not be performed because only part of the remedy was implemented under this RA.
2. From the RA subcontract procurement engineers estimate
3. Costs represent the base RA Subcontract costs
4. Adjusted for unit quantities or line items that were not required. Also includes the change in unit price for Subcontract Modification #2 (PVC risers for piezometers, ISCO monitoring wells, and ISCO injection wells)
5. Subcontract modifications incurred to complete value added field changes and address unforeseen conditions. Change order #2 is reflected under "Actual Subcontract Costs". #3, #4 and #12 were not implemented. #11 did not impact the project costs
6. Estimated O&M costs include GWTF operations and quarterly groundwater monitoring events.

Acronyms:

O&M - operation and maintenance
RA - remedial action
PCB - polychlorinated biphenyl
RD - remedial design
ROD - Record of Decision
AOC - Area of Concern

Table 10-1
Project Contact List
Remedial Action Report
Lawrence Aviation Industries Superfund Site, Port Jefferson Station, New York

Oganization	Contact Person	Role	Phone	Cell Phone	Fascimile	E-mail	Mailing Address
Contractor, Subcontractor, and Key Lower-Tier Subcontractors:							
CDM	Demetrios Klerides	Project Manager	(212) 377-4535	(917) 587-5705	(212) 785-6114	kleridesd@cdm.com	14 Wall Street, Suite 1702 New York, NY 10005
	Ellen Gallerie	Project Engineer	(212) 377-4525	(917) 544-3542		gallerieee@cdm.com	
Arrowhead	Doug Ronk	Project Manager	(913) 814-9994	(913) 461-3805	(913) 814-9997	dronk@arrowhead.org	12920 Metcalf, Suite 150 Overland Park, KS 33213
	Joe Cotter	Project Coordinator/H&S Manager	(913) 814-9994	(913) 961-5257	(913) 814-9997	jcotter@arrowhead.org	
	Matt Swope	Construction Superintendant/ Plant Operator	(913) 814-9994	(913) 461-4182	(913) 814-9997	mswope@arrowhead.org	12920 Metcalf, Suite 150 Overland Park, KS 33213
CDM	Brian Stacks	Resident Engineer Representative and on-site H&S Representative		(315) 374-1042		stacksbd@cdm.com	
CDM	Shawn Oliveira	H&S Officer	(720) 264-1153		(732) 225-7851	OliveiraST@cdm.com	60 Port Blvd, Suite 210 Libby, MT 59923
Panther Technologies Inc.	Kevin Dyson	ISCO Subcontractor	(609) 714-2420	(609) 472-1276	(609) 714-2495	kdyson@panthertech.com	220 Route 70 East, Suite B Medford, NJ 08055
R&L Drilling	Tom Zackman	Drilling Subcontractor	(631) 581-6076	(631) 445-2544	(631) 581-3832		31 Union Avenue, Islip, NY 11751
TestAmerica	Sara Goff	Analytical Laboratory	(802) 660-1990		(802) 660-1919	Sara.Goff@testamericainc.com	30 Community Drive, Suite 11 South Burlington, VT 05403
DESA	John Birri	Analytical Laboratory	(732) 321-6707		(732) 906-6165		2890 Woodbridge Ave, Bldg 209, MS-230, Edison, NJ 08837
Regulators:							
USEPA Region 2	Maria Jon	Project Manager	(212) 637-3967		(212) 637-3526	jon.maria@epa.gov	290 Broadway New York, NY 10007
	Fernando Rosado	Project Officer	(212) 637-4346		(212) 637-3526	rosado.fernando@epa.gov	
	Dennis McChesney	Underground Injection Control	(212) 637-4232		(212) 637-3526	mcchesney.dennis@epa.gov	
Town of Brookhaven	Arthur Gerhauser	Building Department	(631) 451-6333				One Independence Hill Farmingville, NY 11738
	Vincent E. Pascale	Planning and Zoning Board	(631) 451-6403				
NYSDEC	Steven Scharf	Environmental Remediation	(518) 402-9620			sxscharf@gw.dec.state.ny.us	625 Broadway Albany, NY 12233
	John Conover	Environmental Enforcement	(631) 444-0400			jeconover@gw.dec.state.ny.us	SUNY @ Stony Brook, 50 Circle Road, Stony Brook, NY 11790
	Roger Evans	Long Island Well Permit	(631) 444-0365				
SCDHS	Sy Robbins	Health Services	(631) 852-5772				225 East Rabro Drive Hauppauge, NY 11788
	Walter Hilbert	Septic System/Waste Water	(631) 852-5700			Walter.hilbert@suffolkcountyny.gov	
Police and Fire:							
Fire Department		Terryville Fire Department	(631) 473-1224				19 Jayne Blvd, Port Jefferson Station, NY 11776
Police Department		Suffolk County Police Department	(631) 854-8600				6th Precinct, Route 25/Middle Country Road Coram, NY 11727

Table 10-1
Project Contact List
Remedial Action Report
Lawrence Aviation Industries Superfund Site, Port Jefferson Station, New York

Oganization	Contact Person	Role	Phone	Cell Phone	Fascimile	E-mail	Mailing Address
Utilities:							
SCWA		Water	(631) 698-9500				2045 Route 112, Suite 5 Coram, NY 11727
National Grid		Gas	(800) 930-5003				
Verizon		Telephone	(800) 427-9977				
LIPA		Electric	(800) 490-0025				
Property Owners/Representatives:							
NYSDOT Right of Way	Mark Wolfgang		(631) 952-6028				

Acronyms:
CDM - Camp, Dresser & McKee, Inc.
USEPA - United States Environmental Protection Agency
NYSDEC - New York State Department of Environmental Conservation
SCDHS - Suffolk County Department of Health Services
SCWA - Suffolk County Water Authority
DESA - Division of Environmental Science and Assessment
NYSDOT - New York State Department of Transportation
LIPA - Long Island Power Authority

Figures

adapted from NYSDEC Interactive Mapping Gateway: http://www.nysgis.state.ny.us/gateway/index.html

CDM

Figure 1-1
Site Location Map

Lawrence Aviation Industries Superfund Site
Port Jefferson Station, New York

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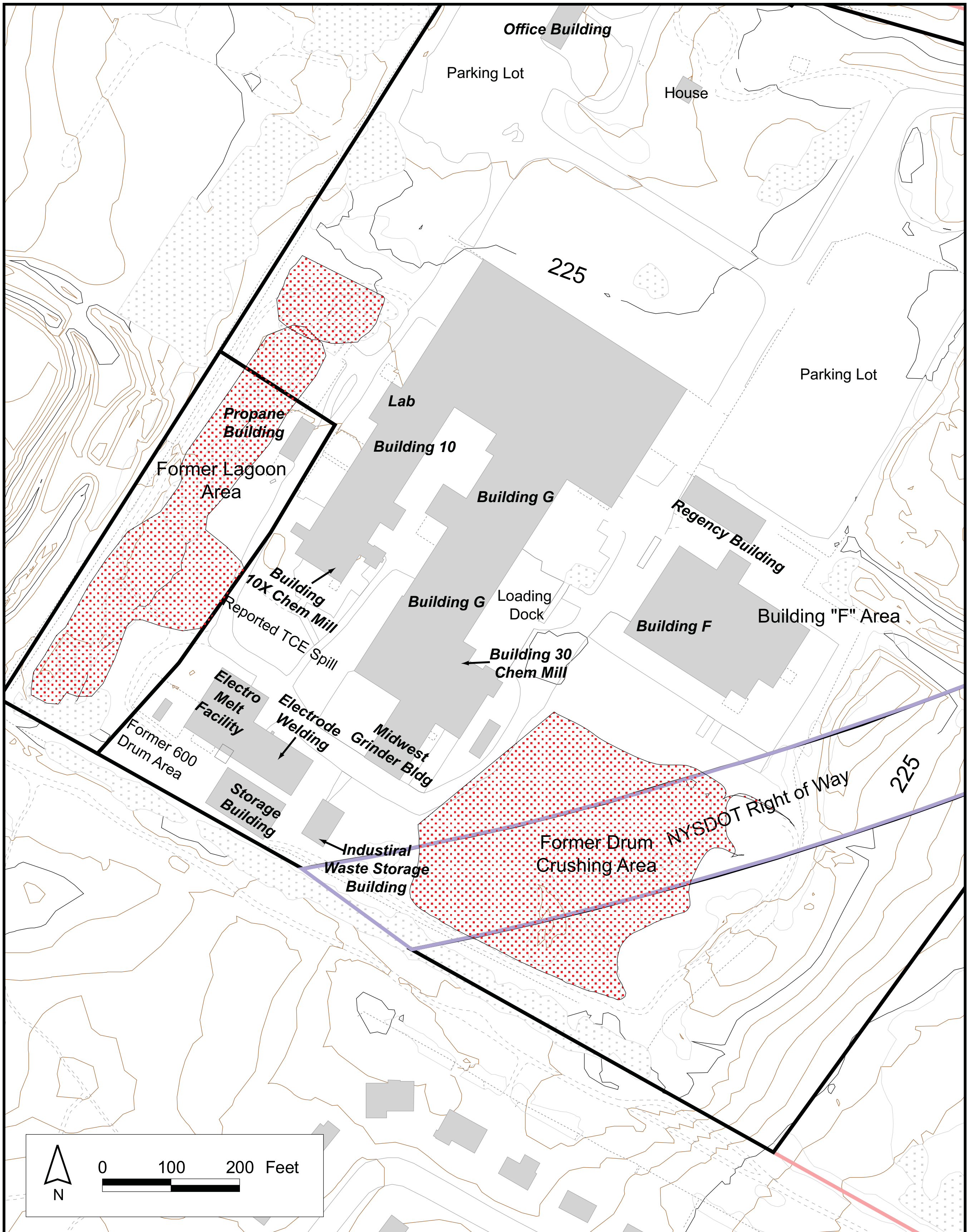

LEGEND

- NYDOT ROW
- LAI Facility
- Outlying Parcels
- Waterbody
- Buildings
- Obscured Ground
- Dirt Trail
- Fence
- 25 Foot Topographic Contour
- 5 Foot Topographic Contour

Figure 1-2
Lawrence Aviation Industries Facility Layout
Lawrence Aviation Industries Superfund Site
Port Jefferson Station, New York

CDM

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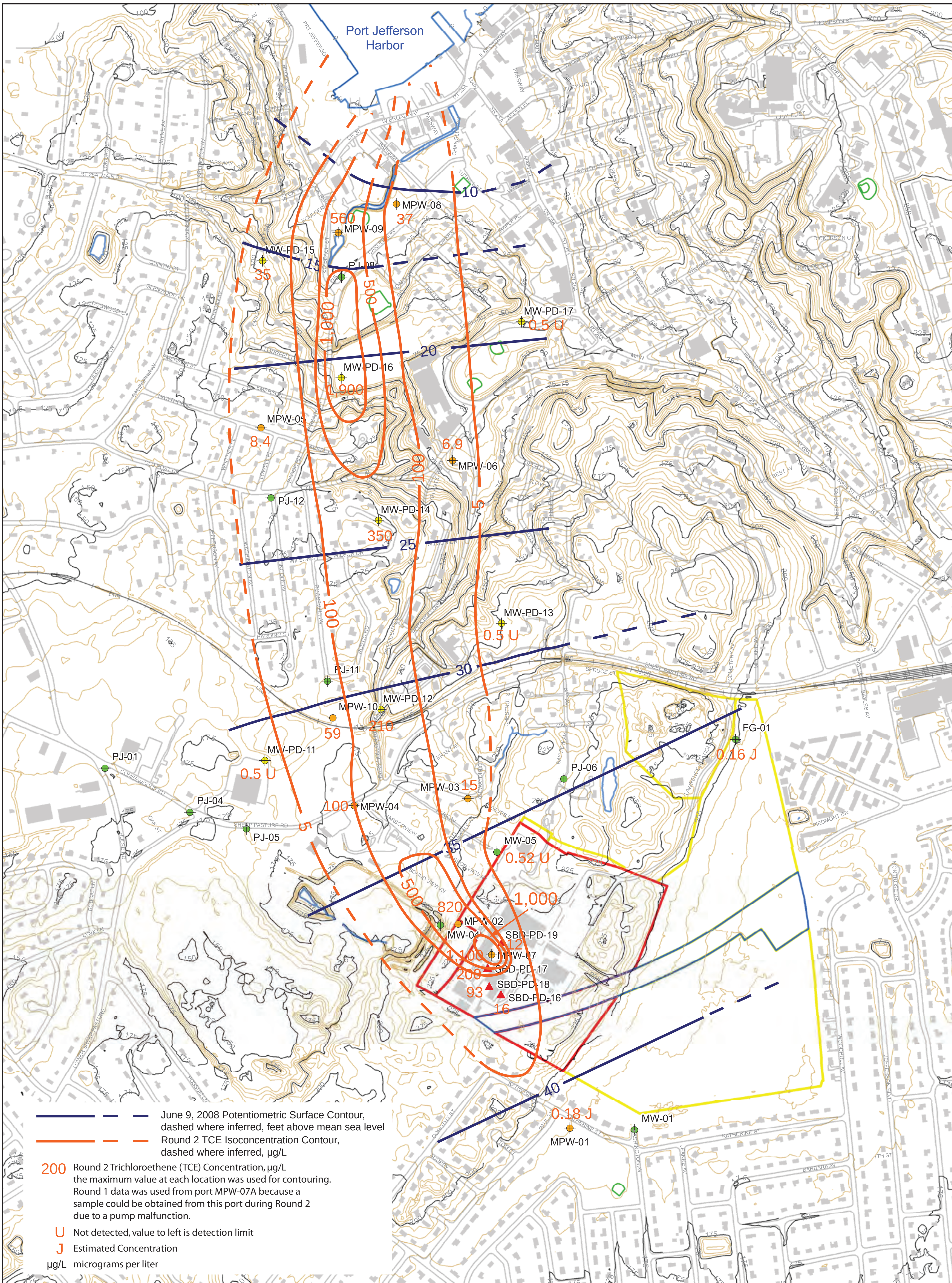


Legend

Remedial Design Locations
- Monitoring Well
- Soil Boring

Remedial Investigation Locations
- Multiport Well

Existing Locations
- Existing Well 2003

- **LAI Facility**
- **Outlying Parcels**
- **NYDOT ROW**
- **Railroad**
- **Buildings**
- **5 Foot Topographic Contour**
- **25 Foot Topographic Contour**

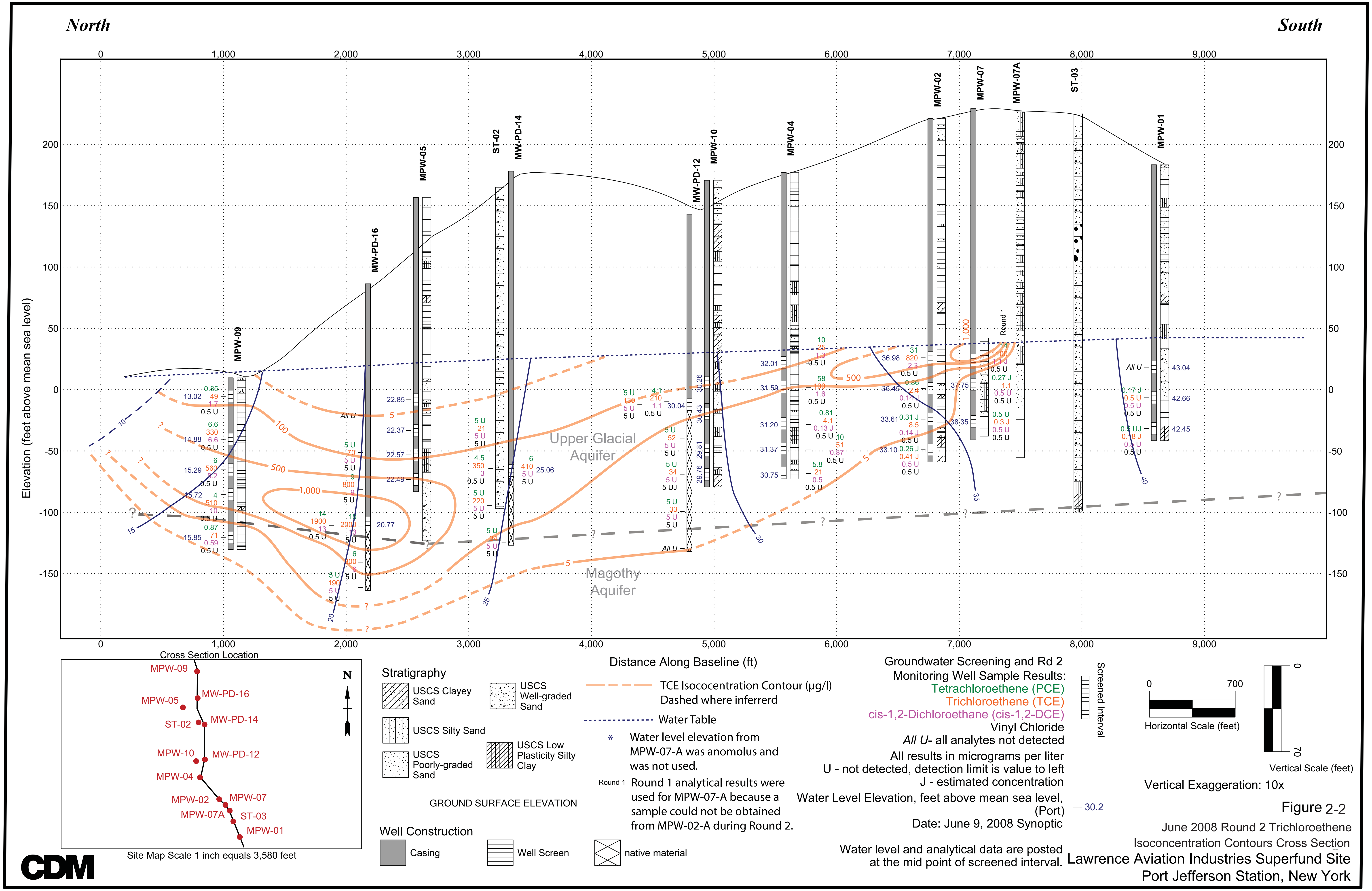
Note: Topographic elevation data is in Feet above Mean Sea Level (datum is NAVD88)

N

0 350 700 1,400 Feet

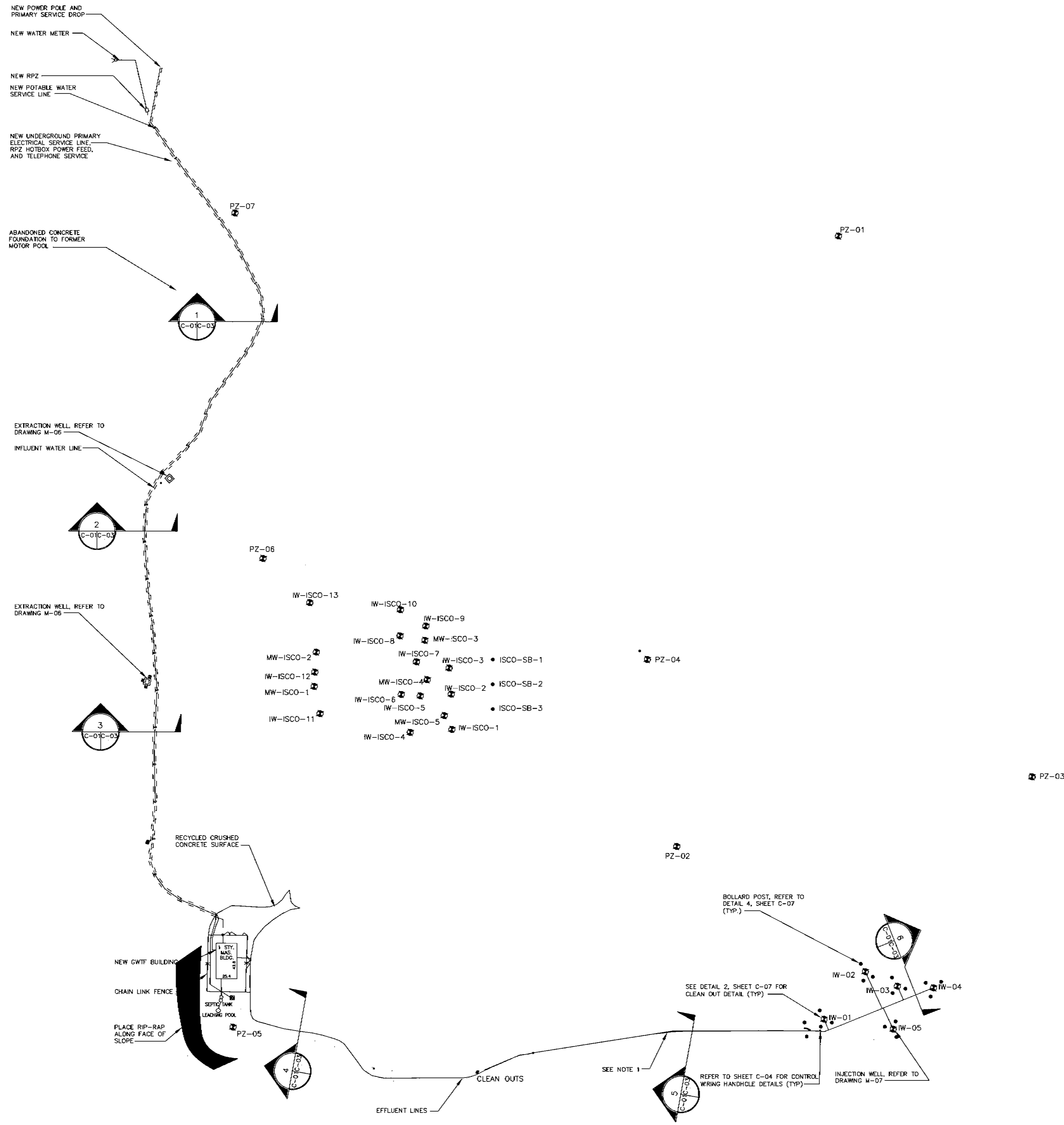
Figure 2-1
June 2008 Upper Glacial Aquifer Potentiometric Surface and Round 2 Trichloroethene Isoconcentration Contours
Lawrence Aviation Industries Superfund Site
Port Jefferson Station, New York

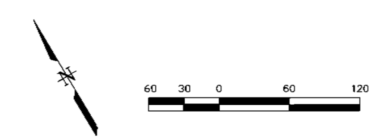
CDM


North
South
MPW-09
MW-PD-16
MPW-05
ST-02
MW-PD-14
MW-PD-12
MPW-10
MPW-04
MPW-02
MPW-07
MPW-07A
ST-03
MPW-01
Round 1
Upper Glacial Aquifer
Magothy Aquifer
Elevation (feet above mean sea level)
Distance Along Baseline (ft)
Cross Section Location
MPW-09
MPW-05
MW-PD-16
ST-02
MW-PD-14
MPW-10
MW-PD-12
MPW-04
MPW-02
MPW-07
MPW-07A
ST-03
MPW-01
N
Site Map Scale 1 inch equals 3,580 feet
Stratigraphy
USCS Clayey Sand
USCS Well-graded Sand
USCS Silty Sand
USCS Poorly-graded Sand
USCS Low Plasticity Silty Clay
GROUND SURFACE ELEVATION
Well Construction
Casing
Well Screen
native material
TCE Isocencentration Contour (µg/l) Dashed where inferrerd
Water Table
Water level elevation from MPW-07-A was anomolus and was not used.
Round 1 Round 1 analytical results were used for MPW-07-A because a sample could not be obtained from MPW-02-A during Round 2.
Groundwater Screening and Rd 2 Monitoring Well Sample Results:
Tetrachloroethene (PCE)
Trichloroethene (TCE)
cis-1,2-Dichloroethane (cis-1,2-DCE)
Vinyl Chloride
All U- all analytes not detected
All results in micrograms per liter
U - not detected, detection limit is value to left
J - estimated concentration
Water Level Elevation, feet above mean sea level, (Port)
Date: June 9, 2008 Synoptic
Water level and analytical data are posted at the mid point of screened interval.
Screened Interval
— 30.2
Horizontal Scale (feet)
Vertical Scale (feet)
Vertical Exaggeration: 10x
CDM
Figure 2-2
June 2008 Round 2 Trichloroethene Isoconcentration Contours Cross Section
Lawrence Aviation Industries Superfund Site
Port Jefferson Station, New York

NOTES:

1. PIPE INSTALLATION WITH LIMITS OF STATE RIGHT OF WAY TO BE BURIED MINIMUM 120" BELOW GRADE. REFER TO DETAIL 5, SHEET C-03.
2. RESTORATION WITHIN NYDOT RIGHT OF WAY TO BE COMPLETED IN ACCORDANCE WITH NYDOT STANDARD SPECIFICATION SECTION 107-08.





REV #	Revisions	Date	Approved
	AS-BUILT	12/10	
	ISSUED FOR CONSTRUCTION	5/19/10	
1	100 PERCENT DESIGN	3/19/10	

ARROWHEAD CONTRACTING INC.
10981 Eicher Drive
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LAWRENCE AVIATION SUPERFUND SITE
PORT JEFFERSON STATION, NEW YORK

GROUNDWATER TREATMENT PLANT
PROJECT SITE PLAN

Designed by: DLR
Drawn by: DLR
Checked by: GWW
Reviewed by: SFS
Submitted by: GWW

Scale: AS SHOWN
Spec. No.: -
Contract No. -
Sheet reference number: 3-1
Date: JANUARY 27, 2010
Drawing Code: -

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING
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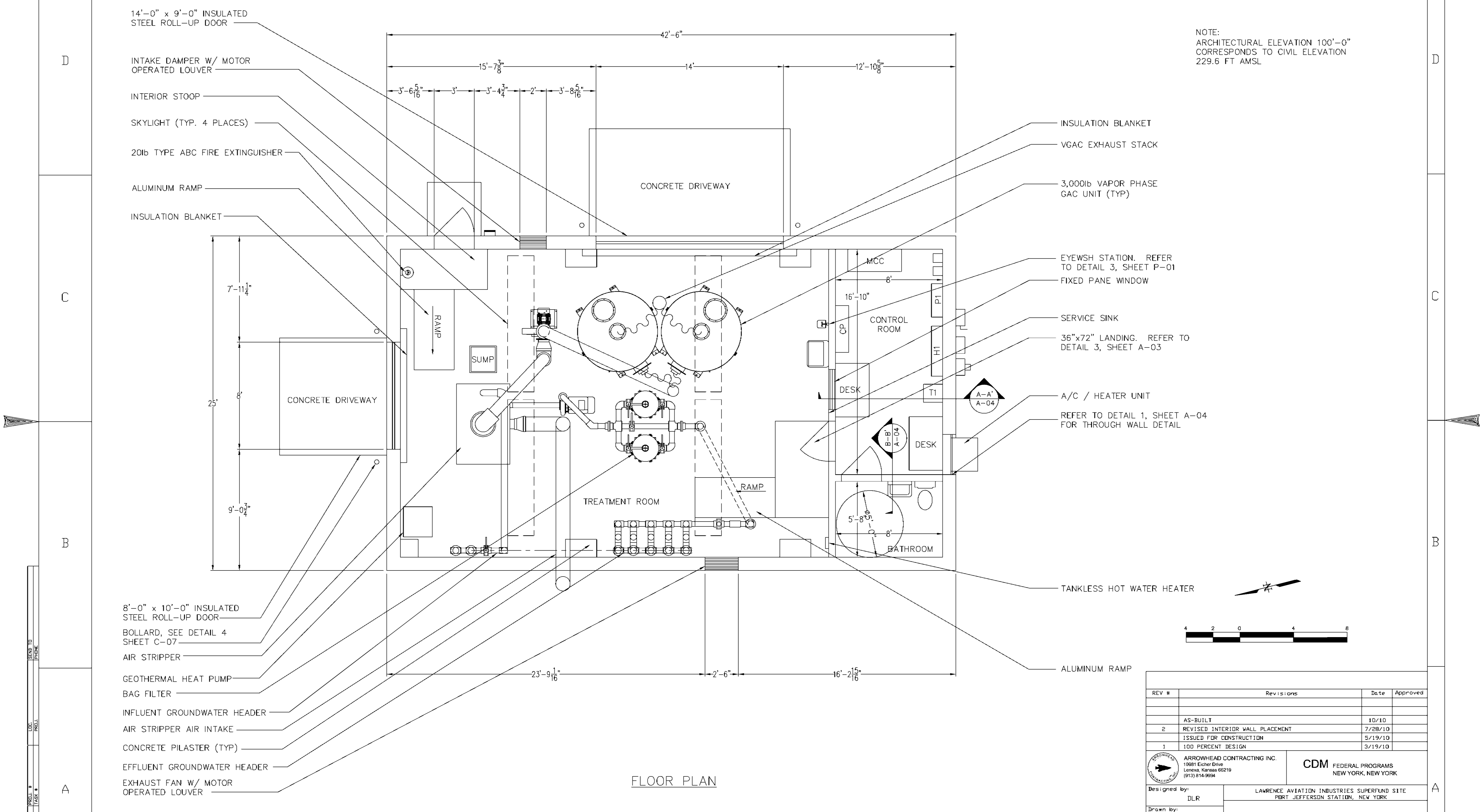

NOTE:
ARCHITECTURAL ELEVATION 100'-0"
CORRESPONDS TO CIVIL ELEVATION
229.6 FT AMSL

FLOOR PLAN

REV #	Revisions	Date	Approved
	AS-BUILT	10/10	
2	REVISED INTERIOR WALL PLACEMENT	7/28/10	
	ISSUED FOR CONSTRUCTION	5/19/10	
1	100 PERCENT DESIGN	3/19/10	

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LAWRENCE AVIATION INDUSTRIES SUPERFUND SITE
PORT JEFFERSON STATION, NEW YORK

GROUNDWATER TREATMENT PLANT
BUILDING PLAN

Designed by: DLR
Drawn by: DLR
Checked by: GWW
Reviewed by: SFS
Submitted by: GWW

VERIFY SCALE
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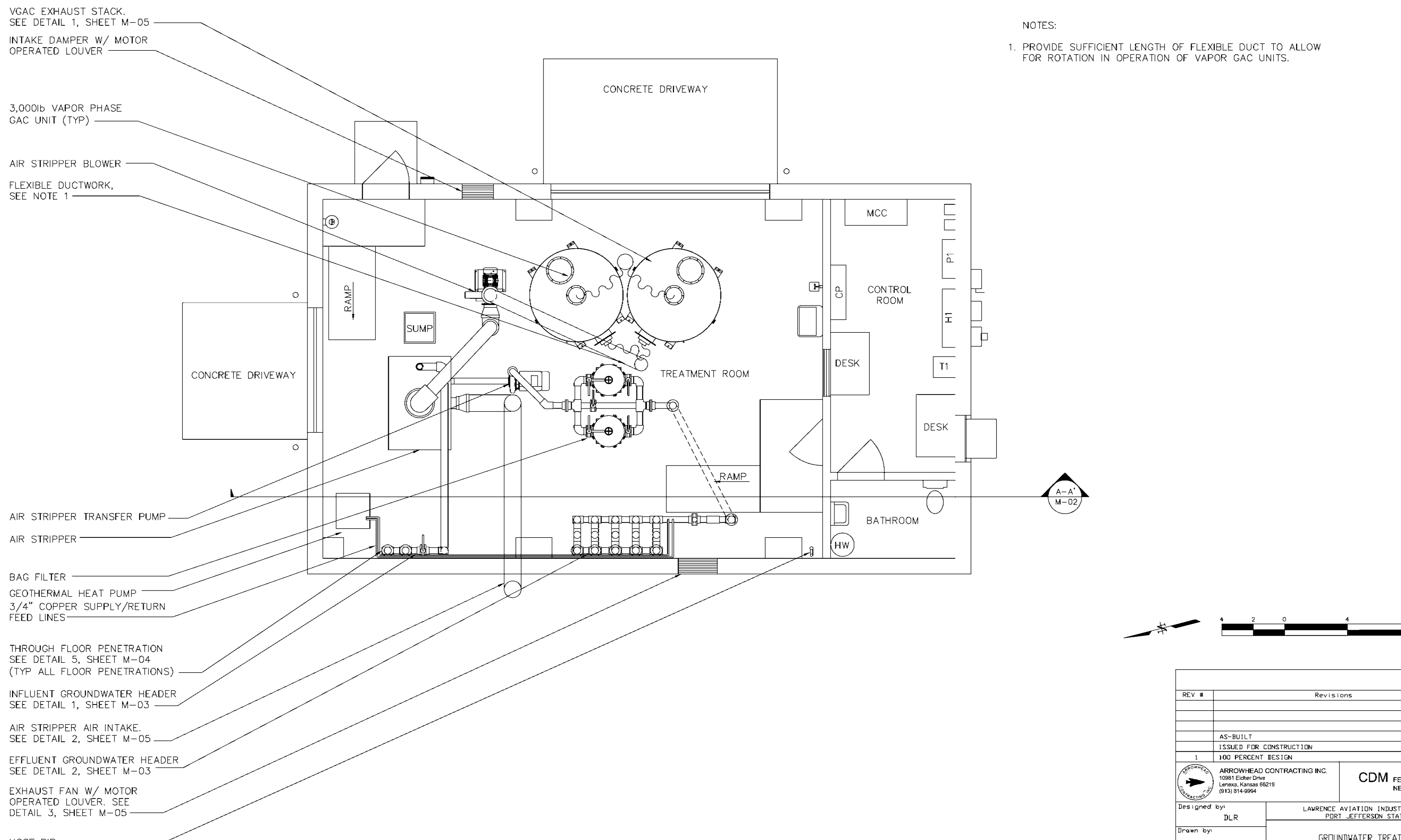
Spec. No.: -
Contract No. -
Sheet reference number: 3-2
Date: JANUARY 27, 2010
Drawing Code: -



NOTES:

1. PROVIDE SUFFICIENT LENGTH OF FLEXIBLE DUCT TO ALLOW FOR ROTATION IN OPERATION OF VAPOR GAC UNITS.

REV #	Revisions	Date	Approved
	AS-BUILT	10/10	
	ISSUED FOR CONSTRUCTION	5/19/10	
1	100 PERCENT DESIGN	3/19/10	

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LAWRENCE AVIATION INDUSTRIES SUPERFUND SITE
PORT JEFFERSON STATION, NEW YORK

GROUNDWATER TREATMENT PLANT
TREATMENT EQUIPMENT
MECHANICAL PLAN

Designed by: DLR
Drawn by: DLR
Checked by: GWW
Reviewed by: SFS
Submitted by: GWW

VERIFY SCALE
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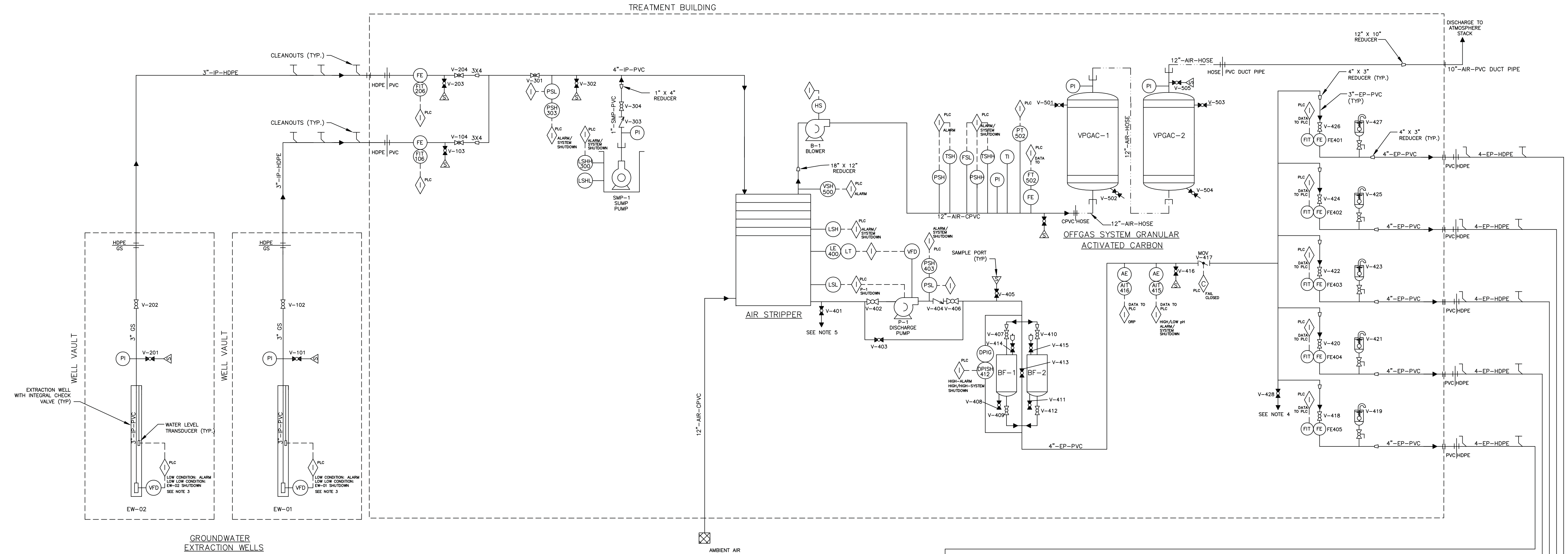
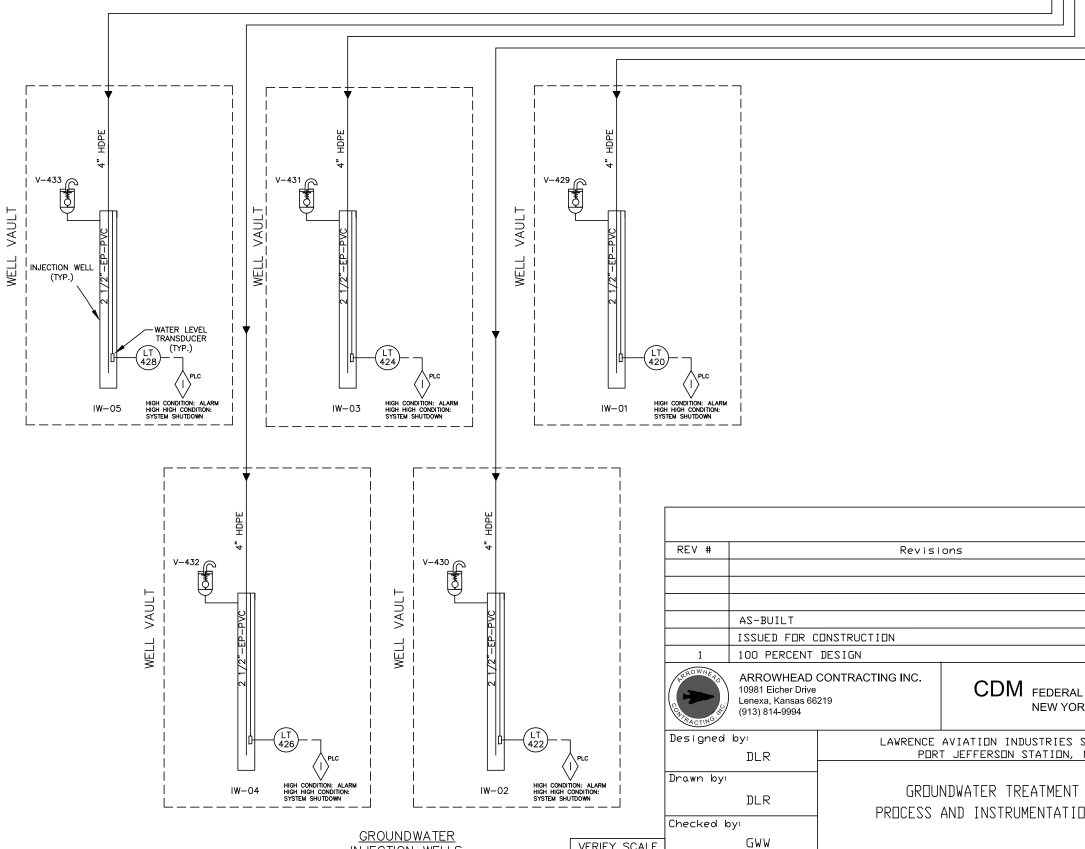
Scale: AS SHOWN
Spec. No.: -
Contract No. -
Sheet reference number: 3-3
Date: JANUARY 27, 2010
Drawing Code: -





LEGEND:

- BUTTERFLY VALVE OPEN
- GLOBE VALVE OPEN
- BALL VALVE OPEN
- BALL VALVE CLOSED
- CHECK VALVE
- SAMPLE PORT
- QUICK DISCONNECT
- PIPE MATERIAL CHANGE
- CONTROL SIGNAL
- AIR HOSE
- DIRECTION OF FLOW
- ENLARGER/REDUCER
- USED FOR ALL CENTRIFUGAL, DIAPHRAGM, ROTARY LOBE, OR PROGRESSIVE CAVITY PUMP TYPES AND BLOWERS
- SUBMERSIBLE PUMP
- PROGRAMABLE LOGIC CONTROLLER
- AIR FILTER WITH BIRD SCREEN
- CLEANOUT
- VENT

ACRONYMS:

AE	ANALYZER ELEMENT
AIT	ANALYZER INDICATING TRANSMITTER
AR	ACID RECIRCULATION
B	BLOWER
BF	BAG FILTER
CPVC	CHLORINATED POLYVINYL CHLORIDE
DPIG	DIFFERENTIAL PRESSURE INDICATING GAUGE
DPISH	DIFFERENTIAL PRESSURE INDICATING SWITCH HIGH
EP	EFFLUENT PIPE
EW	EXTRACTION WELL
FE	FLOW ELEMENT
FI	FLOW INDICATOR
FIT	FLOW INDICATING TRANSMITTER
FSL	FLOW SWITCH LOW
GS	GALVANIZED STEEL
HDPE	HIGH DENSITY POLYETHYLENE
HS	HAND SWITCH
IP	INFLUENT PIPE
LE	LEVEL ELEMENT
LSL	LEVEL SWITCH LOW
LSH	LEVEL SWITCH HIGH
LSHH	LEVEL SWITCH HIGH HIGH
LSHL	LEVEL SWITCH HIGH LOW
LT	LEVEL TRANSDUCER
ORP	OXIDATION REDUCTION POTENTIAL
P	PUMP
PI	PRESSURE INDICATOR
PLC	PROGRAMMABLE LOGIC CONTROLLER
PSH	PRESSURE SWITCH HIGH
PSHH	PRESSURE SWITCH HIGH HIGH
PSL	PRESSURE SWITCH LOW
PT	PRESSURE TRANSMITTER
PVC	POLYVINYL CHLORIDE
SMP	SUMP PUMP
TI	TEMPERATURE INDICATOR
TSH	TEMPERATURE SWITCH HIGH
TSHH	TEMPERATURE SWITCH HIGH HIGH
TYP	TYPICAL
VFD	VARIABLE FREQUENCY DRIVE
VPGAC	VAPOR PHASE GRANULAR ACTIVATED CARBON
VSH	VACUUM SWITCH HIGH

NOTES:

1. VALVES FOR INSTRUMENTATION LINES ARE NOT SHOWN.
2. ACID TO BE DISPOSED OF IN ACCORDANCE WITH SECTION 02120.
3. CONTROLS WILL BE USED TO MAINTAIN A CONSTANT GROUNDWATER ELEVATION IN THE EXTRACTION WELL.
4. PORT WILL BE USED TO COLLECT CLEANOUT WATER DURING MAINTENANCE OF PIPES.
5. PORT WILL BE USED TO DRAIN AND COLLECT REMAINING ACID FROM THE AIR STRIPPER.

REV #	Revisions	Date	Approved
	AS-BUILT	10/10	
	ISSUED FOR CONSTRUCTION	5/19/10	
1	100 PERCENT DESIGN	3/19/10	

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LAWRENCE AVIATION INDUSTRIES SUPERFUND SITE
PORT JEFFERSON STATION, NEW YORK

GROUNDWATER TREATMENT PLANT
PROCESS AND INSTRUMENTATION DIAGRAM

Designed by:	DLR
Drawn by:	DLR
Checked by:	GWW
Reviewed by:	SFS
Submitted by:	GWW
Scale:	AS SHOWN
Spec. No.:	–
Contract No.	–
Sheet reference number:	3-4
Date:	JANUARY 27, 2010
Drawing Code:	–

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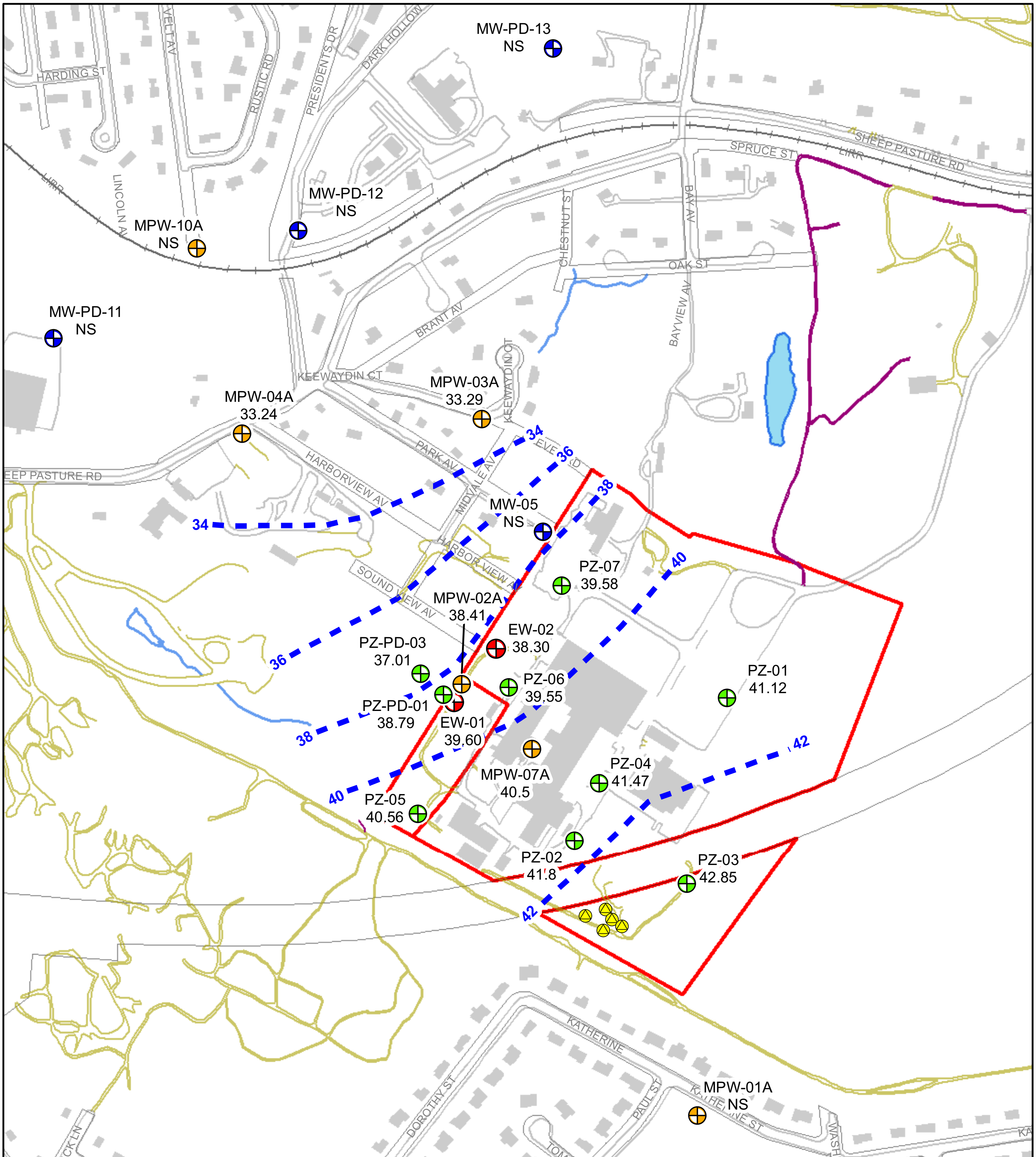

- Groundwater Elevation Contour (feet above MSL)
- Multiport Well
- Monitoring Well
- Piezometer
- Extraction Well
- Effluent Well
- Buildings
- LAI Facility

Acronyms:
CVOC - Chlorinated Volatile Organic Compound
EW - Extraction Well
MPW - multiport well
MSL - mean sea level
MW - monitoring well
NS - not sampled
PZ - piezometer
NAVD - North American Vertical Datum

Notes:
1. Groundwater elevation expressed in feet above mean sea level (NAVD 88).
2. At multiport wells, the groundwater elevation from the shallowest port is shown.

N

0 125 250 500 Feet

Figure 5-1
Baseline Groundwater Elevations
September 15, 2010
Remedial Action
Lawrence Aviation Industries Superfund Site
Port Jefferson Station, New York

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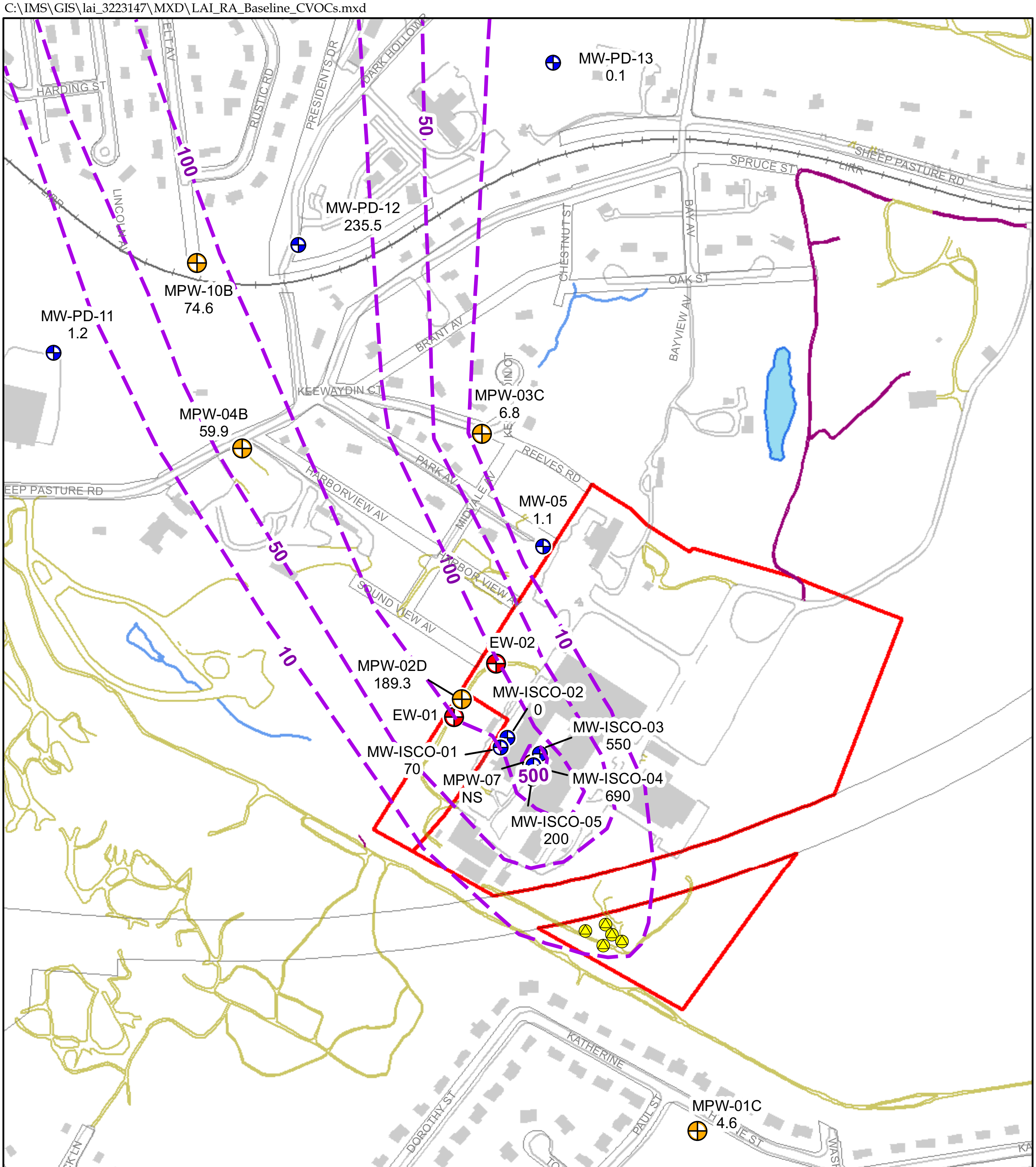

- CVOC Concentration Contours
- Multiport Well
- Monitoring Well
- Piezometer
- Extraction Well
- Effluent Well
- Buildings
- LAI Facility

Acronyms:
CVOC - Chlorinated Volatile Organic Compound
EW - Extraction Well
MPW - multiport well
µg/L - microgram per liter
MW - monitoring well
NS - not sampled
PZ - piezometer
ISCO - in situ chemical oxidation

Notes:
1. CVOC results in µg/L.
2. At multiport wells, the port with the maximum CVOC result was used.
3. For ISCO wells 1 to 5, data used from ISCO 30 day sampling event - September 2010.

N

0 125 250 500 Feet

Figure 5-2
Baseline Groundwater Sampling Results - Total CVOCs
August 2010
Remedial Action
Lawrence Aviation Industries Superfund Site
Port Jefferson Station, New York

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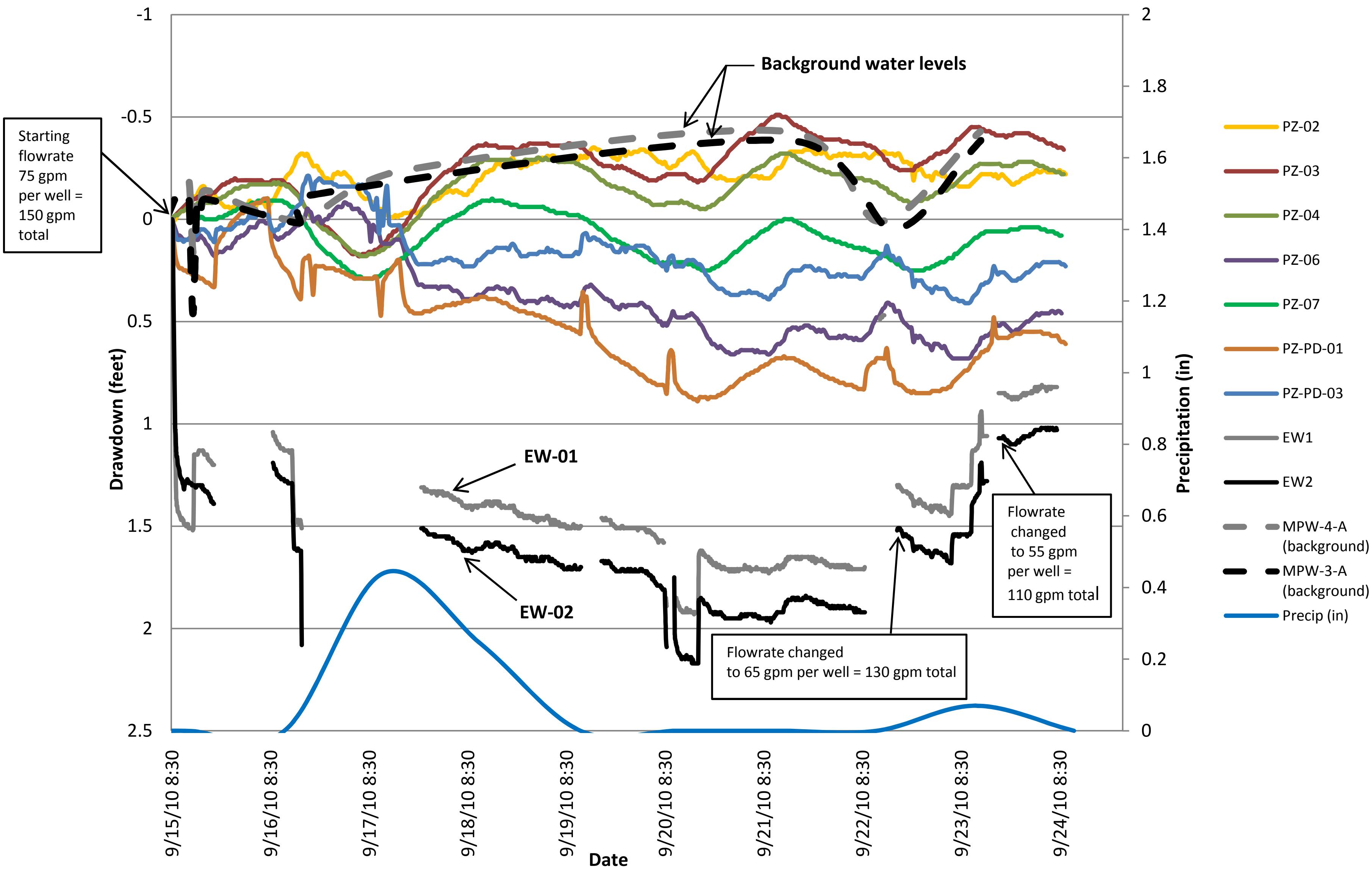
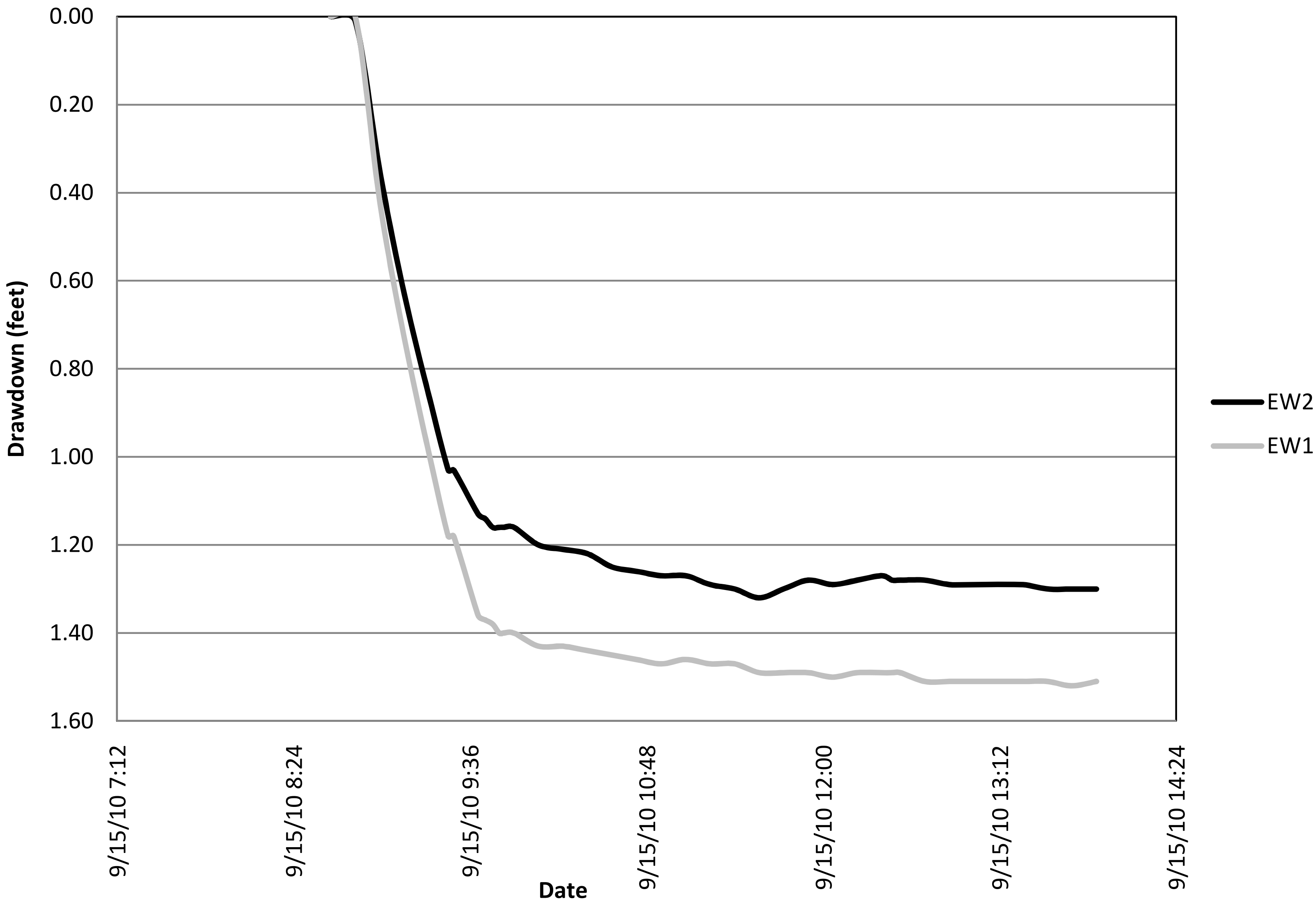
Figure 5-3
ITP Extraction Well and Piezometer Drawdown Depths Over Time
Remedial Action Report
Lawrence Aviation Industries Superfund Site, Port Jefferson, New York



Notes:
1. Gaps in EW-01 and EW-02 data indicate priods of GWTF shutdown.
2. Dashed lines represent background water levels.

CDM

Figure 5-4
ITP Day 1 Extraction Well Drawdown Depths Over Time
Remedial Action Report
Lawrence Aviation Industries Superfund Site, Port Jefferson Station, New York



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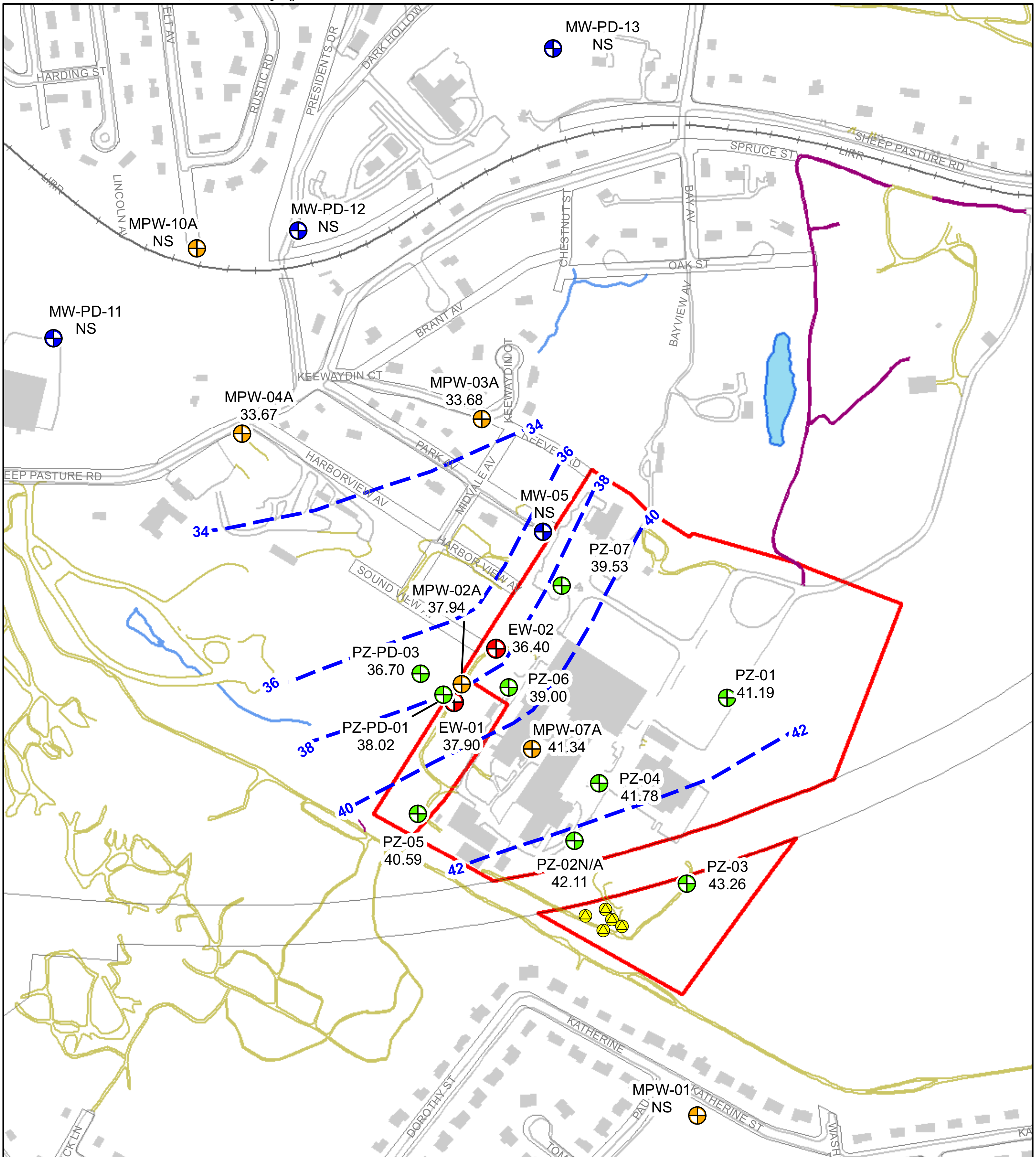

- Groundwater Elevation Contours (ft above MSL)
- Multiport Well
- Monitoring Well
- Piezometer
- Extraction Well
- Effluent Well
- Buildings
- LAI Facility

Acronyms:
EW - Extraction Well
MPW - multiport well
MSL - mean sea level
MW - monitoring well
NS - not sampled
PZ - piezometer
NAVD - North American Vertical Datum

Notes:
1. Groundwater elevation expressed in feet above mean sea level (NAVD 88).
2. At multiport wells, the groundwater elevation from the shallowest port is shown.

N

0 125 250 500 Feet

Figure 5-5
ITP Groundwater Elevations
September 21, 2010
Remedial Action
Lawrence Aviation Industries Superfund Site
Port Jefferson Station, New York

CDM

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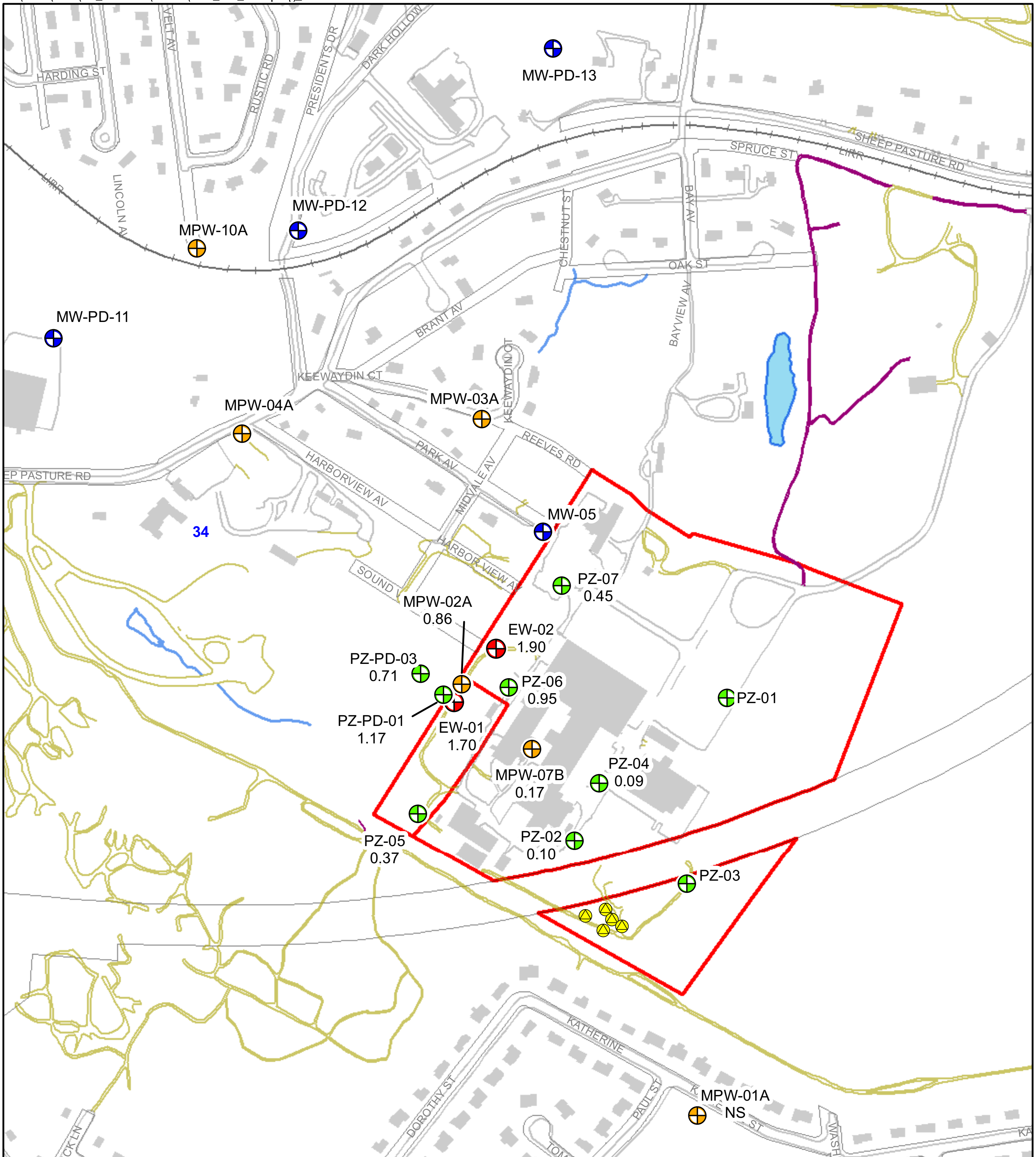

Multiport Well
Monitoring Well
Piezometer
Extraction Well
Effluent Well
Buildings
LAI Facility

Acronyms:
EW - Extraction Well
MPW - multiport well
MW - monitoring well
NS - not sampled
PZ - piezometer

Notes:
1. Drawdown expressed in feet (as compared to baseline groundwater elevations).

N

Feet
0 125 250 500

Figure 5-6
ITP Drawdown Depths
September 21, 2010
Remedial Action
Lawrence Aviation Industries Superfund Site
Port Jefferson Station, New York

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