Operation, Maintenance and Monitoring Manual

Off-Site Interim Remedial Measure
Former Unisys Facility
Great Neck, New York

NYSDEC Site ID# 130045

March 2006

BBL
ENVIRONMENTAL SERVICES, INC.
Remedial Management & Construction

Statement of Certification

On behalf of Lockheed Martin Corporation, I hereby certify and attest that the enclosed Operation, Maintenance and Monitoring Manual for the Off-Site Interim Remedial Measure was prepared in accordance with the New York State Department of Environmental Conservation Administrative Order on Consent No. W-1-0527-91-02, referencing the Former Unisys Corporation Site (Code No. 1-30-045) and dated December 13, 1991.

SIGNED: _____

Lowell W. McBurney, P.E.
License Number 066776, New York
Blasland, Bouck & Lee, Inc.

Table of Contents

Tables

Figures

Appendices

Acronyms and Abbreviations

AEANY	ARCADIS Engineers & Architects of New York, P.C.
AOC	Administrative Order on Consent
ARARs	Applicable or Relevant and Appropriate Requirements
ARCADIS	ARCADIS G&M, Inc.
BBLES	BBL Environmental Services, Inc.
bls	Below land surface
Consent Order	Administrative Order on Consent
1,2-DCE	1,2-Dichloroethene
ECU	Emission Control Unit
Freon 113	1,1,2-Trichlorotrifluoroethane
FS	Feasibility Study
ft	Feet
ft/d	Feet/Day
GCPWD	Garden City Park Water District
Great Neck UFSD	Great Neck Union Free School District
gpm	Gallons per minute
HASP	Health and Safety Plan
HDPE	High Density Polyethylene
HMI	Human-Machine Interface
HVAC	Heating Ventilation and Air Conditioning
HP	Horsepower
i.park	i.park, Lake Success, LLP
IRM	Interim Remedial Measure

LBG	Leggette, Brashears and Graham
LIE	Long Island Expressway
Lockheed Martin	Lockheed Martin Corporation
Loral	Loral Corporation
LPGAC	Liquid-Phase Granular-Activated Carbon
LSXH	Level Switch Extreme High
LSXL	Level Switch Extreme Low
MCC	Motor Control Center
MCP	Main Control Panel
msl	Mean Sea Level
MLWD	Manhasset-Lakeville Water District
NCDOH	Nassau County Department of Health
NCDPW	Nassau County Department of Public Works
NYSDEC	New York State Department of Environmental Conservation
NYSDOT	New York State Department of Transportation
O&M	Operations and Maintenance
OM&M	Operation, Maintenance and Monitoring
OU-1	Operable Unit 1 (pertaining to areas on the former Unisys site)
OU-2	Operable Unit 2 (pertaining to areas off the former Unisys site)
PADM	Performance Analysis and Design Modification Plan
Parkway Plant	MLWD Parkway Treatment System
PLC	Programmable Logic Controller
PID	Photoionization Detector
PCE	Tetrachloroethene (also called Perchloroethene or Perc)

PPZ	Potassium Permanganate-Impregnated Zeolite
PVC	Polyvinyl chloride
QAPP	Quality Assurance Project Plan
QA/QC	Quality Assurance/Quality Control
RI	Remedial Investigation
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
RPM	Revolutions Per Minute
SAP	Sampling and Analysis Plan
SCADA	Supervisory Control and Data Acquisition
SCFM	Standard Cubic Feet per Minute
SDR	Side-Wall Dimension Ratio
SGPA	Special Groundwater Protection Area
Sperry	Sperry Gyroscope Company
SVE	Soil Vapor Extraction
TDH	Total Dynamic Head
TCE	Trichloroethene
TVOC	Total Volatile Organic Compounds
TVSS	Transient Voltage Surge Suppressor
Unisys	Unisys Corporation
US	United States
USEPA	United States Environmental Protection Agency
UST	Underground Storage Tank
V	Volts
VFD	Variable Frequency Drive

VPGAC	Vapor-Phase Granular-Activated Carbon
VOCs	Volatile Organic Compounds
VOV	Variable Orifice Valve
WAGNN	Water Authority of Great Neck North
WAWNC	Water Authority of West Nassau County

1. Introduction

1.1 General

ARCADIS G&M, Inc. (ARCADIS) and ARCADIS Engineers & Architects of New York, P.C. (AEANY) prepared this Operation, Maintenance, and Monitoring (OM&M) Manual on behalf of Lockheed Martin Corporation (Lockheed Martin) for the Off-Site Interim Remedial Measure (IRM) for Operable Unit 2 (OU-2) associated with the former Unisys Corporation (Unisys) facility located in Great Neck, New York (see Figure 1). This OM&M Manual was subsequently revised by BBL Environmental Services, Inc. (BBLES), in conjunction with Blasland, Bouck & Lee, Inc. The former Unisys site, located at 365 Lakeville Road, is classified by the New York State Department of Environmental Conservation (NYSDEC) as a Class 2 Site in the Registry of Inactive Hazardous Waste Disposal Sites in New York State (Site No. 130045) due to the presence of volatile organic compounds (VOCs) in soil and groundwater. The former Unisys site, which is currently owned by i.park, Lake Success, LLP (i.park), is designated as Operable Unit 1 (OU-1), whereas OU-2 addresses off-site areas.

An OU-2 Remedial Investigation (RI) is in progress and is being conducted under NYSDEC Administrative Order on Consent (AOC) No. W-1-0527-91-02, dated December 13, 1991. Based on the results of the OU-2 RI obtained to date, an IRM is being implemented for the OU-2 area. The NYSDEC approved Off-Site IRM was installed between the Northern State Parkway and the Long Island Expressway (LIE) (See Figure 2). The goals of the Off-Site IRM are to help protect public drinking water wells and retard further contaminant migration into the North Hills Special Groundwater Protection Area (SGPA).

The conceptual Off-Site IRM is documented in the NYSDEC-approved OU-2 IRM South System Groundwater Remediation Work Plan (hereinafter called the OU-2 South IRM Work Plan), dated May 29, 2003. This OM&M Manual has been prepared pursuant to the AOC No. W-1-0527-91-02, entered into by Lockheed Martin with the NYSDEC on December 13, 1991. This OM&M Manual is intended to be the primary reference for the operation, maintenance and associated monitoring of the Off-Site IRM System. The OM&M specifications for the key components of the Off-Site IRM System are described in this manual.

1.2 Operation, Maintenance, and Monitoring Manual Organization

Following this Introduction (Section 1), this OM&M Manual is organized as outlined below.

- Section 2 (Site Description and History) provides a description of the Site, including historical operations at the Site. Section 2 also provides a summary of previous investigations and remedial activities associated with both OU-1 and OU-2. Lastly, OU-2 Off-Site IRM objectives are listed in Section 2.

- Section 3 (Environmental Monitoring) describes the environmental component of the OM&M Manual, including operational hydraulic measurements and groundwater quality monitoring. Section 3 also describes the analytical program, the process of evaluating the monitoring results, and related records retention.

- Section 4 (Description of Off-Site IRM Components and Operation) describes each remedial system component.

- Section 5 (System Start-Up) describes the procedures for system start-up testing.

- Section 6 (Monitoring and Testing) describes the procedures for short- and long-term system performance monitoring and testing.
- Section 7 (Off-Site IRM Maintenance and Monitoring) describes the routine maintenance activities and preventative maintenance schedule.
- Section 8 (Record Keeping and Reporting) describes remedial system record keeping and reporting requirements.
- Section 9 (Personnel Organization) identifies the current system operating personnel.
- Section 10 (Health and Safety Plan) introduces the site-specific project Health and Safety Plan (HASP) .
- Section 11 (Contingency Plan) introduces the emergency contingency plan.
- Section 12 (Record Drawings and Equipment Operation and Maintenance Manuals) provides a list of record drawings and pertinent equipment operation and maintenance (O&M) manuals.
- Section 13 (Non-Detect Performance Standards) describes the Non-Detect Performance Standards required by the Remediation Access and Licensing Agreement between Lockheed Martin and the Great Neck Union Free School District (Great Neck UFSD), dated April 14, 2003 (Access Agreement).
- Section 14 (Security) outlines security measures in place at the Off-Site IRM.
- In addition, the following information is provided as Appendices to this OM&M Manual:

- Appendix A (Sampling and Analysis Plan) including Attachment A-1 (Quality Assurance Project Plan [QAPP]);
- Appendix B (Groundwater Monitoring Plan);
- Appendix C (Record Drawings);
- Appendix D (Recovery and Diffusion Wells Construction Details);
- Appendix E (Manufacturer-Supplied Equipment Information);
- Appendix F (OM&M Log Sheet);
- Appendix G (Instrumentation and Control Record Drawings);
- Appendix H (Health and Safety Plan);
- Appendix I (Contingency Plan); and
- Appendix J (Non-Detect Performance Standards).

2. Site Description and History

This section provides a brief site description, a summary of site operational history and a summary of previous investigations and remedial activities.

2.1 Site Description

The former Unisys facility is located in the Village of Lake Success and in the Town of North Hempstead in Nassau County, New York. The former Unisys facility is bounded by Marcus Avenue to the north, Union Turnpike to the south, Lakeville Road to the west and the Triad Business Park to the east.

Land use surrounding the former Unisys facility is comprised of industrial, commercial, and residential properties. Industrial and commercial facilities border the property on the east, northeast and northwest. Residential properties border the site to the southeast, south, and southwest. Four golf courses are located north and northwest of the site.

2.2 Site History

The former Unisys facility was an active manufacturing facility from its startup in 1941 until approximately 1995, when all manufacturing activities ceased. However, some assembly, integration, prototype development and testing, and/or engineering and administrative activities were still being conducted at the facility through early 1999. The facility was originally designed and built by the United States (US) Government and was operated under a contract with Sperry Gyroscope Company (Sperry) from 1941 to 1951. In 1951, the property was sold to Sperry, which merged with Burroughs in 1986 to form the Unisys Corporation. In 1995, Loral Corporation (Loral) acquired assets of Unisys Defense Systems, a division of Unisys Corporation. In early 1996, the electronics and systems integration businesses of Loral were purchased by Lockheed Martin. The property was sold by Lockheed Martin in early 2000 to i.park, which converted the site buildings to commercial rental space.

The facility had been used to manufacture a wide range of defense related products, including navigational systems for the US Navy nuclear submarines (Trident Program), navigational SONAR equipment, RADAR tracking systems (North Warning System), and the weather RADAR systems (NEXRAD). Past manufacturing processes included the following: metal casting, chemical etching, degreasing, plating, painting, metal finishing, machining, electronic circuit board manufacture and assembly. Chemicals used during manufacturing at the plant included halogenated and non-halogenated hydrocarbon solvents, cutting oils, paints, fuel oils, acids and caustics, as well as inorganic plating compounds.

2.3 Previous Investigations

Beginning in January 1978, several investigations and remedial actions have taken place. In January 1994, soil vapor extraction (SVE)/catalytic oxidation for soil remediation in the dry well area began operation as an IRM.

Groundwater and soil investigations were performed at the site between 1988 and 1992 under Nassau County Department of Health (NCDOH) and/or Nassau County Department of Public Works (NCDPW) oversight and

included monitoring and recovery well installation, soil borings, aquifer testing, Underground Storage Tank (UST) excavation, source removal actions, and soil gas surveys. In December 1991, Unisys Corporation entered into a Consent Order with the NYSDEC to conduct a Remedial Investigation/Feasibility Study (RI/FS). In April 1993, a groundwater pump and treatment system began operation on-site as an IRM. From April through June 1993, the investigation and repair of supply Well N-1802 was completed as an IRM.

A Phase I RI was conducted for OU-1 between October 1993 and March 1995 by Leggette, Brashears and Graham (LBG) and Environmental Standards, Inc. (LBG and Environmental Standards, Inc. 1995). A supplemental OU-1 RI was concluded in November 1996 by H2M. For the purposes of this OM&M Manual, the off-site portion of the OU-1 RI is described below.

As part of the OU-1 RI, a well inventory and data review were conducted to locate domestic, municipal and industrial supply wells, and observation wells within a 1.5-mile radius of the site. The results indicated that there were 36 wells within this radius. Results of the groundwater quality data review indicated that the wells located north of the LIE, Well N-9982 that is located south of the site, and Well N-8970 that is located west of the site, exhibited no detectable concentrations of VOCs. This 1.5-mile well inventory was updated as part of the OU-2 RI and expanded to include wells within an area 2 miles downgradient of the site. A total of 12 off-site monitoring wells were installed as part of the OU-1 RI. Biannual groundwater sampling of the existing monitoring wells continues to be conducted.

2.4 Physical Characteristics

On- and off-site physical characteristics are described below.

2.4.1 Surface Features

The former Unisys facility property is industrialized, with the bulk of the property being comprised of the main building, various support buildings (e.g., foundry and boiler building), three retention basins, and parking lots.

2.4.2 Regional and Site Specific Geology

Western Nassau County is underlain by unconsolidated deposits and Precambrian Age bedrock. Based on boring logs and geologic publications (Swarzenski, 1963) for the surrounding area, the unconsolidated deposits are approximately 700 feet (ft) thick and lie upon the bedrock. The unconsolidated deposits are comprised of the following formations from land surface down (from youngest to oldest): Upper Pleistocene glacial deposits, late Cretaceous Magothy Formation and the Late Cretaceous Raritan Formation, which includes the upper clay member and underlying Lloyd Sand unit.

The glacial deposits generally are comprised of stratified, fine to coarse sands and gravel interbedded with silts and thin clay lenses. Based upon boring logs from the off-site and previous site investigations, glacial deposits in the site area are approximately 150 ft thick. The glacial deposits lie unconformably upon the Magothy Formation, which is composed primarily of fine-to-medium sand with silt and clay lenses with a basal coarse sand zone, and is believed to be approximately 250 ft thick. This formation coarsens with depth and unconformably overlies the Raritan Formation. The upper clay member of the Raritan Formation consists predominantly of light to dark grey clay with some silt and is approximately 200 ft thick off site. The

underlying Lloyd Sand unit is approximately 190 ft thick and is composed of light colored sand and gravel with, in some locations, a clayey matrix. The Lloyd Sand unconformably overlies the Precambrian bedrock, which generally consists of gneiss and biotite schist. The bedrock, Magothy and Raritan Formations gently slope (50 ft/mile) to the southeast (Swarzenski, 1963).

2.4.3 Regional and Site Specific Hydrogeology

The following is a detailed description of the regional and site-specific hydrogeology.

Regional Hydrogeology

In general, the hydraulic conductivity of the upper Glacial aquifer (Upper Pleistocene deposits) is greater than that of the underlying Magothy aquifer (Magothy Formation). Values of hydraulic conductivity for the upper glacial and Magothy aquifers have been estimated at 270 feet per day (ft/d) horizontally, 27 ft/d vertically, and 50 ft/d horizontally and 1.4 ft/d vertically, respectively (McClymonds and Franke, 1972). Average groundwater velocity in the vicinity of the site unaffected by pumping wells ranges from approximately 0.3 to 1.0 ft/d. Published data shows that the regional groundwater flow direction within the upper glacial and Magothy aquifers is to the west or northwest (Swarzenski, 1963). According to NCDPW data, the groundwater divide (an imaginary line north of which groundwater generally flows to the north and south of which groundwater generally flows to the south) occurs approximately 0.5 miles south of Union Turnpike. Work completed by Roux Associates in 1990 and LBG in1991 indicates that the hydraulic characteristics of the aquifers and features off-site are within these published ranges.

The Magothy aquifer is Long Island's principal aquifer and its main source of water for public supply wells. Large groundwater users in western Nassau County include the Garden City Park Water District (GCPWD), Manhasset Lakeville Water District (MLWD), Water Authority of Great Neck North (WAGNN), Water Authority of West Nassau County (WAWNC) and a number of other water suppliers.

The Magothy aquifer is underlain by the Raritan Clay that is a confining unit due to its extremely low vertical and horizontal permeability.

Local Hydrogeology

The data collected in support of the OU-1 RI indicate that the local hydrogeology is consistent with regional conditions. The upper Glacial aquifer is partially unsaturated with the maximum thickness of saturated upper Glacial aquifer being approximately 70 ft near the northeast portion of the site. Beneath the site, groundwater occurs mainly in the Magothy aquifer. There does not appear to be a distinct continuous confining layer between the upper Glacial and Magothy aquifers beneath the site. The Raritan Clay, the confining unit between the Magothy and Lloyd aquifers, is also present.

Based on a review of boring logs and interpretation of local hydraulic data and regional flow patterns, the groundwater flow system beneath the site and surrounding area has been divided into four zones for the purposes of groundwater modeling as follows: the upper Glacial aquifer, and the upper, middle and basal portions of the Magothy aquifer. The upper Glacial aquifer is defined as extending from land surface to an elevation of 24 ft below mean sea level (msl). The upper portion of the Magothy aquifer is defined to range from elevation 24 to 113 ft below msl. The middle portion of the Magothy aquifer is defined as an elevation range of 113 to 204 ft below msl. The basal portion of the Magothy aquifer has been defined as an elevation range extending from 204 to 270 ft below msl.

Historic local groundwater flow directions off-site are generally consistent with the regional historic flow previously described. Except as described below, the local horizontal component of groundwater flow in the upper Glacial and upper portion of the Magothy aquifers in the area around the site is primarily to the north, northwest, and west. The local horizontal component of groundwater flow in the middle and basal portions of the Magothy aquifer is primarily to the northwest with a westward component. While they were operating, the pumping of on-site (OU-1) IRM extraction/recovery wells EW-1 and RW-1 depressed the potentiometric surface of the upper Glacial and upper portion of the Magothy aquifers in the northern part of the site. Recent data for the current, final OU-1 groundwater treatment system specified in the Record of Decision (ROD) shows that the system has a similar effect on local groundwater flow patterns.

2.4.4 Summary of On- and Off-Site Contamination

Groundwater beneath and in the vicinity of the former Unisys facility is affected by VOCs in excess of Applicable or Relevant and Appropriate Requirements (ARARs). On average, cis-1,2-dichloroethene (1,2-DCE) accounts for approximately 70% of the VOCs in the groundwater. In general, total volatile organic compound- (TVOC-) impacted groundwater was detected in the upper Glacial aquifer, as well as the upper, middle, and basal portions of the Magothy aquifer, both on- and off-site. TVOCs related to the former Unisys facility were not detected in groundwater samples collected from the Lloyd aquifer.

Because the plume migrates both horizontally and vertically, the plume has its most limited extent in the upper Glacial aquifer and has migrated furthest from the source in the basal portion of the Magothy aquifer. In the basal portion of the Magothy, the plume extends north to the area just beyond the LIE and to the west it extends beyond the Nassau/Queens County line. VOC concentrations are generally highest in the upper Glacial aquifer and upper portion of the Magothy at the site and in an area just north of the Northern State Parkway, and lowest in the basal portion of the Magothy.

2.5 Previous Remedial Activities

Several remedial systems (both IRM and current) have been implemented at OU-1 (the on-site area) to address previously identified sources of contamination or exposure pathways prior to completion of the site RI/FS. These include groundwater, soil, and public supply well (previously described in Section 2.3 of this OM&M Manual) remedial actions, which are described below.

2.5.1 Groundwater Remediation

Both the IRM and current groundwater remedies consisting of pump and treat systems were implemented at OU-1 on-site groundwater. The groundwater IRM consisted of two remedial wells (EW-1 and RW-1) located on the north side of the site, three diffusion (recharge) wells (DW-5, DW-7, and DW-8) located on the south side of the site, four liquid-phase granular-activated carbon (LPGAC) units hooked-up in series, and eight low-profile air strippers. The groundwater IRM system was designed for a combined influent of 1,000 gallons per minute (gpm). Following treatment, the groundwater was returned to the groundwater system on-site via the three diffusion wells. The original groundwater IRM operated between April 1993 and July 2001. The IRM system was shut down in July 2001 and replaced by the current OU-1 groundwater system, which went into operation in 2002.

The final OU-1 groundwater remedy consists of three groundwater extraction/recovery wells (EW-1, RW-1RD, and RW-1RS), two air strippers operated in series, and an emission control unit (ECU) with both vapor-phase granular-activated carbon (VPGAC) and potassium permanganate-impregnated zeolite (PPZ) media to remove VOCs from the air stream prior to atmospheric discharge (note that wells RW-1RD and RW-1RS were installed during the Spring of 2000 to replace well RW-1 that had failed). Treated water is recharged to off-site groundwater via four diffusion wells (DW-9, DW-10, DW-11, and DW-12) located off site, south of the Northern State Parkway.

2.5.2 Soil Remediation

The on-site dry wells were excavated in 1998, and approximately 800 tons of affected soils were removed and disposed. In January 1994, an IRM SVE system consisting of twin regenerative type blowers was used to extract VOC-laden vapors from the deep vadose zone soils. Prior to atmospheric discharge, the VOCs were removed from the vapor stream using a catalytic oxidizer.

Since 2000, the IRM has been upgraded three times. In 2000, the SVE system was expanded to remove perched water and to remediate shallow soil above the confining layer. In 2001, the SVE System was: expanded (by the addition of another SVE well), relocated (the aboveground SVE System equipment was moved to the OU-1 groundwater treatment plant property), and upgraded (the catalytic oxidizer vapor treatment system was replaced by three ECUs, specifically two VPGAC ECUs and one PPZ ECU). In 2005, the SVE system was upgraded with two additional VPGAC ECUs and one additional PPZ ECU.

2.5.3 Off-Site Remedial Objectives

As discussed in previous sections of this OM&M Manual, the VOC plume has migrated in the upper Glacial and Magothy aquifers primarily north, northwest, and west of the site. At its greatest extent, it appears to have traveled just beyond the LIE. The Lloyd aquifer is isolated and hydraulically separated from the overlying Magothy aquifer. Furthermore groundwater modeling predicts that some downgradient municipal supply wells, may eventually be impacted. To rapidly address this situation and control the movement of groundwater with high concentrations of VOCs, Lockheed Martin has implemented the Off-Site IRM. Specifically, the objectives of the Off-Site IRM System are to: (1) protect public drinking water wells, and (2) minimize further contaminant intrusion into the North Hills SGPA.

3. Environmental Monitoring

This section of the OM&M Manual describes the environmental monitoring program that has been developed to monitor the effectiveness of the Off-Site IRM System. Appendix B of the OM&M Manual (Groundwater Monitoring Plan) provides additional detail on the short- and long-term monitoring schedules and data evaluations.

3.1 Environmental Monitoring Plan

The environmental monitoring component of the OM&M Manual includes two elements as follows: 1) operational hydraulic monitoring (also referred to as water-level measurements), and 2) operational groundwater quality monitoring. The monitoring network has been established to satisfy the Project Objectives described in Section 2.5.3. The Groundwater Monitoring Plan is Appendix B of the OM&M Manual. In summary, a total of 28 wells are included in the hydraulic monitoring network (27 monitoring wells and one recovery well). A total of 16 wells are included in the groundwater quality monitoring network. Table 1 of the Groundwater Monitoring Plan (Appendix B) summarizes the wells included in the monitoring plan for hydraulic monitoring and groundwater quality. Figure 1 of the Groundwater Monitoring Plan (Appendix B) shows the locations of wells in the monitoring network. The wells included in the monitoring network may be modified based on a review of the monitoring reports and with NYSDEC's prior approval.

The actual sampling methodologies and quality assurance/quality control (QA/QC) procedures to be utilized are described in the Sampling and Analysis Plan (SAP) provided in Appendix A and the Quality Assurance Project Plan (QAPP) provided as Attachment A-1 of Appendix A.

3.2 Hydraulic Monitoring Schedule and Reporting

Baseline operational hydraulic monitoring will commence prior to the initial startup of the Off-Site IRM. Hydraulic monitoring will continue following start-up of the Off-Site IRM once a month for six months and then quarterly for the remainder of the first year (two additional water level events). Thereafter, water levels will be measured annually. Initially, groundwater elevations will be measured in the 27 monitoring wells and the recovery well (a total of 28 wells). The number of wells in the baseline operational hydraulic monitoring network may be modified after the first 6 months of monitoring is complete based on the review of the monitoring reports and with NYSDEC's prior approval.

Water-level elevation results will be tabulated and added to the existing database. These data will be plotted on maps for all four aquifer zones (upper Glacial, and the upper, middle and lower portions of the Magothy aquifer) and will be contoured, if possible. The figures will be reviewed to assess the areas of influence created by the pumping at recovery well RW-100 and the injection of treated water at diffusion wells DW-100, DW-101 and DW-102. Vertical hydraulic gradients will also be analyzed to determine vertical flow gradients.

Upon completion of water-level measurement rounds and the reduction of the field records, the data will be included in the Off-Site IRM Reports. The reports will include a description of the field work, tabulated water level results, tabulated vertical gradients and groundwater maps. These reports were discussed in more detail in the separately bound Performance Analysis and Design Modification (PADM) Plan.

These operational water level data will be used, along with the groundwater quality data, to assess the overall performance of the Off-Site IRM. Conclusions will be included based on the data generated in the reporting period and over the period of record. In addition, recommendations, if appropriate, will be provided for changes to the monitoring program, as needed. Changes to the monitoring program will only be made with prior NYSDEC approval.

3.3 Groundwater Quality Sampling Schedule and Reporting

Baseline operational groundwater quality sampling will commence following start-up of the Off-Site IRM. Groundwater samples will be collected and analyzed from the 15 monitoring wells and the recovery well (for a total of 16 locations) twice a year for the first year of operation (after the start-up period). Thereafter, groundwater samples will be collected annually. The number of wells in the groundwater quality network may be additionally modified after the first year of monitoring (i.e., two rounds) is complete based on the review of the analytical reports and with NYSDEC's prior approval.

Groundwater quality results will be tabulated and added to the existing database. Groundwater ARARs will be included with the tabulated groundwater quality results. The primary VOCs of concern (cis-1,2-dichlorethene, trichloroethene [TCE], tetrachloroethene [PCE], vinyl chloride, and 1,1,2-trichlorotrifluorethane [Freon 113]) will be monitored and compared to the ARARs. Table 3 in Appendix B summarizes the ARARs. In addition, TVOC groundwater quality results will be plotted over time for the 16 wells in the groundwater monitoring network. The plots will include historical data, if available. The plots will be reviewed to determine the effectiveness of the Off-Site IRM.

Upon completion of the groundwater quality sampling rounds, receipt of the data from the analytical laboratory and validation of the analytical data, Off-Site IRM Reports will be prepared. Each report will include a description of the field work, tabulated groundwater quality results, and graphs showing groundwater quality over time for select wells sampled. These reports are discussed in more detail in the separately bound PADM Plan.

The operational groundwater quality data, along with the water level data, will be used to assess the overall performance of the Off-Site IRM. Conclusions based on the data generated in the reporting period and over the period of record will be included. In addition, recommendations, if appropriate, will be provided for changes to the monitoring program, as needed. Changes to the sampling program will only be made with prior NYSDEC approval.

4. Description of Off-Site IRM Components and Operation

VOC-impacted groundwater will be addressed as follows:

- Removed from the Magothy Aquifer at three separate, screened intervals via recovery well RW-100, located on the Great Neck UFSD property;
- Conveyed to the Treatment Plant, located on the MLWD property via a dual containment pipeline;
- Treated using two air strippers, so that the concentration of VOCs in the groundwater will be reduced to meet the Non-Detect Performance Standards in accordance with the Access Agreement between Lockheed Martin and the Great Neck UFSD; and
- Re-injected into the aquifer via one or more of three diffusion wells (DW-100, DW-101, and DW-102) located on the New York State Department of Transportation (NYSDOT) property.

An emission control system will be used to reduce concentration of VOCs in air stripper off-gas to meet the Non-Detect Performance Standards in accordance with the Access Agreement between Lockheed Martin and the Great Neck UFSD, prior to discharge to the atmosphere.

The following subsections include descriptions of the recovery well and influent pipeline; the groundwater treatment system; the discharge pipeline and diffusion wells; the emission control system; the treatment building; and the process controls and alarms. For these elements of the Off-Site IRM, initial set points for various process equipment are shown in the following subsections. These set points may be adjusted based on actual operating conditions. The following information associated with the Off-Site IRM is also provided in this OM&M Manual:

- Table 1 – Design Influent and Effluent Limits for Treated Water;
- Table 2 – Effluent Limits for Treated Air:
- Figure 3 – Off-Site Treatment System Site Plan;
- Figure 4 – Off-Site Treatment System Schematic;
- Appendix C – Record Drawings (under separate cover);
- Appendix D – Recovery and Diffusion Wells Construction Details;
- Appendix E – Manufacturer-Supplied Equipment Information (under separate cover); and
- Appendix G – Instrumentation and Control Record Drawings.

4.1 Recovery Well, Pump, and Piping

4.1.1 Recovery Well and Pump

The recovery well (RW-100) was installed on the Great Neck UFSD property at a location selected to capture groundwater in the off-site area where VOC concentrations are highest (see Figure 3 or Drawing C-1 in Appendix C). Well RW-100 was installed to total depth of 335 ft below land surface (bls), and has three screened intervals in the middle horizon of the Magothy Aquifer. Specifically, the screens are located between 190 and 210 ft bls, 238 and 260 ft bls, and 276 to 324 ft bls. The exact intervals screened were selected after a vertical profile boring was drilled to better define the local hydrogeologic, groundwater conditions, and contaminant concentrations. The Recovery Well Construction Log is included in Appendix D.

The groundwater recovery pump in RW-100 (P-101) is a 40 horsepower (HP), Grundfos Model No. 625S400-2 submersible pump with a Franklin 460 Volt (V), 3,450 revolutions per minute (RPM) motor, designed to pump 600 gpm at a total discharge head (TDH) of 200 ft (pump and motor information provided in Table 3 and manufacturer-supplied equipment information are provided in Appendix E). The RW-100 wellhead is enclosed in a below-grade, locked vault along with associated piping, valves, and instrumentation that include an air release valve, Cla-Val™/check valve combination, an analog card at the programmable logic controller (PLC) to monitor flow rate, a digital flow indicator, pressure indicator, sample tap, strainer (single basket), and a flow meter readout panel. The remaining flow controls, electrical devices, and accessories associated with the recovery well are housed in the treatment plant influent well vault and the treatment building. The recovery well vault has a level switch to shut the entire system down on a high alarm to prevent release of untreated groundwater to the surrounding soils, should a leak in the piping in the vault occur. Fiber optic cable is installed between the recovery well and the treatment plant to reduce the risk of transmitting lightning strikes to the treatment plant. In addition, a sump and sump pump are installed in the recovery well vault to pump accumulated water into the influent water line.

4.1.2 Influent Pipeline

The influent pipeline, used to convey the groundwater recovered in RW-100 to the Treatment Plant, is approximately 1,700 linear ft long and is located as shown on Figure 3 or Drawing C-1 in Appendix C. The influent pipeline consists of a double-walled or dual containment-type pipe in which the primary or "carrier" pipe is "contained" within a secondary pipe, for added protection against release of fluid out of the pipeline. Specifically, the carrier pipe is an 8-inch-diameter High Density Polyethylene (HDPE) pipe, with a side-wall dimension ratio of 11 (SDR-11) installed inside a 12-inch-diameter HDPE SDR-17 pipe (manufacturer-supplied equipment information on the dual containment pipe is provided in Appendix E). The carrier pipe and the containment pipe are equipped with leak detection devices to shut the system down in case of a pipeline failure.

Prior to entering the treatment building, the influent pipeline enters the treatment plant influent vault, where the dual-containment pipeline transitions to single-walled pipe. Inside the vault, the influent pipeline includes a check valve, butterfly valve, propeller-type flow meter, pressure indicator, and sample tap. Upon exiting the treatment plant influent vault, untreated groundwater enters the treatment building and into the first of two, packed-column tower air strippers (AS-1).

4.2 Groundwater Treatment System

Twin, series-arranged air stripper towers are used to remove VOCs from the recovered groundwater. The following subsections include a description of the air stripper process, design criteria and parameters, and information on the system components (the air stripping towers, the transfer pump and the blower).

The Off-Site IRM groundwater treatment system is a modified version of the pre-existing MLWD Parkway Treatment System (Parkway Plant). The Parkway Plant was designed, built and operated to treat extracted groundwater, which had been impacted by similar VOCs to the Off-Site IRM VOCs, prior to use as a public drinking water source. However, due to the significant differences between the off-site design criteria (e.g., influent groundwater quality and quantity; the need for off-gas treatment; reinjection of treated groundwater, etc.) significant renovations to the Parkway Plant, including modification, removal, or replacement of equipment were required for use as the Off-Site IRM. In the following subsections, information concerning these changes, especially with regards to the status of equipment that was not removed or replaced is provided for continuity.

4.2.1 Air Stripper Process Description

Air stripping is a mass transfer process. In a packed-column aeration system, like the Off-Site IRM System, air and water are run counter-current through a randomly packed media in a tower structure. The media enhances air/liquid contact by breaking the water into a thin film and exposing a large amount of the liquid surface area to the counter-flowing air. The more surface area exposed, the greater the opportunity for transfer of the VOCs out of the water into the passing air. The media also serves to continually mix the water so that the stripping process is not limited by diffusion of the VOCs through the water.

Specifically, in the Off-Site IRM groundwater system (refer to Figure 4 or Appendix G), the following occurs:

- Pump P-101 pumps untreated groundwater from recovery well RW-100 to the first air stripper (AS-1);
- Water flows down through Air Stripper AS-1 and into Clear Well No. 1, while Blower B-310 blows air (actually the off-gas from Air Stripper AS-2) up through Air Stripper AS-1 column and out to the emission control system; and
- Transfer Pump P-211 pumps the partially treated groundwater from Clear Well No. 1 to the top of Air Stripper AS-2, where it drains into Clear Well No. 2, while Blower B-310 pulls ambient air up through Air Stripper AS-2 column and ultimately into the blower.

4.2.2 Air Stripper System Design Criteria and Parameters

The design criteria for the Off-Site IRM influent and effluent groundwater are listed below.

Maximum Water Flow Rate	600 gpm
Typical Water Flow Rate	500 gpm
Minimum Water Temperature	50 degrees Fahrenheit
Influent VOC Concentrations	see Table 1
Effluent VOC Concentrations	Non-Detect Performance Standards in accordance with the Access Agreement between Lockheed Martin and the Great Neck UFSD

Based on the above-listed design criteria and the pre-existing equipment at the Parkway Plant, the resulting Off-Site IRM design parameters are:

Number of Tower Air Strippers	2
Design Air to Water Ratio	60:1
Packed Tower Diameter	108-inch-diameter
Column Material	Aluminum
Packing Media Size	2-inch-diameter
Packing Media Type	Polypropylene Jaeger Tripacks
Packed Bed Depth	24 ft
Overall Tower Height (per tower)	30 ft
Removal Efficiency	>99.98%

4.2.3 Air Stripper System Components

The Off-Site IRM consists of the following primary components: two air stripping towers with associated clear wells, one transfer pump and one blower.

4.2.3.1 Air Stripper Towers, Internals, and Clear Wells

For use in the Off-Site IRM groundwater treatment system, the pre-existing twin, series-arranged air stripper towers (Hydro Group Inc. Model PCS-108-24) were modified as follows:

- Water distribution trays were replaced because the hydraulic loading changed from the original design rate of 1,000 to 3,000 gpm to 500 to 600 gpm; and
- Caps were specially manufactured to allow ductwork to be attached directly to the air strippers. Duct had to be added due to the need for an emission control system to reduce the VOC levels in the air stripper off-gas.

Specifics of the tower column and internal details are summarized above. Manufacturer-supplied equipment OM&M manuals, including equipment cut-sheets are provided in Appendix E, along with information on the distribution trays and caps. The tower internal equipment, including the packing, has never been replaced and appears to be in good condition, with no apparent signs of iron fouling.

Each air stripper contains a concrete clear well underneath it to help equalize water flow through the system. The clear wells are approximately 30 ft x 30 ft x 8 ft in depth, resulting in a 90-minute retention time, if completely full, at the design flow rate of 600 gpm. Under normal operating conditions, the clear well water level is maintained at a depth of 4 ft from the clear well bottom and the effective water retention time is 45 minutes at water flow rate of 600 gpm (design) and 54 minutes at water flow rate of 500 gpm (normal). Clear well operating and switch levels are shown on Drawing P-4 of the Record Drawings. The level switch extreme low (LSXL) and the level switch extreme high (LSXH) are set at depths of 1 ft 3 in. and 5 ft 3 in., as measured from the clear well bottom, respectively.

4.2.3.2 Transfer Pump and Ancillary Piping

Transfer pump (P-211) is a Christensen Model 11CLC, single-stage pump with an 10 HP, 460V, 1,800 RPM motor (Hitachi Model S12931H) rated for 600 gpm at 53 ft TDH. Pump P-211 pumps partially treated water from Clear Well No. 1 to the top of Air Stripper No. 2 for final treatment (see Table 3 and manufacturer-supplied equipment information in Appendix E).

To maintain the design criteria of a constant, continuous flow throughout the system, the pump is controlled with a flow control valve (FCV-211) equipped with a motor operated valve (MOV-211). The valve continuously and automatically adjusts the pump flow rate to maintain a constant level in the clear well (initially set at 4.0 ft above the clear well bottom), thus the flow out of Clear Well No. 1 is equal to the flow into the clear well.

The original flow control valve in this location was replaced due to the significant reduction in flow rate (from 1,000 to 3,000 gpm to 500 to 600 gpm). The original valve was too large to properly maintain a constant flow rate throughout the system. To install the properly sized 4-inch-diameter flow control valve, the pre-existing 8-inch-diameter line was reduced. A reducer was also installed downstream of the valve to transition back to

exiting piping. The rate of flow can be checked using a pitot-tube and differential pressure gauge flow indicator (FI/FE-211) installed on the influent pipe to Air Stripper No. 2.

4.2.3.3 Blower

In the Off-Site IRM, Blower B-310 is installed in a push/pull configuration. Blower B-310 pulls ambient air through Air Stripper AS-2, and pushes the Air Stripper AS-2 off-gas through Stripper AS-1 and the five ECUs.

Blower (B-310) is a Northern Blower backward inclined centrifugal fan, design 6640, size 40-2663 with a Baldor 75 HP, 3,600 RPM, 460V motor rated for 5,000 standard cubic feet per minute (SCFM) at 49 inches static pressure to address worst case conditions (see design criteria and parameters above). Since expected VOC loading is considerably less than worst case, a variable frequency drive (VFD) unit was installed to allow manual control of the system flowrate. The VFD not only allows efficient operation of Blower B-310, but also improves effectiveness of the ECUs to remove VOCs from the stripper off-gas.

Originally there were four air stripper blowers (B-310 through B-340), two per air stripper in the MLWD Parkway Plant. The original Blower B-310 was replaced with a new blower for the Off-Site IRM. Blowers B-320 and B-330 were removed and their intakes were covered with an air-tight steel plate and an inlet screen, respectively. Blower B-340 was left in-place, but will not be used as part of the Off-Site IRM.

4.3 Discharge Pump, Pipeline, and Diffusion Wells

Once the raw groundwater has been treated, it is reinjected into the Magothy aquifer. Primary components associated with the discharge system are as follows:

- One discharge pump located in Clear Well No. 2 to reinject the treated water back into the Magothy aquifer via one or more of the three diffusion wells;
- Two bag filters located between Clear Well No. 2 and the discharge pipeline to remove particulate matter prior to discharge to the diffusion wells;
- The discharge pipeline for the conveyance of the treated water from the Plant to the diffusion wells;
- Three Variable Orifice Valves (VOVs), one located at the bottom of each of the drop pipes in each of the diffusion wells, to improve overall discharge system performance; and
- Three diffusion wells to reinject the treated groundwater back into the Magothy aquifer.

4.3.1 Discharge Pump and Ancillary Piping

Discharge Pump P-225, used to pump treated groundwater from Clear Well No. 2, through the bag filters, and out to the diffusion wells, is a Christensen Model 11CLC, double-staged pump with an 25 HP, 460V, 1,800 RPM motor (Hitachi Model S15931H) rated for 600 gpm at 100 ft TDH (see Table 3 and manufacturer-supplied equipment information in Appendix E).

To maintain a constant, continuous flow of treated water to the diffusion wells, which is desired when using VOVs to reinject water into the subsurface, a variable speed drive is used to control/maintain the pump flow rate. The drive adjusts pump speed to maintain a constant level in Clear Well No. 2 (initially set at 4.0 ft above the clear well bottom).

4.3.2 Bag Filters

A dual bag filter system (two housing units that contain eight bags per unit) with motor-actuated control valves is used to remove particulate matter before discharge to the diffusion wells. The filter bags used are 25 micron size. Only one filter housing is kept on-line at a time. The actuators are controlled based on the differential pressure across the filter bed in use. Once the differential pressure reaches the filter system changeover set point (initially set at 10 pounds per square inch), the actuator opens the valve for the unit which is on "stand-by" and at the same time initiates an advisory condition, then closes the valve for the unit which has been "in service," redirecting the flow into the fresh filter units. When the operator replaces the filter bags in the unit that was just taken off-line with new filter bags, the unit is placed in stand-by mode by the operator acknowledging the advisory condition. Should the differential pressure reach the high set point (initially set at 15 pounds per square inch), the entire system will automatically and immediately shut down.

4.3.3 Discharge Pipeline

A discharge pipeline is required to convey the treated groundwater to the diffusion wells. The discharge pipeline consists of the following components: part of the former MLWD Well No. 2 influent pipeline, part of the former MLWD Well N5710 ductile iron, cement-lined influent pipeline, and an 8-inch-diameter polyvinyl chloride (PVC) line.

Specifically, as shown on Drawings C-1 thru C-4, C-9, and C-10 of the Record Drawing in Appendix C, the discharge system is as follows:

- The former discharge lines that emptied into the on-site reservoir were cut and capped on the downstream/reservoir side of the cut such that no water from the Off-Site IRM, including both the Entrance Vault and Exit Vault, can enter the MLWD reservoir;
- The former Well No. 2 and Well N5710 influent lines were reconfigured such that approximately the first 750 ft of the discharge pipeline is a combination of existing lines. At that point, the Well N5710 line was cut, the line going towards the well was capped, and an elbow was installed so that the discharge pipeline could be directed towards the diffusion well area;
- The remaining portion of the pipeline is constructed with approximately 1,000 ft of 8-inch-diameter PVC Blue Brute pipe; and
- The discharge pipeline contains two air release valves at high points in the line, and three gate valves off the discharge main line, one for each diffusion well. An additional tee was also installed, approximately 40 ft north of the DW-101 tee for a future diffusion well, if needed.

4.3.4 Diffusion Wells

Three diffusion wells (DW-100, DW-101, and DW-102) are used to reinject the treated groundwater into the Magothy aquifer. The wells were installed at the locations shown on Figure 3 for the following reasons:

- They are not located within the dissolved VOC plume. This is desirable so that the groundwater mounding: a) does not "push" the dissolved VOC plume out further to the east where it currently does not exist, and b) creates a hydraulic barrier which hinders further migration of the dissolved VOC plume to the east; and

- They are located far enough from the recovery well so as to eliminate the possibility of short-circuiting the treated water readily being recovered by the recovery well. This design maintains the effectiveness of the recovery well.

The diffusion wells range from approximately 424 to 434 ft in depth. Well casings are 12-inch-diameter, Schedule 80 PVC. The well screens are 40 slot, 10-inch-diameter, Type 304 stainless steel, wire wrapped, high-flow Johnson screens. The wells are reduced down from 12-inch-diameter casings to 10-inch-diameter screens because the 10-inch-diameter screens have comparable intake area (in square feet) of well opening per length of screen as a 12-inch-diameter screen and were determined to be more cost-effective.

Well construction logs for diffusion wells DW-100, DW-101, and DW-102 are included in Appendix D. The wells were screened towards the bottom of wells, corresponding to deeper portions of the middle and deep Magothy formations.

Each diffusion well includes a flow meter, sampling port, pressure gauge, and combination vacuum breaker/air release valve on the drop pipe, as well as the well casing. The well and the above-listed instrumentation are located in locked, underground vaults as shown on Drawing C-9 of the Record Drawings (Appendix C).

A 4-inch VOV is installed at the base of each drop pipe, approximately 110 ft bls. The 4-inch valves allow the entire flow at a design rate of 600 gpm to be directed to one diffusion well, if the well and surrounding formation can handle the entire flow.

4.4 Emissions Control System

The emission control system uses VPGAC and PPZ to remove VOCs from the air stripper off-gas prior to discharge to the atmosphere. The following subsections include a description of the VPGAC and PPZ processes, design criteria and parameters, and information on the system components.

4.4.1 VPGAC and PPZ Process Description

VPGAC adsorbs the VOC molecules forming a physical bond via Van der Waal forces with the molecule. VPGAC is manufactured to ensure an extensive natural surface area that is available for the adsorption process. The surface area of granular carbons can range up to 1,200 square meters per gram of material. The physical adsorption of VOCs on, and into VPGAC is concentration gradient driven. Thus, the adsorption capacity of the VPGAC is dependent on the concentration of VOCs in the off-gas. For example, as VOC concentration increases, additional pounds of VOCs per pound of VPGAC can be adsorbed. The three VPGAC units are arranged in series configuration.

Due to the need for direct contact between the VOC molecule and the VPGAC surface, the presence of moisture in the air stream will impact the rate of adsorption. The capacity of the activated carbon declines rapidly as the relative humidity of the air increases above 60%. In order to optimize the carbon usage rate, the air stream is heated to lower the relative humidity of the air to the 40% to 60% range.

The PPZ units, which are arranged in series configuration, were installed to reduce the concentration of vinyl chloride within the vapor stream to a non-detect concentration via chemical oxidation.

4.4.2 Emission Control System Design Criteria and Parameters

The emission control system design parameters are listed below:

Maximum Air Flow Rate	5,000 SCFM (for 60:1 air:water ratio)
Typical Air Flow Rate	4,200 SCFM (assuming 500 gpm)
VOC Loading	See Table 1, assume 100% of VOCs removed from recovered groundwater
Relative Humidity	100% from the air strippers
Influent (raw) Temperature	50 degrees Fahrenheit
Required Increase in Temperature to Reduce Relative Humidity below 50%	45 degrees Fahrenheit
Effluent VOC Concentrations	Non-Detect Performance Standards in accordance with the Access Agreement between Lockheed Martin and the Great Neck UFSD
Expected VPGAC Changeout Frequency	60 days
Expected PPZ Changeout Frequency	To be determined

4.4.3 Emission Control System Components

4.4.3.1 Emission Control Units

The sizing and configuration of the VPGAC and PPZ ECUs were determined based on expected air flow rates, VOC characteristics and loadings. The following ECUs with VPGAC type, PPZ type, and loading were selected:

- Primary Units: Three (3) TIGG Model NB-20 ECUs, each filled with 28,000 pounds of TIGG 5CC 6X12 virgin vapor-phase coconut shell carbon (for a total of 84,000 pounds of VPGAC); and
- Secondary Units: Two (2) T1GG Model NB-15 ECUs, each filled with 28,000 pounds of Hydrosil 600 PPZ.

To enhance system performance, flow will always be through the three primary units (the NB-20 Units). The carbon will be changed out in the first bed when VOCs are detected in the discharge from the first VPGAC unit. This changeout frequency may be modified based on operating experience and only with prior NYSDEC approval. Manufacturer-supplied equipment information of the VPGAC ECUs are provided in Appendix E.

The three VPGAC ECUs are insulated with 2-inch-thick, rigid Styrofoam boards to maintain desired temperature and relative humidity conditions throughout the vapor-phase treatment system. The insulation is finished with stucco embossed aluminum jacketing. The insulation is applied to the top of the ECUs to withstand mild personnel traffic. The ECUs are equipped with safety railing, sampling ports and access ladders.

The two PPZ units are operated in a series configuration. Flow will always be through both units. The PPZ will be changed out in the first bed when vinyl chloride is detected in the discharge from the first PPZ unit. Manufacturer-supplied equipment information of the PPZ ECUs are provided in Appendix E. The two PPZ ECUs are mounted on a concrete pad and equipped with safety railings, sampling ports and access ladders. The two PPZ ECUs are insulated similarly to the VPGAC ECUs.

4.4.3.2 Duct and Insulation

Duct is 18-inch-diameter, schedule 10 (~1/8-inch thick), aluminum. The exterior duct has a 2-inch thick, 370 Melamine foam insulation with brown PVC coating. Condensate traps have been installed in duct low points to collect condensation from various locations in the duct. Collected condensate is transferred into Clear Well No. 1. The condensate lines are heat traced to prevent freezing.

4.4.3.3 Duct Heater

A Reznor model RP 350 exterior use duct heater (DH-500), with a power-vented burner duct, a stainless steel heat exchanger and burner, and electronic modulation control of temperature has been installed to improve the effectiveness of the VPGAC to remove the VOCs from the vapor stream. Manufacturer-supplied equipment information on duct heater DH-500 is provided in Appendix E.

The heater is instrumented and controlled to prevent overheating of the duct heater or underheating of the off-gas. In the event alarm temperatures are reached in the duct heaters, the entire Off-Site IRM will automatically and immediately shut down. Prior to the heaters, the ducts are equipped with condensate collection traps to capture excess moisture and reduce the moisture content of the air entering the duct heaters.

4.5 Process Controls and Operation

The process control system is designed to provide the necessary safeties and interlocks to ensure that the recovery well, piping, and treatment system operate smoothly, efficiently, and as one unit. Additionally, the system includes the capability of allowing local or remote operator(s) to observe and control the operation of the system from a single computer workstation.

Controls and instrumentation are interconnected via serial network, utilizing network wiring installed in exposed conduit. The actual network and control connection layout is presented on Drawings I-1 through I-5 and E-2 through E-5 of the Record Drawing included in Appendix C. The main control panel (MCP), located in the air-conditioned control room of the Treatment Plant, includes a primary PLC which monitors and integrates the operation of the recovery well and clear well pumps, air stripping system, emission control system, and all treatment system interlocks. This panel serves as the node through which remote control and communication with the control system takes place. The primary PLC is integrated with the Supervisory Control and Data Acquisition (SCADA) system, including an operator interface station. The primary PLC is also supported with a secondary PLC that utilizes fail safe logic to automatically and immediately shut down the entire treatment system in the event of a critical alarm input or a failure of either the primary or secondary PLCs. An audible alarm notifies the operator of any critical alarms. If operating personnel are not on-site, a project team member will be alerted of the shut down by a dedicated autodialer. The dedicated autodialer will also notify a project team member of power loss.

The power supplies for both PLCs, system instrumentation, and process control devices are protected with transient voltage surge suppression (TVSS) systems to limit voltage spikes to the systems. Both PLCs, system instrumentation, and process control devices are also protected by separate uninterrupted power supplies (UPS) which maintain power to these devices in case of a power outage. The primary PLC is supported with PC

ANYWHERE software, which is used with a cable modem to allow remote access and control of the system. However, since the secondary PLC is the back-up, fail-safe system, it cannot be interfaced with remotely.

4.5.1 Operation and Programmable Logic Controllers

Operation of the Off-Site IRM is controlled and integrated through the primary PLC located in the system's MCP. The primary PLC provides the necessary control logic to coordinate signals from the remote switches and instrumentation throughout the treatment system. These interlocks ensure proper operating conditions are maintained within the treatment system.

Under normal operating conditions, the control system has the following functions:

- Monitors and automatically maintains the operating water levels within both clear wells. This ensures that the pumping rates are synchronized throughout the system;
- Monitors the line pressure and annulus pressure on the influent and the line pressure on the effluent pipelines to ensure that the pipes maintain structural integrity and there are no leaks;
- Monitors the air stream flow rate to ensure that it is adequate to treat the VOC-laden water stream;
- Monitors and maintains design temperature of the ECU system influent air stream in order to ensure VOC adsorption efficiency within the VPGAC- and PPZ-filled ECUs;
- Monitors filter bag differential pressures and controls the bag filter sequencing;
- Maintains fail-safes and alarm interlocks to maintain safe and effective operation of the system. Fail-safes and alarm interlocks are described in the Section 4.5.2 including calling project team members when plant shut downs occur due to either a primary (via a network internet connection) or critical (via an autodialer) alarm; and
- Ensures that once the Plant is shut down, regardless of whether it is due to a power failure or an alarm condition, the Plant does not automatically restart. The Plant has to be manually restarted. Manual restart is required so that the cause of the alarm is investigated and the problem can be addressed prior to restart.

Major instrument operational controls are listed below.

- A hand/off/auto switch provided within the MCP is used to operate Blower B-310.

- Blower B-310 discharge includes a pressure transmitter with high- and low-pressure settings, low-pressure switch, and a low-flow switch. These instruments are connected to alarm-indicating lights mounted on the MCP.

- The recovery well RW-100 pump (P-101) is operated with hand/off/auto switches mounted on the MCP. The recovery well pump switches will not operate unless the blower switch is in the "on" position and the blower is running.

- A motorized control valve (FCV-211) is installed on the discharge of the Clear Well No. 1 pump (P-211). This valve accommodates an analog signal from the MCP and modulates the flow from the associated clear well pump in order to maintain a constant pre-set water level in the associated clear well. Thus, a constant flow is maintained through Clear Well No. 1.

- A variable speed drive is installed and connected to the Clear Well No. 2 pump (P-225) motor. The variable speed drive accommodates a similar analog signal from the MCP that modulates pump speed and thus

controls the flow from Clear Well No. 2 pump in order to maintain a constant pre-set water level in the clear well. Thus, a constant flow is maintained through Clear Well No. 2.

- As with the recovery well pump, the clear well pumps will not operate unless the blower is running. This ensures that groundwater is not pumped through the air stripping system without receiving treatment.

- Ultrasonic water level indicating transmitters are installed within the clear wells to measure the clear well water levels and transmit the signal to the MCP, control the downstream modulating valve for Clear Well No. 1, and control the variable speed drive for pump P-225 in Clear Well No. 2, as described above. The ultrasonic level signals also have high- and low-level alarm and advisory set points in the primary PLC.

- In order to ensure that the air stream entering the ECU system is at proper temperature and relative humidity, the duct heater is controlled to maintain a set discharge temperature. If the duct heater cannot maintain the set air stream temperature, the operator will be notified via an advisory and if the temperature reaches the low alarm set point, the entire system will be automatically and immediately shut down.

- Differential pressure across the effluent bag filter unit in service is continuously monitored. Once the differential pressure measured reaches the low set point value, the primary PLC opens the valve for the stand-by unit and activates an advisory, and then closes the valve for the previously operating filter unit. Upon switching to the stand-by unit, an advisory is sent out to the project team members alerting them that a bag filter change out is required. If this advisory is not cleared, which can only be done manually at the site, before the differential pressure reaches a high differential pressure set-point, the entire system will automatically and immediately shut down.

- Two UPS were installed. One is for the process control devices, including the primary PLC to enable these components to continue to operate in case of power failure and ensure that monitoring and control devices operate properly. If there is a power failure and the primary UPS also losses power, the system will shut down due to a critical alarm. A second UPS was installed for the secondary PLC. If the secondary UPS losses power, then the system will shut down due to fail-safe circuitry as described below in Section 4.5.2.

4.5.2 Alarms and Interlocks

The recovery well, air stripping, emission control, and treated water diffusion systems are interlocked and alarmed to ensure that water and air are properly treated, and for efficient system operation. Three types of interlocks and alarms are incorporated into the treatment system to prevent water from being discharged from the air stripper system in the event that an air stripper blower is not operating, a leak in either the influent or effluent conveyance lines, or a flooding condition in either of the Treatment Plant's clear wells. The three types of alarms and interlocks used are: primary alarms, secondary alarms, including the fail-safe circuitry, and advisories. Each type of alarm/interlock, including the fail-safe circuitry, is described below.

Primary alarms are alarms that are processed by the main PLC to shut the system down. The PLC is constantly receiving signals from the instrumentation listed below. When the PLC detects an alarm condition from one of these instruments, the primary PLC automatically and immediately sends a signal to relays which causes the starter coils for all the process equipment (pumps, blower, and duct heater) to open, thus causing all the process equipment to shut down. The one exception is that there is a 10-minute delay on the air stripper blower to allow for additional treatment of the water still in the air stripper towers when the alarm condition occurs. One example of a primary alarm condition is a voltage dip in the incoming power supply that causes pump P-211 to

shut down, which causes the water level in Clear Well No. 1 to rise to its high-high condition, thus causing the PLC to initiate shut down of the Treatment Plant. A complete list of the primary alarms is provided below. The primary PLC will alert project team members of the shut down via cell phone, text messages and computer e-mails when there is a primary alarm.

SHUT-DOWN ALARMS IN PRIMARY PLC			
ALARM DESCRIPTION (ALARM SCREEN ON HMI)	**TAG NO.**	**DEVICE TYPE**	**LOCATION**
EMERGENCY STOP ENGAGED	-	PUSH BUTTON/TOUCH SCREEN	3 IN FIELD, 1 ON MCP AND 1 ON TOUCH SCREEN
RW-100 VAULT HIGH WATER LEVEL	LSH-111	FLOAT SWITCH	RECOVERY WELL VAULT
RW-100 CONTROL PANEL NETWORK COMM. LOSS	RW-100 PLC	PLC-001	MCP
TREATMENT PLANT INFLUENT LOW PRESSURE (SET POINT)	PT-131	PRESSURE TRANSMITTER	ENTRANCE VAULT
TREATMENT PLANT INFLUENT HIGH PRESSURE (SET POINT)	PT-131	PRESSURE TRANSMITTER	ENTRANCE VAULT
RW-100 CONVEYANCE PIPING ANNULUS HIGH PRESSURE (SET POINT)	PT-121	PRESSURE TRANSMITTER	ENTRANCE VAULT
RW-100 CONVEYANCE PIPING ANNULUS EXTREME HIGH PRESSURE	PSH-121	PRESSURE SWITCH	ENTRANCE VAULT
ENTRANCE VAULT HIGH-HIGH LEVEL	LSHH-142	FLOAT SWITCH	ENTRANCE VAULT
CLEAR WELL CW-210 EXTREME HIGH LEVEL	LSXH-212	CONDUCTANCE LEVEL SWITCH	CLEAR WELL #1
CLEAR WELL CW-210 HIGH-HIGH LEVEL (SET POINT)	LIT-211	LEVEL INDICATING TRANSMITTER	CLEAR WELL #1
CLEAR WELL CW-210 LOW-LOW LEVEL (SET POINT)	LIT-211	LEVEL INDICATING TRANSMITTER	CLEAR WELL #1
CLEAR WELL CW-210 EXTREME LOW LEVEL	LSXL-211	CONDUCTANCE LEVEL SWITCH	CLEAR WELL #1
CLEAR WELL CW-220 EXTREME HIGH LEVEL	LSXH-222	CONDUCTANCE LEVEL SWITCH	CLEAR WELL #2
CLEAR WELL CW-220 HIGH-HIGH LEVEL (SET POINT)	LIT-221	LEVEL INDICATING TRANSMITTER	CLEAR WELL #2
CLEAR WELL CW-220 LOW-LOW LEVEL (SET POINT)	LIT-221	LEVEL INDICATING TRANSMITTER	CLEAR WELL #2
CLEAR WELL CW-220 EXTREME LOW LEVEL	LSXL-221	CONDUCTANCE LEVEL SWITCH	CLEAR WELL #2

SHUT-DOWN ALARMS IN PRIMARY PLC			
ALARM DESCRIPTION (ALARM SCREEN ON HMI)	**TAG NO.**	**DEVICE TYPE**	**LOCATION**
BAG FILTER HIGH DIFFERENTIAL PRESSURE	PT-401/PT-402	INLET PRES. TRANS./OUTLET PRES. TRANSMITTER	AT BAG FILTERS
TREATMENT PLANT EFFLUENT EXTREME LOW PRESSURE	PSL-404	PRESSURE SWITCH	EFFLUENT LINE IN BLDG.
TREATMENT PLANT EFFLUENT LOW PRESSURE (SET POINT)	PT-402	PRESSURE TRANSMITTER	EFFLUENT LINE IN BLDG.
TREATMENT PLANT EFFLUENT HIGH PRESSURE (SET POINT)	PT-402	PRESSURE TRANSMITTER	EFFLUENT LINE IN BLDG.
TREATMENT BUILDING FLOOD	LSH-201A	FLOAT SWITCH	ADJACENT TO EACH BLDG. ENTRANCE
TREATMENT BUILDING FLOOD	LSH-201B	FLOAT SWITCH	ADJACENT TO EACH BLDG. ENTRANCE
VPGAC INFLUENT EXTREME HIGH TEMPERATURE	TSH-503	TEMPERATURE SWITCH	DUCT HEATER EFFLUENT LINE
BLOWER EFFLUENT LOW AIR FLOW	FSL-642	THERMO DISPERSION FLOW SWITCH	BETWEEN PPZ UNITS
BLOWER EFFLUENT LOW AIR PRESSURE	PSL-313	PRESSURE SWITCH	BLOWER DISCHARGE
BLOWER LOW AIR FLOW (SET POINT)	FIT-641	THERMO DISPERSION FLOW INDICATING TRANSMITTER	BETWEEN PPZ UNITS
BLOWER LOW AIR PRESSURE (SET POINT)	PIT-312	PRESSURE INDICATING TRANSMITTER	BLOWER ROOM
BLOWER HIGH AIR PRESSURE (SET POINT)	PIT-312	PRESSURE INDICATING TRANSMITTER	BLOWER ROOM
VPGAC INFLUENT LOW TEMPERATURE (SET POINT)	TT-502	TEMPERATURE TRANSMITTER	DUCT HEATER EFFLUENT LINE
VPGAC INFLUENT HIGH TEMPERATURE (SET POINT)	TT-502	TEMPERATURE TRANSMITTER	DUCT HEATER EFFLUENT LINE
PUMP P-211 LOW PRESSURE (SET POINT)	PT-211	PRESSURE TRANSMITTER	PUMP P-211 DISCHARGE
PUMP P-225 LOW PRESSURE (SET POINT)	PT-225	PRESSURE TRANSMITTER	PUMP P-225 DISCHARGE
BLOWER VFD FAULT	VFD FAULT CONTACT	BLOWER VFD FAULT CONTACT	BLOWER ROOM
PUMP P-225 VFD FAULT	VFD FAULT CONTACT	PUMP P-225 VFD FAULT CONTACT	ELECTRICAL ROOM

Secondary, or critical, alarms are used to back-up key primary alarms or to shut the system down if either the primary PLC or the blower VFD fail. If a primary alarm instrument fails to appropriately respond to an alarm

condition (or the primary PLC or the blower VFD fails), a hard-wired switch will send a signal directly to a relay. Relay contacts will then send inputs to the primary PLC, the secondary PLC, and the autodialer. The Treatment Plant will automatically and immediately shut down via either the primary PLC or the secondary PLC (both are capable of shutting the plant down as a redundant feature) and will notify project team members of the shut down. When the process equipment is shut down by the secondary PLC, all the equipment, including the air stripper blower, is shut down immediately. All critical switches, when triggered, not only send a signal to the secondary PLC but, for additional protection, send an alarm signal to the primary PLC. Thus, if there were to be a failure within the secondary PLC, the alarm condition would be recognized by the primary PLC and shut the system down. However, as discussed below, due to the fail-safe logic incorporated in the system's wiring, if the secondary PLC were to lose power, the system would shut down automatically and immediately. Thus, the need for the primary PLC to back-up the secondary PLC is redundant.

Fail-safe circuitry means the normal condition of a circuit is energized. If for some reason (e.g., loss of power, a broken wire or a relay burns out) the "switch" becomes de-energized and opens, the circuit is broken, which immediately cuts power to other devices on the circuit. These systems were implemented to make sure (fail-safe) that a circuit does not close, or remain closed, when the circuit/switch is de-energized. At the Off-Site IRM, this system is useful in many ways, but specifically a) shuts the treatment process down once the circuit is broken by any of these switches, and b) ensures that if there is a power failure or a key system component loses power, switches will open causing the entire system to shut down. For example, the secondary PLC acts as a fail-safe permissive switch wired in series with the starter coils associated with all the process equipment (pumps, blower, and duct heater) such that if a critical, hard-wired switch (i.e., a critical alarm) opens, the secondary PLC will cause the output relays to all process equipment to de-energize, thus shutting all the process equipment down. The secondary PLC is wired such that it has to be manually reset in the field before the process can be restarted and to prevent unwanted automatic restart.

A complete list of the critical alarms is provided below. Critical alarms also send a signal to the autodialer to call project team members.

CRITICAL ALARMS TO SECONDARY PLC

ALARM DESCRIPTION (ALARM LIGHTS ON FRONT OF PLC)	TAG NO.	DEVICE TYPE	LOCATION
RW-100 VAULT HIGH WATER LEVEL	LSH-111	FLOAT SWITCH	RECOVERY WELL VAULT
RW-100 CONVEYANCE PIPING ANNULUS EXTREME HIGH PRESSURE SWITCH	PSH-121	PRESSURE SWITCH	ENTRANCE VAULT
ENTRANCE VAULT HIGH-HIGH LEVEL	LSHH-142	FLOAT SWITCH	ENTRANCE VAULT
CLEAR WELL CW-210 EXTREME HIGH LEVEL	LSXH-212	CONDUCTANCE LEVEL SWITCH	CLEAR WELL #1
CLEAR WELL CW-210 EXTREME LOW LEVEL	LSXL-211	CONDUCTANCE LEVEL SWITCH	CLEAR WELL #1
CLEAR WELL CW-220 EXTREME HIGH LEVEL	LSXH-222	CONDUCTANCE LEVEL SWITCH	CLEAR WELL #2
CLEAR WELL CW-220 EXTREME LOW LEVEL	LSXL-221	CONDUCTANCE LEVEL SWITCH	CLEAR WELL #2
TREATMENT PLANT EFFLUENT EXTREME LOW PRESSURE	PSL-404	PRESSURE SWITCH	EFFLUENT LINE IN BLDG.
TREATMENT BUILDING FLOOD	LSH-201A	FLOAT SWITCH	ADJACENT TO EACH BLDG. ENTRANCE

CRITICAL ALARMS TO SECONDARY PLC			
ALARM DESCRIPTION (ALARM LIGHTS ON FRONT OF PLC)	**TAG NO.**	**DEVICE TYPE**	**LOCATION**
TREATMENT BUILDING FLOOD	LSH-201B	FLOAT SWITCH	ADJACENT TO EACH BLDG. ENTRANCE
VPGAC INFLUENT EXTREME HIGH TEMPERATURE	TSH-503	TEMPERATURE SWITCH	DUCT HEATER EFFLUENT LINE
BLOWER EFFLUENT LOW AIR FLOW	FSL-642	THERMO DISPERSION FLOW SWITCH	BETWEEN PPZ UNITS
BLOWER EFFLUENT LOW AIR PRESSURE	PSL-313	PRESSURE SWITCH	BLOWER DISCHARGE
PRIMARY PLC FAILURE	-	MCP	CONTROL ROOM
BLOWER VFD FAULT	VFD FAULT CONTACT	BLOWER VFD FAULT CONTACT	BLOWER ROOM

Advisory conditions occur when process variables are outside of their desired range, but do not require immediate shut down of the Treatment Plant. An advisory is programmed to allow operators to get an advanced warning of a possible problem. The advisories that were initially incorporated into the system are listed below.

ADVISORY CONDITIONS IN PRIMARY PLC			
ADVISORY DESCRIPTION (ADVISORY SCREEN ON HMI)	**TAG NO.**	**DEVICE TYPE**	**LOCATION**
BAG FILTER PRESSURE ADVISORY FILTER SWITCH OCCURRED	PT-401 & PT-402	PRESSURE TRANSMITTER	AT BAG FILTERS
CLEAR WELL CW-210 HIGH LEVEL ADVISORY	LIT-211	LEVEL INDICATOR TRANSMITTER	CLEAR WELL #1
CLEAR WELL CW-220 HIGH LEVEL ADVISORY	LIT-221	LEVEL INDICATOR TRANSMITTER	CLEAR WELL #2
CLEAR WELL CW-210 LOW LEVEL ADVISORY	LIT-211	LEVEL INDICATOR TRANSMITTER	CLEAR WELL #1
CLEAR WELL CW-220 LOW LEVEL ADVISORY	LIT-221	LEVEL INDICATOR TRANSMITTER	CLEAR WELL #2
VPGAC INFLUENT STREAM HIGH HUMIDITY ADVISORY	RHT-621	RELATIVE HUMIDITY TEMPERATURE TRANSMITTER	BETWEEN GAC UNITS
VPGAC INFLUENT STREAM LOW TEMPERATURE ADVISORY	TT-502	TEMPERATURE TRANSMITTER	DUCT HEATER EFFLUENT LINE
PLANT INFLUENT STREAM LOW WATER FLOW ADVISORY	FIT-131	FLOW INDICATOR TRANSMITTER	INFLUENT VAULT
RW-100 STRAINER HIGH DIFFERENTIAL PRESSURE HIGH ADVISORY	PT-101 & PT-102	PRESSURE TRANSMITTER	RECOVERY WELL VAULT
ENTRANCE VAULT HIGH WATER LEVEL ADVISORY	LSH-141	FLOAT SWITCH	ENTRANCE VAULT
PUMP P-211 HIGH PRESSURE ADVISORY	PT-211	PRESSURE TRANSMITTER	PUMP P-211 DISCHARGE
PUMP P-225 HIGH PRESSURE ADVISORY	PT-225	PRESSURE TRANSMITTER	PUMP P-225 DISCHARGE

4.5.3 System Operation and Maintenance

The treatment system is designed to run automatically and will operate 24-hours per day, 7 days per week. During the initial start-up period, an operator will be on-site 24-hours per day, 7 days per week. This coverage schedule will be reduced as operating experience is gained and only with prior NYSDEC approval. In the longer term, site inspections will be made at least weekly to check the performance of the system and to collect the necessary monitoring samples required by the NYSDEC. A toll-free Lockheed Martin emergency telephone number (1-800-449-4486) is prominently displayed on signs mounted near the entrance doors on the northeast and southwest ends of the Treatment Building. This telephone number has also been supplied to Great Neck UFSD and community officials. Additionally, these same signs contain the NYSDEC Spill Hotline telephone number (1-800-457-7362) that can be used to report spills. If the plant shuts down, a project team member is alerted by a dedicated autodialer and will respond immediately. An operator will be on call 24-hours a day, 7 days a week. In addition, the system performance is able to be monitored remotely by authorized personnel, on an as needed basis, via modem and computer.

4.6 Treatment Building

The former MLWD Parkway Station Treatment Building was modified for use as the Off-Site IRM. The existing plant houses two air strippers, blower, pumps, instrumentation and controls. Completed modifications and additions to the Treatment Plant are presented in the Record Drawing included in Appendix C.

4.7 Utility Services

Existing electric service available at the site was modified to provide an uninterruptible power supply and the connection between the MLWD Well No. 1 Building and the Treatment Plant was disconnected at the Well No. 1 Building. A new primary feed line (480/277V, 3 phase, 4 wire, 600 Amp Main) was installed along the western and southern MLWD property boundary and connected to the new transformer installed south of the southwestern corner of the Treatment Plant building. A secondary feed line was installed from the new transformer to the circuit breaker in the motor control center (MCC), and the new metering panel; as shown on E-1, E-2, E-3, and E-5 of the Record Drawings (Appendix C). The incoming electrical service is protected by a TVSS and an external grounding grid provides supplemental grounding.

Controls and instrumentation for the operation of the treatment system and associated recovery well are installed within the Treatment Plant building. The networking enabled the control and monitoring of the entire system via a single serial node, which is monitored and controlled via a computer housed within the office and a remote dialup modem. The autodialer is connected to a dedicated telephone line.

A 2-inch-diameter natural gas line was connected to the main located at the end of Tanners Road with a gas meter. A ¾-inch-diameter line runs from the meter to the duct heater as shown on Drawings C-1 and P-5 of the Record Drawings (Appendix C).

Existing potable water supply and sanitary sewer facilities were determined suitable for use and were not modified.

5. System Start-Up

This section discusses system pre-start-up and start-up activities to be followed during start-up of the Off-Site IRM.

5.1 Pre-Start-Up Activities

The following activities were executed prior to all testing and will be also conducted prior to system start-up. System start-up activities will not commence until malfunctions that could affect system start-up and operation are corrected.

1. Check utilities – electrical, natural gas, cable and telephone.

2. Check/test electrical equipment – transformers, switch gear, control panels, electrical panels, motors, electrically actuated valves, MCC, etc.

3. Test building controls – Heating Ventilation and Air Conditioning (HVAC) and lighting.

4. Check/test piping.

5. Test mechanical equipment (i.e., operate each piece of mechanical equipment briefly to ensure proper operation prior to start-up activities).

6. Test instrumentation and system alarms and interlocks.

5.2 System Start-Up Control Sequence

The system requires a manual starting. This manual start-up procedure involves a series of steps that the PLC will sequence. The steps required to start the system are outlined below:

1. Engage Air Stripper Blower (B-310) by switching HS-310 to auto position. Allow 10 minutes to elapse before Step 2.

2. Engage Duct Heater (DH-500) by switching HS-500 to auto position. Allow 10 minutes to elapse before Step 3.

3. Engage Clear Well Pumps (P-211 and P-225); by switching HS-211 and HS-225 to auto position with 2 minutes between engagement of each clear well pump. Allow 2 minutes to elapse before Step 4.

4. Engage Recovery Well Pump (P-101) by switching HS-101, to auto position with pre-set design flow rates.

6. Monitoring and Testing

Monitoring and testing includes activities that will be performed to evaluate the operation of the Off-Site IRM. The monitoring and testing activities to be conducted after system start-up are described in this section.

6.1 Short-Term

The following subsections describe the activities that will be completed after startup in the first six months of full operation. During the initial start-up period, an operator will be on-site 24-hours per day, 7 days per week. This coverage schedule will be reduced as operating experience is gained and only with prior NYSDEC approval. The proposed schedule presented in this section may also require modification based on site-specific data obtained during the start-up period and on-going system operation. Changes to the proposed schedule will only be made with prior NYSDEC approval.

6.1.1 Operational Hydraulic Monitoring and Groundwater Quality

During the first six months of the Off-Site IRM System operation, operational hydraulic monitoring and groundwater quality monitoring will be conducted to monitor the performance and effectiveness of the Off-Site IRM System. A detailed description of these programs is presented in the Groundwater Monitoring Plan (Appendix B).

6.1.2 Off-Site IRM System Performance and Compliance Monitoring

The following sections present the monitoring protocols for each of the various components comprising the Off-Site IRM including the recovery well, air stripping system, ECUs, and treated water discharge system. The short-term performance and compliance monitoring schedule is summarized in Table 4. Locations of sampling ports are shown on Figure 4.

6.1.2.1 Groundwater Recovery and Treatment System

During the first six months of Off-Site IRM System operation, the groundwater recovery/diffusion systems will be monitored as follows (also refer to Table 4).

- Flow rate: Recovery well RW-100 flow rate (FE/FIQT-131) and the total effluent flowrate (FE/FIQT-401), will be monitored continuously and recorded every 4 minutes via the on-site SCADA system. The above flow rates, as well as the Clear Well No. 1 effluent flow rate (FE/FI-211) will be monitored and recorded manually via the on-site operator on at least a weekly basis to help assess the accuracy of the SCADA system and monitoring equipment. The diffusion well flow rates (FE/FIQ -711, FE/FIQ-721, and FE/FIQ-731) will also be monitored and recorded manually via the on-site operator on at least a weekly basis.

- Pressure: Recovery pipeline pressure in the influent pipeline (PI/PT-131), and in the containment pipeline (PI/PT-121) in the Plant Influent Vault, Clear Well No. 1 effluent (PI/PT-211), Clear Well No. 2 effluent (PI/PT-225), and Bag filter influent and effluent (PI/PT-401 and PI/PT-402, respectively) will be monitored

continuously and recorded every 1 minute via the on-site SCADA System. The above pressures, along with recovery well RW-100 (PI-101, PI-102, PI-103), total effluent (PI-403), and individual diffusion wells (PI-711, PI-712, PI-713, PI-721, PI-722, PI-723, PI-731, PI-732, PI-733) will be monitored and recorded manually via the on-site operation on at least a weekly basis to help assess the accuracy of the SCADA system, monitoring equipment and overall system performance.

- Water Quality: During the first six months of operation, water samples will be collected on a weekly basis from the recovery well RW-100 (WSP-1). Water samples will be analyzed for VOCs, including freons. Water samples will be collected, submitted and analyzed per the SAP, provided in Appendix A.

6.1.2.2 Air Stripping System

During the first six months of Off-Site IRM System operation, the air stripping system will be monitored as follows (also refer to Table 4).

- Air Stripping System: During the first six months of operation, water samples will be collected on a weekly basis from the system influent (WSP-1, system influent sample which is the same as the recovery well RW-100 sample) and the system effluent (WSP-3). Water samples will be collected on a monthly basis from the Air Stripper No. 1 effluent (WSP-2). Water samples will be analyzed for VOCs, including freons. Water samples will be collected, submitted and analyzed per the SAP, provided in Appendix A. Following receipt of the analytical data, air stripper removal efficiencies will be calculated to determine the effectiveness of the air stripping system. Changes in the sampling program will only be made with prior NYSDEC approval.

- Air Stripper Blower: The air stripper blower influent and effluent pressures (PIT-311 and PIT-312), will be measured within duct between the two air strippers. The air flow rate (FE/FIT-313) after the air strippers and the air flow rate after the first PPZ unit (FE/FIT-641) will be monitored and recorded continuously via the SCADA system. The above measurements will also be monitored and recorded manually via the on-site operator on at least a weekly basis.

6.1.2.3 Emissions Control Unit

During the first six months of Off-Site IRM System operation, the ECUs will be monitored as follows (also refer to Table 4).

- Emissions Control System: During the six months of operation, air samples will be collected from the emission control system influent (VSP-1), the effluent from the primary VPGAC (VSP-2), the effluent from the secondary VPGAC (VSP-3), the effluent from the tertiary VPGAC (VSP-4), the effluent from the primary PPZ (VSP-7) and the system effluent (VSP-8) on a weekly basis. Air sampling will be collected on a monthly basis from the Air Stripper No. 2 effluent (VSP-6). Air samples will be collected, submitted and analyzed for VOCs, including freons, as specified in the SAP provided in Appendix A. Results of these analyses will be used to help assess system performance and to help determine VPGAC and PPZ usage rates. Changes to the sampling program will only be made with prior NYSDEC approval.

- Temperature/Relative Humidity: Temperature and relative humidity measurements will be obtained on at least a weekly basis via an on-site operator. Temperature and relative humidity measurements will be obtained at the Duct Heater influent (RHT/TT-501), VPGAC #1 effluent (RHT/TT-621), and VPGAC #3

effluent (RHT/TT-631) vapor stream locations. The combined temperature and relative humidity will also be continuously monitored via the SCADA systems. Additionally, temperature readings will be obtained at Air Stripper No. 1 effluent (TI-313), the Duct Heater discharge (TT-502), VPGAC No. 1 influent (TI-611), VPGAC No. 3 effluent (TI-635) and at the stack discharge to atmosphere (TI-651).

- Pressure: The Duct Heater influent pressure (PIT-313) will be monitored and recorded continuously via the SCADA system and manually via the on-site operator on at least a weekly basis. Additionally, the influent pressure for each ECU (PI-611, PI-621, PI-631 PI-634, PI-636 and PI-643) and the stack discharge pressure (PI-651) will be monitored and recorded manually via the on-site operator on at least a weekly basis.

6.1.2.4 Clear Well Operation

During the first six months of Off-Site IRM System operation, clear well water levels operations will be monitored as follows (also refer to Table 4).

- Individual clear well water levels (LE/LIT-211, LE/LIT-221) will be monitored continuously via the on-site SCADA system and recorded manually via the on-site operator on at least a weekly basis.

6.2 Long-Term

The following subsections describe the activities that will be completed following the first six months of operation (i.e., long-term operation). The proposed schedule presented in this section may require modification based on site-specific data obtained during the start-up period, and on-going system operation. Modifications to the schedule will only be made with prior NYSDEC approval.

6.2.1 Operational Hydraulic Monitoring and Groundwater Quality

During the long-term Off-Site IRM System operation, operational hydraulic monitoring and groundwater quality monitoring will continue to be conducted to monitor the performance and effectiveness of the Off-Site IRM System. A detailed description of these programs is presented in the Groundwater Monitoring Plan (Appendix B).

6.2.2 Off-Site IRM System Performance and Compliance Monitoring

The following sections present the monitoring protocols for each of the various components comprising the Off-Site IRM including the recovery well, air stripping system, ECUs, and treated water discharge system. The long-term performance and compliance monitoring schedule is summarized in Table 4. Locations of sampling ports are shown on Figure 4.

6.2.2.1 Groundwater Recovery and Treatment System

During the long-term Off-Site IRM System operation, the groundwater recovery/diffusion systems will be monitored as follows (also refer to Table 4).

- Flow rate: Recovery well RW-100 flow rate (FE/FIQT-131) and the total effluent flowrate (FE/FIQT-401), will be monitored continuously and recorded every 4 minutes via the on-site SCADA system. The above flow rates, as well as the Clear Well No. 1 effluent flow rate (FE/FI-211) will be monitored and recorded manually via the on-site operator on at least a monthly basis to help assess the accuracy of the SCADA system and monitoring equipment. The diffusion well flow rates (FE/FIQ-711, FE/FIQ-721 and FE/FIQ-731) will also be monitored and recorded manually via the on-site operator on at least a monthly basis.

- Pressure: Recovery pipeline pressure in the influent pipeline (PI/PT-131), and in the containment pipeline (PI/PT-121) in the Plant Influent Vault, Clear Well No. 1 effluent (PI/PT-211), Clear well No. 2 effluent (PI/PT-225), and Bag filter influent and effluent (PI/PT-401 and PI/PT-402, respectively) will be monitored continuously and recorded every 1 minute via the on-site SCADA System. The above pressures, along with recovery well RW-100 (PI/PT-101, PI/PT-102, PI-103), total effluent (PI-403), and individual diffusion wells (PI-711, PI-712, PI-713, PI-721, PI-722, PI-723, PI-731, PI-732, PI-733) will be monitored and recorded manually via the on-site operation on at least a monthly basis to help assess the accuracy of the SCADA system, monitoring equipment and overall system performance.

- Water Quality: Water samples will be collected on a monthly basis from the recovery well RW-100 (WSP-1). Water samples will be analyzed for VOCs, including freons. Water samples will be collected, submitted and analyzed per the SAP, provided in Appendix A.

6.2.2.2 Air Stripping System

During the long-term Off-Site IRM System operation, the air stripping system will be monitored as follows (also refer to Table 4).

- Air Stripping System: Water samples will be collected on a monthly basis from the system influent (WSP-1, system influent sample which is the same as the recovery well RW-100 sample), Air Stripper No. 1 effluent (WSP-2), and system effluent (WSP-3). Water samples will be analyzed for VOCs, including freons. Water samples will be collected, submitted and analyzed per the SAP, provided in Appendix A. Following receipt of the analytical data, air stripper removal efficiencies will be calculated to determine the effectiveness of the air stripping system. Changes in the sampling program will only be made with prior NYSDEC approval.

- Air Stripper Blower: The air stripper blower influent and effluent pressures (PIT-311 and PIT-312), will be measured within duct between the two air strippers. The air flow rate (FE/FIT-313) after the air strippers and air flow rate after the first PPZ unit (FE/FIT-641) will be monitored and recorded continuously via the SCADA system. The above measurements will also be monitored and recorded manually via the on-site operator on at least a monthly basis during the long-term period of operation.

6.2.2.3 Emissions Control Unit

During the long-term Off-Site IRM System operation, the ECUs will be monitored as follows (also refer to Table 4).

- Emissions Control System: Air samples will be collected from the emission control system influent (VSP-1), the effluent from the primary VPGAC (VSP-2), the effluent from the secondary VPGAC (VSP-3), the effluent from the tertiary VPGAC (VSP-4), the effluent from the primary PPZ (VSP-7) and the system effluent (VSP-8) on a monthly basis. Air samples will be collected on a monthly basis from the Air Stripper No. 2 effluent (VSP-6). Air samples will be collected, submitted and analyzed for VOCs, including freons, as specified in the SAP provided in Appendix A. Results of these analyses will be used to help assess system performance and to help determine VPGAC and PPZ usage rates. Changes to the sampling program will only be made with prior NYSDEC approval.

- Temperature/Relative Humidity: Temperature and relative humidity measurements will be obtained on at least a monthly basis during the long-term period of operation via an on-site operator. Temperature and relative humidity measurements will be obtained at Duct Heater (RHT/TT-501), VPGAC No. 1 effluent (RHT/TT-621), and VPGAC No. 3 effluent (RHT/TT-631) vapor stream locations. The combined temperature and relative humidity will also be continuously monitored via the SCADA system. Additionally, temperature readings will be obtained at Air Stripper No. 1 effluent (TI-313), the duct heater discharge (TT-502) VPGAC No. 1 influent (TI-611), VPGAC No. 3 effluent (TI-635), and at the stack discharge to atmosphere (TI-651).

- Pressure: The Duct Heater influent pressure (PIT-313) will be monitored and recorded continuously via the SCADA system and manually via the on-site operator on at least a monthly basis. Additionally, the pressure for each ECU (PI-611, PI-621, PI-631, PI-634, PI-636 and PI-643) and the stack discharge pressure (PI-651) will be monitored and recorded manually via the on-site operator at least on a monthly basis.

6.2.2.4 Clear Well Operation

During the long-term Off-Site IRM System operation, the clear well operation will be monitored as follows (also refer to Table 4).

- Clear Well Water Levels: Individual clear well water levels (LE/LIT-211, LE/LIT-221) will be monitored continuously via the on-site SCADA system and recorded manually via the on-site operator on at least a monthly basis.

7. Off-Site IRM System Maintenance and Monitoring

The anticipated maintenance and monitoring activities and their associated schedules for the Off-Site IRM are described in this section. The schedule commences after the first six months of system operation. During the first six months, the treatment system will be monitored on a more frequent basis and maintenance will occur as necessary. In fact, during the initial start-up period, an operator will be on-site 24-hours per day, 7 days per week. This coverage schedule will be reduced as operating experience is gained and only with prior NYSDEC approval. In addition to the activities described below, the operator should always refer to the individual system O&M Manuals located in Appendix E for the manufacturer-recommended maintenance activities of individual components. OM&M Log Sheets are provided in Appendix F.

7.1 Regularly Scheduled Maintenance Activities

Regularly scheduled maintenance activities for the Off-Site IRM System are as follows:

Each Workday:

- ☐ Check for proper system operation and water and air flow rates at MCP Human-Machine Interface (HMI) terminal on-site or via remote computer access (i.e., SCADA system).
- ☐ Check for alarm conditions via remote computer access (i.e., SCADA system).
- ☐ Verify the status of the bag filter via remote computer access (i.e. SCADA system) and replace bag filters, if necessary.

Weekly:

- ☐ Screen effluent air before each and after all ECUs with a photoionization detector (PID).

Monthly:

- ☐ Inspect site locks and fencing.
- ☐ Inspect Influent and Effluent Vaults, along with all well vaults for any storm water.
- ☐ Inspect air inlet filters for particulate accumulation and replace filters, if necessary.
- ☐ Clean blower motor housing.
- ☐ Visually check for leaks on above grade pipes and blower unit.
- ☐ Manually check and record system parameters, as required, on OM&M Log Sheets in Appendix F.
- ☐ Manually check for alarm conditions.

Semi-annually:

- ☐ Inspect and test all alarm conditions that cause a system shutdown (i.e., float switches in the clear wells and well vaults).

Annually:

- Shut down system and inspect clear wells.
- Inspect all flanges from blower, tower air strippers and clear well pumps.
- Inspect air stripper towers, internals, and clear wells for evidence of discolorization, orange tint indicating iron build-up, slimy film or any kind of off-white colored build-up.

The schedule for the above-described regularly scheduled maintenance activities may be modified with prior NYSDEC approval.

In addition to the maintenance activities list above, scheduled maintenance activities for specific components of the Off-Site IRM System are identified in the manufacturer O&M Manuals provided in the Appendix E.

7.2 Periodic Alarm & Operator Testing

The Project Manager, or his designate, will, on a periodic basis, cause an unexpected shutdown of the system by tripping one of the system's alarms and observe how the Off-Site IRM and operator-of-record respond. A record of the test will be kept on file. Unless there is specific reason to do so, an alarm will only be tested once in a twelve month period. Initially these tests will be performed on a monthly basis, but may be performed on a less frequent basis with prior NYSDEC approval

7.3 Preventative Maintenance Schedule

Preventative maintenance consists of lubricating pump motors, blower motor, cleanout of packing material in tower air strippers, etc. Preventative maintenance activities for specific components of the Off-Site IRM System are identified in manufacturer supplied equipment information presented in Appendix E.

8. Record Keeping and Reporting

Records documenting the operation and maintenance of the Off-Site IRM System will be maintained electronically (SCADA system) and via manual means (OM&M Log Sheets). The OM&M Log Sheets (Appendix F) will be completed during site inspections to document system operation and maintenance activities. Electronic and system inspection and maintenance logs will be retained a minimum of 10 years after data is collected.

System OM&M Reports will aid in tracking system performance and effectiveness. These reports will be prepared and submitted to NYSDEC as discussed in the separately-bound PADM Plan.

9. Personnel Organization

Lockheed Martin and subcontractor personnel for site operations are organized as follows:

Lockheed Martin Project Manager:	Tina Armstrong, Ph.D.
Lockheed Martin Director of Environmental Remediation:	Tom Blackman
BBLES Project Officer:	Lowell McBurney, P.E.
BBLES Project Manager:	Scott Morris, P.E.
BBLES Site Supervisor:	Scott DeCesare

Contact information for these individuals is located in the Contingency Plan provided in Appendix I.

10. Health and Safety Plan

The site-specific Health and Safety Plan for the facility is provided in Appendix H.

11. Contingency Plan

The Contingency Plan for the facility is provided in Appendix I.

12. Record Drawings and Manufacturer Supplied Equipment Information

Record Drawings and manufacturer supplied equipment information are provided in Appendix C and Appendix E, respectively, of this OM&M Manual.

13. Non-Detect Performance Standards

The Non-Detect Performance Standards are required by the Access Agreement between Lockheed Martin and the Great Neck UFSD. Tables 1 and 2 from the Access Agreement, included in Appendix J, provide a list of the constituents and required method detection limits covered by the Access Agreement for aqueous and air samples, respectively. There are no other discharge limitations for the facility. Pursuant to 6 NYCRR Part 201-3.3(c)(29), the air discharge is exempt for NYSDEC registration or permitting. Please note that on Table 2, USEPA method TO-14A is specified for air discharge sampling. However, this method is no longer run by analytical laboratories and has been replaced with USEPA method TO-15.

14. Security

To reduce the risk of vandalism, the following security measures have been implemented:

- A 6-foot fence around the treatment building;
- A 6-foot fence around the recovery well vault area;
- Locking gate to prevent access to NYSDOT property where the diffusion wells are located;
- Locks on the building and the below grade structures, such as well and pipeline vaults;
- Recently upgraded exterior lighting around the treatment building; and
- Interior and exterior video and audio monitoring system for the treatment building.

The site is co-occupied with MLWD, which retains operational control of some facilities located on the grounds.

Tables

TABLE 2

FORMER UNISYS FACILITY
GREAT NECK, NEW YORK
OFF-SITE INTERIM REMEDIAL MEASURE

EFFLUENT LIMITS FOR TREATED AIR

Parameter	AGC [1,2] ($\mu g/m^3$)	SGC [1,2] ($\mu g/m^3$)	Effluent Air Performance Standard [3] ($\mu g/m^3$)
Tetrachloroethene	1	1,000	ND
Trichloroethene	0.5	54,000	ND
cis-1,2-Dichloroethene	1,900	190,000 [4]	ND
Vinyl Chloride	0.11	180,000	ND
Freon 113	180,000	960,000	ND

Notes:
$\mu g/m^3$ - micrograms per cubic meter.

(1) Ambient air concentrations limits based on NYSDEC December 22, 2003 Air Guide No. 1 (DAR-1) AGCs and SGC, and NYSDEC recommendations.
(2) AGC refers to Annual Guidance Concentrations and SGC refers to Short-Term Guidance Concentrations.
(3) "ND" denotes analyte not detected in the sample at or above its minimum detection limit of 0.5 ppbV per USEPA Method TO-15. The Non-Detect Performance Standards are specified in the Remediation Access and Licensing Agreement between Lockheed Martin Corporation and the Great Neck Union Free School District, dated April 14, 2003.
(4) Since no SGC was provided in the DAR-1 AGC/AGC Tables, dated December 22, 2003, an interim SGC was developed based on guidance provided in Section IV.A.2.b.1 of the New York State DAR-1 Guidelines for the Control of Toxic Ambient Air Contaminants, 1991 edition. Specifically, for cis-1,2-Dichloroethene, which is not defined as a HIGH toxicity contaminant, the interim SGC = (smaller of TWA-TLV or TWA-REL)/4.2 or 793,000 $\mu g/m^3$/4.2 = 190,000 $\mu g/m^3$.

TABLE 3

FORMER UNISYS FACILITY
GREAT NECK, NEW YORK
OFF-SITE INTERIM REMEDIAL MEASURE

PUMP AND BLOWER SUMMARY

	Pump/Blower				Motor		
Designation	**Type**	**Make**	**Model**	**Rating**	**Make**	**Model**	**Rating**
P-101	Submersible Turbine Pump	Grundfos	625S400-2	600 GPM/200 FT TDH	Franklin	6-inch	40HP, 460V, 3450 RPM
P-141	Sump Pump	TEEL	Grainger #3P511	38 GPM/20 FT TDH	TEEL	N/A	N/A
P-211	Submersible Turbine Pump	Christensen	11CLC - 1 STAGE	600 GPM/53 FT TDH	Hitachi	S12931H	10 HP, 460V, 1800 RPM
P-225	Submersible Turbine Pump	Christensen	11CLC - 2 STAGE	600 GPM/100 FT TDH	Hitachi	S15931H	25HP, 460V, 1800 RPM
B-310	Centrifugal Fan	Northern Blower	Blower Design 6440, Size 40-2663, Serial No. A51871-1	5,000 CFM/49 IN TDH	Baldor	EM4313T	75 HP, 460V, 3600 RPM

Notes:
GPM = Gallons per minute.
FT = Feet of water pressure.
IN = Inches of water pressure.
TDH = Total design head.
EFF = Efficiency.
N/A = Not available.
V = Volts.
HP = Horsepower.
RPM = Revolutions per minute.

TABLE 3

FORMER UNISYS FACILITY
GREAT NECK, NEW YORK
OFF-SITE INTERIM REMEDIAL MEASURE

PUMP AND BLOWER SUMMARY

	Pump/Blower				Motor		
Designation	Type	Make	Model	Rating	Make	Model	Rating
P-101	Submersible Turbine Pump	Grundfos	625S400-2	600 GPM/200 FT TDH	Franklin	6-inch	40HP, 460V, 3450 RPM
P-141	Sump Pump	TEEL	Grainger #3P511	38 GPM/20 FT TDH	TEEL	N/A	N/A
P-211	Submersible Turbine Pump	Christensen	11CLC - 1 STAGE	600 GPM/53 FT TDH @ 84% EFF	Hitachi	S12931H	10 HP, 460V, 1800 RPM
P-225	Submersible Turbine Pump	Christensen	11CLC - 2 STAGE	600 GPM/100 FT TDH @ 82% EFF	Hitachi	S15931H	25HP, 460V, 1800 RPM
B-310	Centrifugal Fan	Northern Blower	6440 HP, SIZE 40-2600, Serial No. A38892-3	5,000 CFM/49 IN TDH	Baldor	EM4313T	75 HP, 460V, 3600 RPM

Notes:
GPM = Gallons per minute.
FT = Feet of water pressure.
IN = Inches of water pressure.
TDH = Total design head.
EFF = Efficiency.
N/A = Not available.
V = Volts.
HP = Horsepower.
RPM = Revolutions per minute.

TABLE 4

FORMER UNISYS FACILITY
GREAT NECK, NEW YORK
OFF-SITE INTERIM REMEDIAL MEASURE

MONITORING AND TESTING SCHEDULE

Sample Location/Instrument (a)	Parameter/Measurement (b)	Frequency		
		Short-Term (c)	Long-Term (d)	SCADA Data Acquistion
Water Samples				
Tower 1 Influent (WSP-1)	VOCs including freons	Weekly	Monthly	NA
Tower 1 Effluent (WSP-2)	VOCs including freons	Monthly	Monthly	NA
Tower 2 Effluent (WSP-3)	VOCs including freons	Weekly	Monthly	NA
Air Samples				
Tower 1 Effluent/ECU-1 Influent (VSP-1)	VOCs including freons and PID readings	Weekly	Monthly	NA
ECU-1 Effluent/ECU-2 Influent (VSP-2)	VOCs including freons and PID readings	Weekly	Monthly	NA
ECU-2 Effluent/ECU-3 Influent (VSP-3)	VOCs including freons and PID readings	Weekly	Monthly	NA
ECU-3 Effluent/ECU-4 Influent (VSP-4)	VOCs including freons and PID readings	Weekly	Monthly	NA
ECU-4 Effluent/ECU-5 Influent (VSP-7)	VOCs including freons and PID readings	Weekly	Monthly	NA
Stack Discharge (VSP-8)	VOCs including freons and PID readings	Weekly	Monthly	NA
Tower 2 Effluent/Tower 1 Influent (VSP-6)	VOCs including freons	Monthly	Quarterly	NA
Water Flow Measurements				
Plant Influent Vault (FE/FIQT-131)	Flow rate (gpm + total gal.)	Weekly	Monthly	Continuously
Clearwell No. 1 Effluent (FE/FI-211)	Flow rate (gpm)	Weekly	Monthly	NA
Clearwell No. 2 Effluent (FE/FIQT-401)	Flow rate (gpm + total gal.)	Weekly	Monthly	Continuously
Diffusion Well DW-100 (FE/FIQ-711)	Flow rate (gpm + total gal.)	Weekly	Monthly	NA
Diffusion Well DW-101 (FE/FIQ-721)	Flow rate (gpm + total gal.)	Weekly	Monthly	NA
Diffusion Well DW-102 (FE/FIQ-731)	Flow rate (gpm + total gal.)	Weekly	Monthly	NA
Air Flow Measurements				
Air Stripper No. 1 Effluent (FIT-313)	Flow rate (cfm)	Weekly	Monthly	Continuously
ECU-4 Effluent (FIT-641)	Flow rate (cfm)	Weekly	Monthly	Continuously

TABLE 4

FORMER UNISYS FACILITY
GREAT NECK, NEW YORK
OFF-SITE INTERIM REMEDIAL MEASURE

MONITORING AND TESTING SCHEDULE

Sample Location/Instrument (a)	Parameter/Measurement (b)	Frequency		
		Short-Term (c)	Long-Term (d)	SCADA Data Acquistion
Water Pressure Measurements				
RW-100 Well Vault (PI/PT-101 & 102, PI-103)	Pressure (psi)	Weekly	Monthly	NA
Influent Vault (PI/PT-121 & 131)	Pressure (psi)	Weekly	Monthly	Continuously
Clearwell No. 1 Effluent (PI/PT-211)	Pressure (psi)	Weekly	Monthly	Continuously
Clearwell No. 2 Effluent (PI/PT-225)	Pressure (psi)	Weekly	Monthly	Continuously
Bag Filter (PI/PT-401 & 402)	Pressure (psi)	Weekly	Monthly	Continuously
Effluent (PI-403)	Pressure (psi)	Weekly	Monthly	NA
Diffusion Well DW-100 (PI-711, 712 & 713)	Pressure (psi)	Weekly	Monthly	NA
Diffusion Well DW-101 (PI-721, 722 & 723)	Pressure (psi)	Weekly	Monthly	NA
Diffusion Well DW-102 (PI-731, 732 & 733)	Pressure (psi)	Weekly	Monthly	NA
Air Pressure Measurements				
Air Inlet Screens (PDIS-301, 302 & 303)	Pressure (iwg)	Weekly	Monthly	Continuously
Blower Influent (PIT-311)	Pressure (iwg)	Weekly	Monthly	Continuously
Blower Effluent (PIT-312)	Pressure (iwg)	Weekly	Monthly	Continuously
Duct Heater Influent (PIT-313)	Pressure (iwg)	Weekly	Monthly	Continuously
VPGAC#1 Influent (PI-611), #2 Influent (PI-621), #3 Influent (PI-631), PPZ#1 Influent (PI-634 & PI-636), PPZ#2 Influent (PI-643), Stack Discharge (PI-651)	Pressure (iwg)	Weekly	Monthly	NA
Clearwell Water Level Measurements				
Clearwell No.1 (LIT-211)	Feet	Weekly	Monthly	Continuously
Clearwell No.2 (LIT-221)	Feet	Weekly	Monthly	Continuously

TABLE 4

FORMER UNISYS FACILITY
GREAT NECK, NEW YORK
OFF-SITE INTERIM REMEDIAL MEASURE

MONITORING AND TESTING SCHEDULE

Sample Location/Instrument (a)	Parameter/Measurement (b)	Frequency		
		Short-Term (c)	Long-Term (d)	SCADA Data Acquistion
Air Temperature & Relatively Humidity Measurements				
Air Stripper No. 1 Effluent (TI-313)	Temperature	Weekly	Monthly	NA
Duct Heater Influent (TT/RHT-501)	Temperature/Relative Humidity	Weekly	Monthly	Continuously
Duct Heater Efffluent (TT-502)	Temperature	Weekly	Monthly	Continuously
VPGAC #1 Influent (TI-611)	Temperature	Weekly	Monthly	NA
VPGAC #1 Effluent (TT/RHT-621)	Temperature/Relative Humidity	Weekly	Monthly	Continuously
VPGAC #3 Effluent (TT/RHT-633)	Temperature/Relative Humidity	Weekly	Monthly	Continuously
VPGAC #3 Effluent (TI-635)	Temperature	Weekly	Monthly	NA
Stack Discharge (TI-651)	Temperature	Weekly	Monthly	NA

Notes:

(a) Refer to Figure 4 for diagram showing referenced sample locations.

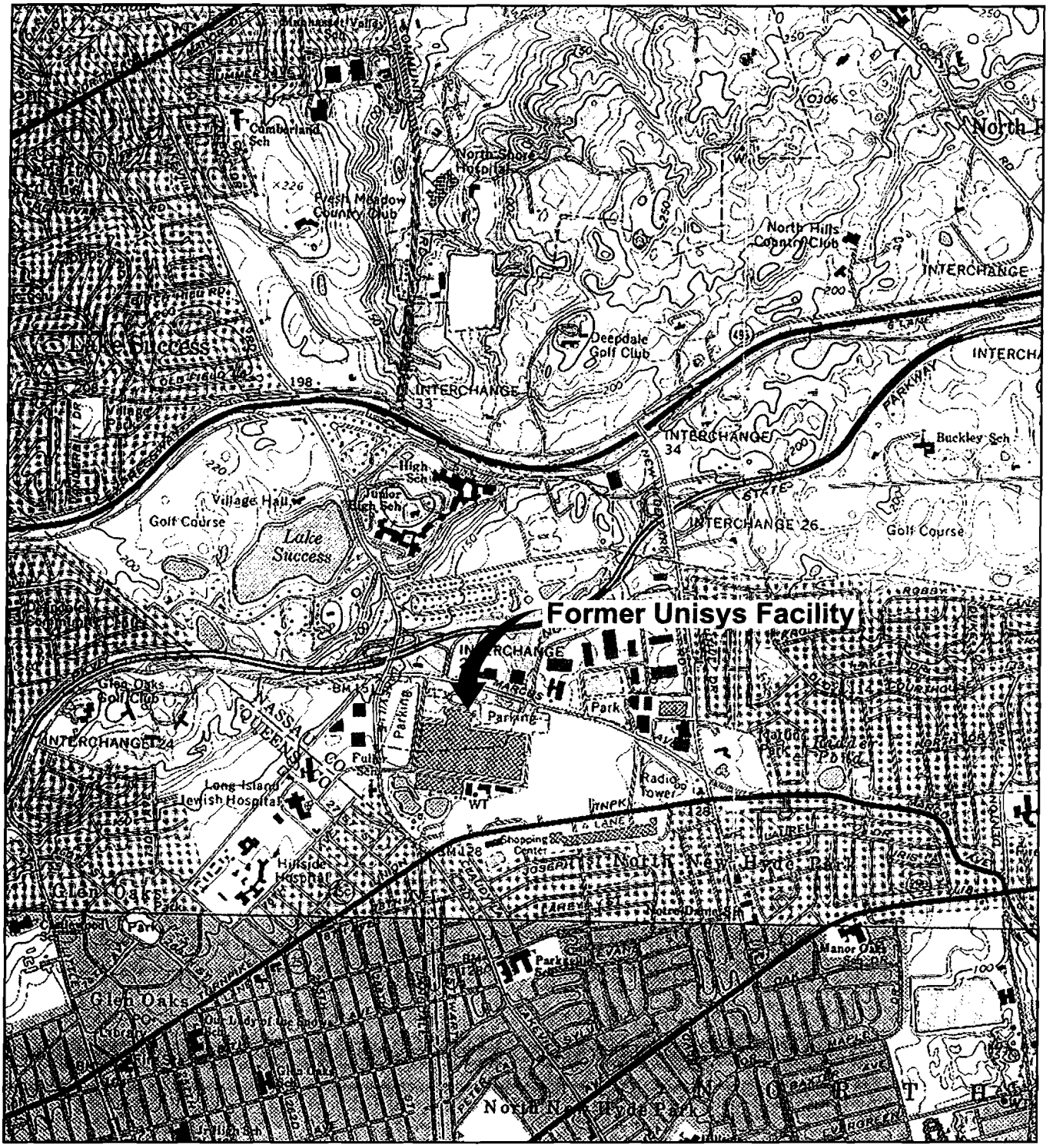
(b) Parameters/measurements may be modified based on review of short-term and/or long-term testing results. Water samples will be analyzed for VOCs, including freons, by NYSDEC ASP OLM 04.2. Air samples will be analyzed for VOCs, including freons, by USEPA Method TO-15.

(c) Modification of short-term schedule may be required based on the results of start-up and performance testing. Changes will only be made with prior NYSDEC approval.

(d) Modification of long-term schedule may be required based on the results of short-term testing. Changes will only be made with prior NYSDEC approval.

NA Not applicable.
ECU Emissions control unit.
VOCs Volatile organic compounds including Freons.
PID Photoionization Detector.
gal. Gallons.
gpm Gallons per minute.
cfm Cubic feet per minute.
psi Pounds per square inch.
iwg Inches of water gauge.
NYSDEC New York State Department of Environmental Conservation.
ASP Analytical Services Protocol.
OLM Organic Leachate Model.
USEPA United States Environmental Protection Agency.

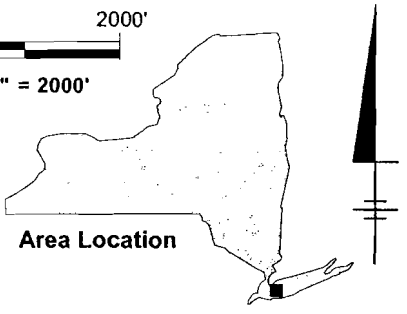
Figures



REFERENCE: BASE MAP USGS 7.5 MIN. QUAD., LYNBROOK & SEA CLIFF, NY, 1968, PHOTOREVISED 1979.

2000' 0 2000'

Approximate Scale: 1" = 2000'



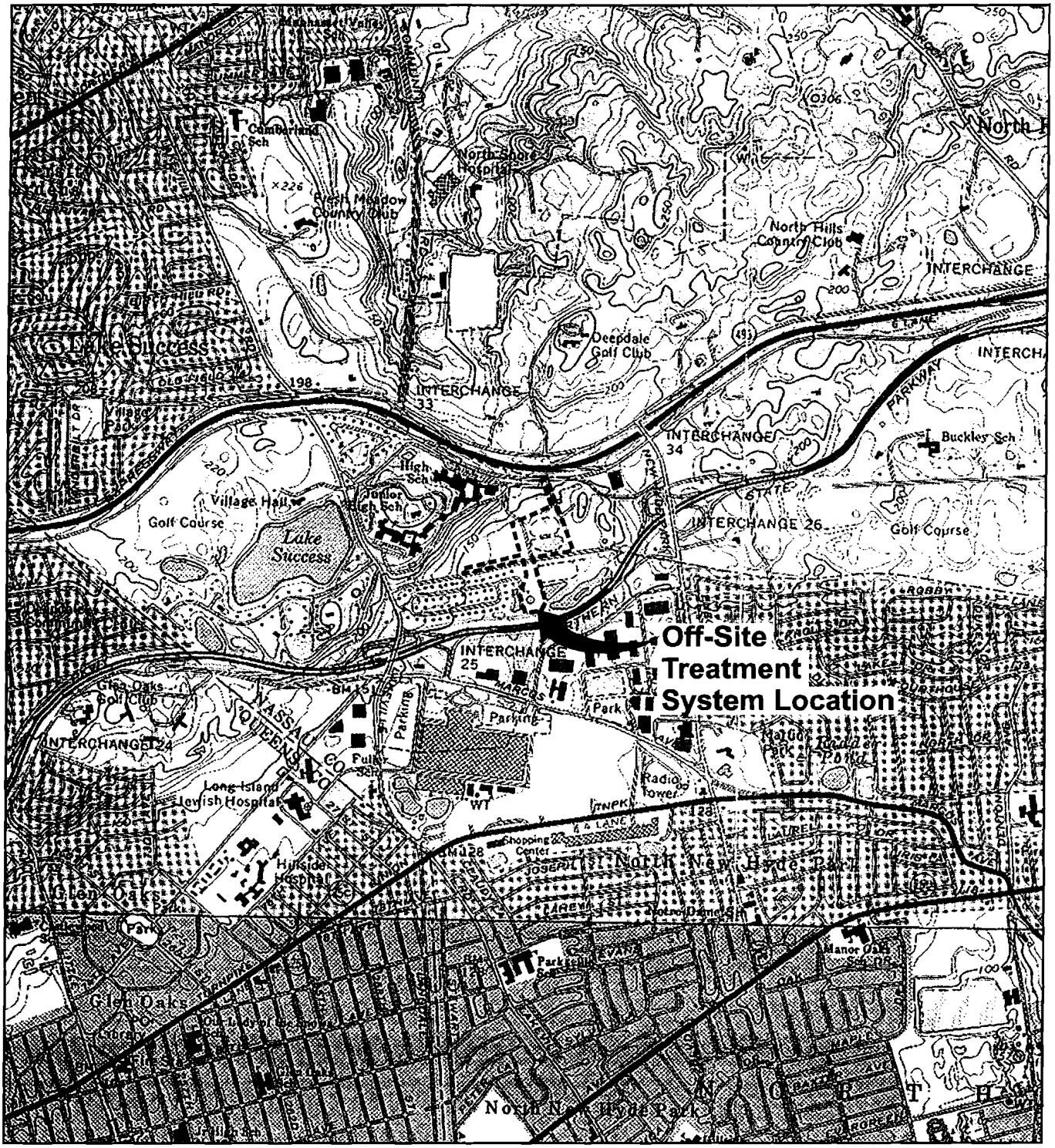
02/24/06 SYR-D85- DJH, KLS
38031004/38031n02.cdr

FORMER UNISYS FACILITY
OFF-SITE IRM
GREAT NECK, NEW YORK

SITE LOCATION MAP

BBL
BLASLAND, BOUCK & LEE, INC.
engineers, scientists, economists

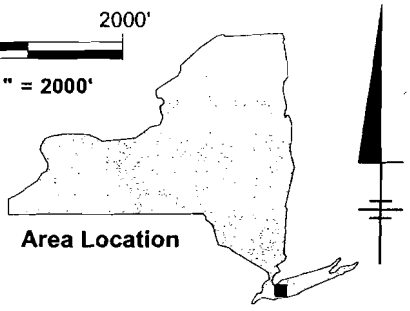
FIGURE 1



REFERENCE: BASE MAP USGS 7.5 MIN. QUAD., LYNBROOK & SEA CLIFF, NY, 1968, PHOTOREVISED 1979.

2000' 0 2000'

Approximate Scale: 1" = 2000'



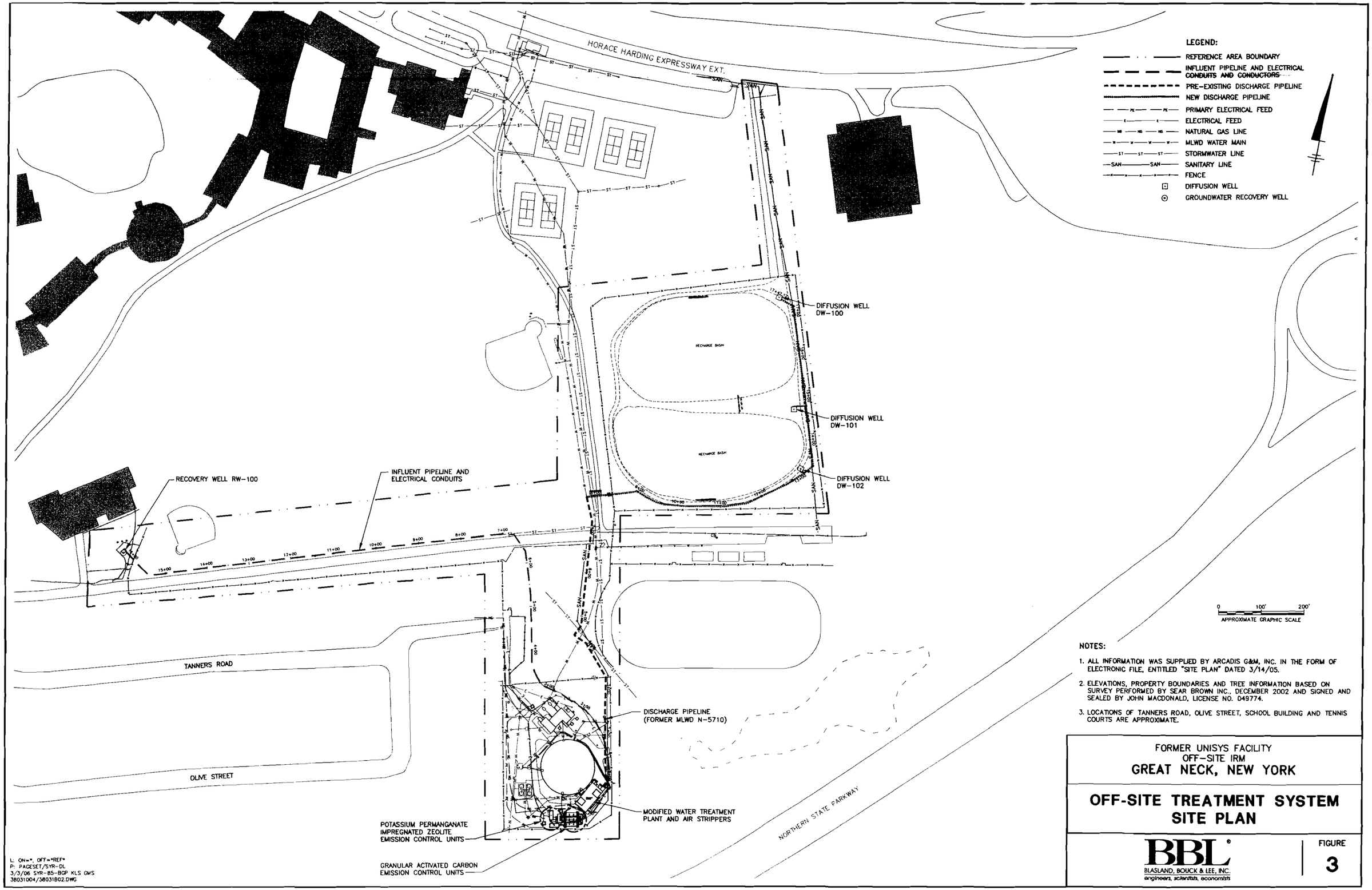
FORMER UNISYS FACILITY
OFF-SITE IRM
GREAT NECK, NEW YORK

OFF-SITE TREATMENT SYSTEM LOCATION MAP

BBL®
BLASLAND, BOUCK & LEE, INC.
engineers, scientists, economists

FIGURE 2

02/24/06 SYR-D85- DJH, KLS
38031004/38031n03.cdr



NOTES:

1. ALL INFORMATION WAS SUPPLIED BY ARCADIS G&M, INC. IN THE FORM OF ELECTRONIC FILE, ENTITLED "SITE PLAN" DATED 3/14/05.
2. ELEVATIONS, PROPERTY BOUNDARIES AND TREE INFORMATION BASED ON SURVEY PERFORMED BY SEAR BROWN INC., DECEMBER 2002 AND SIGNED AND SEALED BY JOHN MACDONALD, LICENSE NO. 049774.
3. LOCATIONS OF TANNERS ROAD, OLIVE STREET, SCHOOL BUILDING AND TENNIS COURTS ARE APPROXIMATE.

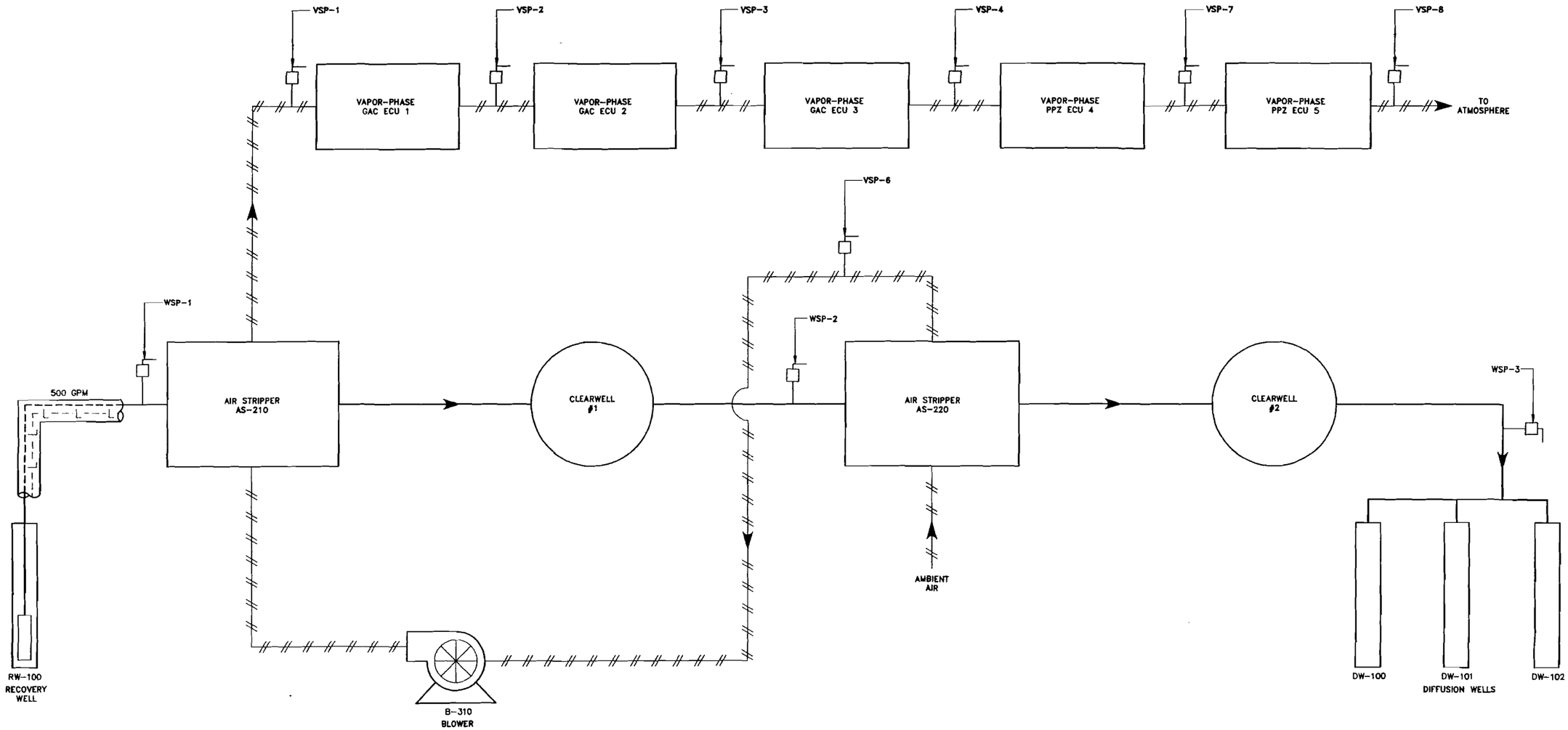
FORMER UNISYS FACILITY
OFF-SITE IRM
GREAT NECK, NEW YORK

OFF-SITE TREATMENT SYSTEM SITE PLAN

BBL
BLASLAND, BOUCK & LEE, INC.
engineers, scientists, economists

FIGURE 3

L: ON=*, OFF=*REF*
P: PAGESET/SYR-DL
3/3/06 SYR-85-BGP KLS GMS
38031004/38031B02.DWG



NOTE:

VSP-5 WAS FORMERLY THE DISCHARGE FROM THE FOURTH VAPOR-PHASE GAC UNIT.

LEGEND:

VSP-1	VAPOR SAMPLE PORT
WSP-1	WATER SAMPLE PORT
	AIR PROCESS LINE
	WATER PROCESS LINE
	PROCESS LINE (DUAL WALL WITH LEAK DETECTION)
	SAMPLE PORT

FORMER UNISYS FACILITY
OFF-SITE IRM
GREAT NECK, NEW YORK

OFF-SITE TREATMENT SYSTEM SCHEMATIC

BBL BLASLAND, BOUCK & LEE, INC.
engineers, scientists, economists

FIGURE 4

X: (XREF)
L: (LAYER)
P: PAGESET/PLT-DL
02/24/06 SYR-85-SDL BGP KLS
38031004/38031F01.DWG

Appendices

Appendix A
Sampling and Analysis Plan

Off-Site Interim Remedial Measure
Former Unisys Facility
Great Neck, New York

NYSDEC Site ID# 130045

March 2006

BBL
ENVIRONMENTAL SERVICES, INC.
Remedial Management & Construction

Table of Contents

1. Introduction

ARCADIS G&M, Inc. (ARCADIS) originally prepared this Sampling and Analysis Plan (SAP) on behalf of Lockheed Martin Corporation (Lockheed Martin) for the Off-Site Interim Remedial Measure (IRM) for Operable Unit 2 (OU-2) associated with the former Unisys Corporation (Unisys) facility located in Great Neck, New York (see Figure 1 of the Operations, Maintenance and Monitoring [OM&M] Manual). This SAP was subsequently revised by BBL Environmental Services, Inc. (BBLES), in conjunction with Blasland, Bouck & Lee, Inc. The former Unisys site, located at 365 Lakeville Road in Great Neck, New York, is classified by the New York State Department of Environmental Conservation (NYSDEC) as a Class 2 Site in the Registry of Inactive Hazardous Waste Disposal Sites in New York State (Site No. 130045) due to the presence of volatile organic compounds (VOCs) in soil and groundwater. The former Unisys site, which is currently owned by i.park, Lake Success, LLP (i.park), is designated as Operable Unit 1 (OU-1), whereas OU-2 addresses off-site areas.

An OU-2 Remedial Investigation (RI) is in progress and is being conducted under NYSDEC Administrative Order on Consent (AOC) No. W-1-0527-91-02, dated December 13, 1991. Based on the results of the OU-2 RI obtained to date, an IRM is being implemented for the OU-2 area. The NYSDEC-approved Off-Site IRM has been installed between the Northern State Parkway and the Long Island Expressway (LIE). The goals of the Off-Site IRM are to help protect public drinking water wells and retard further contaminant migration into the North Hills Special Groundwater Protection Area (SGPA). The conceptual Off-Site IRM is documented in the NYSDEC-approved OU-2 IRM South System Groundwater Remediation Work Plan (hereinafter called the OU-2 South IRM Work Plan), dated May 29, 2003.

This SAP was prepared as a component of the OM&M Manual to present the methodologies to be employed during sampling and analysis activities associated with various monitoring requirements. Specifically, the SAP identifies the procedures to be used to implement hydraulic operational monitoring (water-level measurements), groundwater quality operational monitoring (sampling of groundwater monitoring wells), and system performance and compliance monitoring (water and/or air sampling associated with the groundwater recovery well and treatment system components), including start-up sampling activities. All procedures and protocols described herein will be conducted in accordance with the requirements set forth in the Quality Assurance Project Plan (QAPP), provided as Attachment A-1 to this SAP, and the site-specific Health and Safety Plan (HASP), incorporated here by reference and provided as Appendix H of the OM&M Manual.

2. Site Description

The site was a former manufacturing facility of mainly electronic components for military and commercial applications. The site is located in both the Village of Lake Success and the Town of North Hempstead in Nassau County at 365 Lakeville Road in Great Neck, New York. The site is bounded by Marcus Avenue to the north, Union Turnpike to the south, Lakeville Road to the west and Triad Business Park to the east. A site location map is presented on Figure 1 of the OM&M Manual.

The subject area has been separated into two project areas, which represent portions of the site and/or surrounding areas. OU-1 consists of the on-site area and OU-2 consists of the off-site area. The off-site area includes the Off-Site IRM, which is located south of the LIE, as shown on Figure 2 of the OM&M Manual.

3. Sampling and Analysis Activities Associated with Operational Monitoring

This section identifies the procedures to be used to implement environmental groundwater monitoring associated with the Off-Site IRM. Groundwater monitoring in the area of the Off-Site IRM includes both hydraulic (water-level) measurements and groundwater quality monitoring. The monitoring network has been established to satisfy the Project Objectives described in Section 2 of the OM&M Manual. In summary, a total of 28 wells are included in the hydraulic monitoring network (27 monitoring wells and one recovery well). A total of 16 wells are included in the groundwater quality monitoring network. Table 1 of the Groundwater Monitoring Plan (Appendix B of the OM&M Manual) summarizes the wells included in the monitoring plan for hydraulic monitoring and groundwater quality. Figure 1 of the Groundwater Monitoring Plan (Appendix B of the OM&M Manual) shows the locations of wells in the monitoring network. The wells included in the monitoring network may be modified based on a review of the monitoring reports and with NYSDEC's prior approval.

3.1 Operational Hydraulic Monitoring

This section summarizes the monitoring locations and schedule, and describes the procedures for collection of water-level measurements to be used for operational hydraulic monitoring.

3.1.1 Hydraulic Monitoring Locations and Schedule

A total of 28 wells are included in the hydraulic monitoring network (27 monitoring wells and one recovery well). Table 1 of the Groundwater Monitoring Plan (Appendix B of the OM&M Manual) summarizes the wells included in the monitoring plan for hydraulic monitoring and groundwater quality. Figure 1 of the Groundwater Monitoring Plan (Appendix B of the OM&M Manual) shows the locations of wells in the monitoring network. A more detailed description of the baseline operational hydraulic monitoring program (including objectives/rationale, monitoring well designations, construction details, and locations) is presented in the Groundwater Monitoring Plan (Appendix B of the OM&M Manual). The wells included in the monitoring network may be modified based on a review of the monitoring reports and with NYSDEC's prior approval.

3.1.2 Hydraulic Measurement Collection Procedures

Hydraulic (i.e., water level) measurements will be collected from the monitoring well network using the following procedures. Water-level measurements will be collected by measuring the depth to water at each well from the surveyed measuring point identified on each well casing or at the well head (in the case of recovery wells and diffusion wells). The water-level measurements will be made to the nearest one-hundredth of a foot with an electronic water-level indicator probe. The probe will be decontaminated between well locations using methods described in the QAPP (provided as Attachment A-1, Section 4.3 – Decontamination). Water-level measurements and other pertinent information (e.g., well designation) will be recorded as outlined in the attached QAPP (Section 4.1.5 – Field Records).

3.2 Operational Groundwater Quality Monitoring

This section summarizes the sampling locations and schedule, and describes the procedures for groundwater sample collection and analysis to be used for operational groundwater quality monitoring activities.

3.2.1 Groundwater Sampling Locations

A total of 16 wells are included in the groundwater quality monitoring network. Table 1 of the Groundwater Monitoring Plan (Appendix B of the OM&M Manual) summarizes the wells included in the monitoring plan for hydraulic monitoring and groundwater quality. Figure 1 of the Groundwater Monitoring Plan (Appendix B of the OM&M Manual) shows the locations of wells in the monitoring network. A more detailed description of the baseline operational groundwater quality monitoring program (including objectives/rationale, monitoring well designations, construction details, and locations) are presented in the Groundwater Monitoring Plan (Appendix B of the OM&M Manual). The wells included in the monitoring network may be modified based on a review of the analytical reports and with NYSDEC's prior approval.

3.2.2 Groundwater Sample Collection and Analysis

Evacuation (i.e., purging) and collection of groundwater samples from monitoring wells will be conducted in accordance with the 1995 United States Environmental Protection Agency (USEPA) Region II Draft Groundwater Sampling Procedure for Low-Flow Pump Purging and Sampling, as discussed below.

Pre-sampling activities include accessing the well, preparing the well site for purging and sampling, and collecting initial measurements. To access the well, the protective casing will be unlocked and any surficial dirt will be cleaned from around the wellhead. Plastic sheeting will be placed around the well and secured at the corners. The depth to water in the well will be measured to the hundredth of a foot with an electronic water-level indicator and the total depth of the well will be sounded. Information pertinent to the well purging and sampling activities will be recorded as outlined in the QAPP (provided as Attachment A-1, Section 4.1.5 – Field Records).

For wells with a total depth less than 300 ft below land surface (bls), a variable speed, 2-inch-diameter, stainless steel Grundfos RediFlo submersible pump will be placed in the screen interval and used to purge the well, in accordance with USEPA (1995) Micropurge procedures. Dedicated ½-inch-diameter polyethylene tubing will be connected to the pump, and the pump and tubing will be gradually lowered so as to place the pump intake within the center of the well screen zone.

For wells deeper than 300 ft bls, a bladder pump will be used to purge the well, in accordance with USEPA (1995) Micropurge procedures. Dedicated ½-inch-diameter polyethylene tubing will be connected to a dedicated remote stainless steel screen. The bladder pump assembly will be attached to this dedicated tubing/screen assembly and both will be gradually lowered as to place the remote screen within the center of the well screen zone.

With either pump, the purge rate will not exceed 500 milliliters per minute (mL/min). The volume of water in the tubing will be calculated and this single volume will be purged prior to monitoring field parameters. A flow-through cell will be used to monitor all field parameters. Field parameters (i.e., pH, specific conductance,

dissolved oxygen [DO], oxidation-reduction potential [redox], and temperature) will be measured, with calibrated meters, from the flow-through cell approximately every five minutes until three consecutive readings within 10 percent are observed. Field meters will be calibrated daily according to the manufacturer's instructions. Following stabilization of field parameters, the flow rate will be decreased to 100 mL/min to allow groundwater sample collection to take place.

Before the collection of each round of groundwater samples, appropriate pre-cleaned sample containers (bottles) will be provided by the laboratory in accordance with procedures and requirements described in the QAPP (Attachment A-1, Section 4.2 – Preparation and Preservation of Sample Containers). The sample bottles will be inventoried and inspected to make sure all the required bottles are present, unbroken, and have been adequately prepared by the laboratory (i.e., sample preservation requirements, as applicable). Throughout the sample collection and handling process, the sampling technician will wear new disposable surgical gloves for each well sampled.

All groundwater samples will be collected from the pump discharge into laboratory-supplied sample bottles. Special care will be taken in filling and capping the volatile organic compound (VOC) vials, so that no headspace or air bubbles are present in the groundwater samples collected for VOC analysis. In addition, overflowing bottles will be avoided to prevent the loss of floating substances or preservatives that may have already been added to the bottle. All sample bottle caps will be secured snugly, but not over-tightened.

Once sampling is complete, the pump will be gradually removed from the well and dedicated sampling equipment (i.e., tubing or tubing/screen assembly) will be disconnected from the pump and remain secured inside the well casing. The wells will be locked when sampling is completed.

All samples (including Quality Assurance/Quality Control [QA/QC] samples specified in the QAPP included as Attachment A-1) will be properly labeled and identified, and information on the Water Sampling Log and chain-of-custody form will be completed. The attached QAPP provides additional details regarding Field Records and QA/QC samples, frequency and protocols (Section 4.1 – Field QA/QC), sample labeling (Section 4.2 – Preparation and Preservation of Sample Containers), and sample custody (Section 4.4 – Sample Custody). All sample containers will be checked for proper identification/labeling and compared to the chain-of-custody form for accuracy prior to packaging any sample for shipment. The chain-of-custody form will be placed in a sealed plastic bag and taped to the underside of the cooler lid. The samples may then be wrapped with a cushioning material, as needed, to preclude breakage during shipment and placed in a cooler. Sufficient amounts of bagged ice or ice packs will be placed in the cooler to keep the samples at 4 degrees Celsius until arrival at the laboratory. When the cooler is ready, it will be sealed with fiber (duct) tape, and custody seals will be placed in such a manner that any opening of the cooler prior to arrival at the laboratory can be detected.

Samples will be delivered by courier or overnight carrier to the analytical laboratory following sample custody requirements specified in the attached QAPP. The laboratory will be prepared to receive the samples and perform preliminary extractions or analyses within the analytical method recommended holding times. All groundwater samples (including QA/QC samples) will be analyzed for Target Compound List (TCL) VOCs plus freons using USEPA Statement of Work (SOW) organic low medium (OLM) 04.2 per NYSDEC Analytical Services Protocol (ASP) Method 2000-1 as described in the attached QAPP (Section 4.5 – Laboratory Analyses). Samples will be analyzed by a New York State Department of Health (NYSDOH) Environmental Laboratory Approval Program- (ELAP-) certified laboratory.

All non-dedicated well evacuation and sampling equipment (e.g., probes, pumps, etc.) will be decontaminated between well locations using methods described in the attached QAPP (Section 4.3 – Decontamination). All

water generated during purging and decontamination will be containerized and transported on-site for disposal, as described in Section 6 – Waste Disposal of this SAP.

4. Sampling and Analysis Activities Associated with Performance and Compliance Monitoring

This section identifies the procedures to be used to implement performance and compliance monitoring associated with the OM&M of the Off-Site IRM. As discussed in the OM&M Manual, performance and compliance monitoring includes water and/or air sampling and analysis activities associated with the three primary Off-Site IRM components: 1) the Groundwater Recovery System, 2) the Air Stripping System, and 3) the Emissions Control Units (ECUs). As such, this section specifically summarizes the associated sampling locations and schedule, and describes the procedures for water and air sample collection and analysis to be used during start-up, short-term, and long-term operation of the Off-Site IRM.

4.1 Sampling Locations and Schedule

The objectives for sample collection and analysis associated with performance and compliance monitoring are presented in the OM&M Manual. In summary, the analytical data will be utilized to 1) evaluate the effectiveness and efficiency of the treatment system, 2) determine compliance of discharge water and air quality within the requirements and limits specified in the OM&M Manual, and 3) evaluate the need for operation and maintenance activities (e.g., carbon change-outs).

The specific number of sampling locations and schedule, or frequency, will vary depending on the phase of operation (i.e., start-up, short-term, or long-term) as defined in more detail in the OM&M Manual. In general, water samples will be collected from the Groundwater Recovery System (i.e., from the discharge of recovery well RW-100) and the Air Stripping System (i.e., the influent [same as discharge of recovery well RW-100], intermediate location, and the effluent). Air samples will be collected from the Air Stripping System (i.e., intermediate location) and from selected ECUs (i.e., the influent, intermediate locations, and the effluent). A more detailed summary of the sampling locations, organized by Off-Site IRM component, is provided in the following sub-sections of this SAP.

The schedule, or frequency, of sampling events during operation of the Off-Site IRM is presented in Table 4 of the OM&M Manual. As stated in the OM&M Manual, the proposed schedule may require modification based on site-specific data obtained during the start-up period, and on-going system operation and will be made with prior NYSDEC concurrence As defined in the OM&M Manual, short-term operation consists of the first seven months of system operation including the one-month start-up period. Long-term operation consists of system operation after the initial seven-months of short-term operation.

Table 4 of the OM&M Manual provides a summary of sample locations and frequency for performance and compliance monitoring activities for short-term (including start-up, referred to as the first month of short-term operation) and long-term operation. The frequency of sampling events for short-term (including start-up) and long-term operation is also described in Sections 6.1 and 6.2, respectively, of the OM&M Manual. Modifications to the sample locations and frequency may be made with prior NYSDEC approval.

4.1.1 Groundwater Recovery System

Water sampling locations associated with the Off-Site IRM include the sampling port associated with the recovery well RW-100. The sampling port is located at the wellhead within the recovery well vault. This sampling port location will allow for collection of water samples for the periodic evaluation and quantification of VOCs present in groundwater extracted by the recovery well. However, since there is only one recovery well, the air stripper influent sample is the same as the RW-100 sample. Thus only one sample, the air stripper influent, will typically be collected.

4.1.2 Air Stripping System

Water sampling locations associated with the Air Stripping System include the treatment system influent sampling port, the intermediate sampling port, and the treatment system effluent sampling port. These sampling port locations will allow for collection of water samples for the periodic evaluation and quantification of VOCs present in raw, partially treated, and treated groundwater. Air sampling locations associated with the Air Stripping System include air stripper effluents. These air sampling locations will allow for collection of air samples for the evaluation of air stripping system efficiency.

4.1.3 Emissions Control Units

Air sampling locations associated with the ECUs include the ECU influent sampling port (same as the second air stripper tower effluent sample port), primary ECU effluent ports, intermediate ECU effluent ports, and the final ECU effluent sampling port (system compliance point). These sampling port locations will allow for collection of air samples for the periodic evaluation and quantification of VOCs present in untreated, partially treated, and treated air.

4.2 Water Sample Collection and Analysis

Before the collection of each round of water samples, appropriate pre-cleaned sample containers will be provided by the laboratory in accordance with procedures and requirements described in the QAPP (Attachment A-1, Section 4.2 – Preparation and Preservation of Sample Containers). The sample bottles will be inventoried and inspected to make sure all the required bottles are present, unbroken, and have been adequately prepared by the laboratory (i.e., sample preservation requirements, as applicable). Throughout the sample collection and handling process, the sampling technician will wear new disposable surgical gloves for each location sampled.

To collect a water sample from the desired sample location, the appropriate container will be filled directly from the sample port. The flow of water from the sample port will be adjusted to ensure slow laminar flow so that no entrained air bubbles result. As such, special care will be taken in filling and capping the VOC vials, so that no headspace or air bubbles are present in the water samples collected for VOC analysis. In addition, overflowing bottles will be avoided to prevent the loss of floating substances or preservatives that may have already been added to the bottle. All sample bottle caps will be secured snugly, but not over-tightened.

All samples (including QA/QC samples specified in the QAPP included as Attachment A-1) will be properly labeled and identified, and information on the Water Sampling Log and chain-of-custody form will be

completed. The attached QAPP (Appendix A-1) provides additional details regarding Field Records and QA/QC samples, frequency and protocols (Section 4.1 – Field QA/QC), sample labeling (Section 4.2 – Preparation and Preservation of Sample Containers), and sample custody (Section 4.4 – Sample Custody). All sample containers will be checked for proper identification/labeling and compared to the chain-of-custody form for accuracy prior to packaging any sample for shipment. The chain-of-custody form will be placed in a sealed plastic bag and taped to the underside of the cooler lid. The samples may then be wrapped with a cushioning material, as needed, to preclude breakage during shipment and placed in a cooler. Sufficient amounts of bagged ice or ice packs will be placed in the cooler to keep the samples at 4 degrees Celsius until arrival at the laboratory. When the cooler is ready, it will be sealed with fiber (duct) tape, and custody seals will be placed in such a manner that any opening of the cooler prior to arrival at the laboratory can be detected.

Samples will be delivered by courier or overnight carrier to the analytical laboratory following sample custody requirements specified in the attached QAPP. The laboratory will be prepared to receive the samples and perform preliminary extractions or analyses within the analytical method recommended holding times. All water samples (including QA/QC samples) will be analyzed for TCL VOCs plus freons using USEPA SOW OLM 04.02 per NYSDEC ASP Method 2000-1, as described in the attached QAPP (Section 4.5 – Laboratory Analyses). Samples will be analyzed by a NYSDOH ELAP-certified laboratory.

4.3 Air Sample Collection, Analysis, and Monitoring

Before the collection of each round of air samples, appropriate pre-cleaned sample containers will be provided by the laboratory in accordance with procedures and requirements described in the QAPP (Attachment A-1, Section 4.2 – Preparation and Preservation of Sample Containers), as applicable. The sample containers provided by the laboratory for air sampling will be six-liter Summa canisters. The sample containers will be inventoried and inspected to make sure all the required containers are present and in good condition. Throughout the sample collection and handling process, the sampling technician will wear new disposable surgical gloves for each location sampled.

To collect an air sample from the desired sample location, the appropriate container will be filled from the sample port. Heavy walled disposable Teflon tubing will be used to connect the sample container and the sample port. The laboratory will provide the SUMMA canister under vacuum. The SUMMA canister will be filled completely until the canister has equilibrated with the system pressure at the sample port.

All samples (including QA/QC samples specified in the QAPP included as Attachment A-1) will be properly labeled and identified, and information on the Field Sampling Log and chain-of-custody form will be completed. The system pressure and temperature at the location and time of sample collection will also be recorded on the Field Sampling Log. The attached QAPP provides additional details regarding Field Records and QA/QC samples, frequency and protocols (Section 4.1 – Field QA/QC), sample labeling (Section 4.2 – Preparation and Preservation of Sample Containers), and sample custody (Section 4.4 – Sample Custody). All sample containers will be checked for proper identification/labeling and compared to the chain-of-custody form for accuracy prior to packaging any sample for shipment. The chain-of-custody form will be placed in a sealed plastic bag and taped to the underside of the cooler lid. The samples may then be wrapped with a cushioning material, as needed, to preclude damage during shipment and placed in a cooler. The air samples will remain at ambient temperature throughout transport until arrival at the laboratory. When the cooler is ready, it will be sealed with fiber (duct) tape, and custody seals will be placed in such a manner that any opening of the cooler prior to arrival at the laboratory can be detected.

Samples will be delivered by courier or overnight carrier to the analytical laboratory following sample custody requirements specified in the attached QAPP. The laboratory will be prepared to receive the samples and perform preliminary extractions or analyses within the analytical method recommended holding times. All air samples will be submitted a NYSDOH ELAP-certified laboratory for analysis for VOCs plus freons by USEPA Method TO-15, as further described in the QAPP (Attachment A-1).

In addition to air sample collection for laboratory analysis, real-time air monitoring utilizing an intrinsically safe photoionization detector (PID) will also be performed at the ECU effluent sampling ports on a weekly basis throughout the duration of system operation. Readings will be recorded in an on-site logbook, as described in the attached QAPP. These data, in conjunction with the laboratory samples, will be used to determine if and when a change-out of the vapor-phase granular activated carbon (VPGAC) treatment beds and potassium permanganate-impregnated zeolite (PPZ) may be warranted. A PID with an 11.7 eV lamp will be utilized for this monitoring. An 11.7 eV PID is capable of detecting the primary site-related compounds in groundwater (i.e., cis-1,2-dichloroethene, trichloroethene, and tetrachloroethene), including their degradation products (i.e., 1,1,-dichloroethane, 1,1-dichloroethene, and vinyl chloride). The frequency of PID readings may be reduced with prior NYSDEC approval.

5. Field Decontamination Procedures

Proper decontamination of non-dedicated field equipment associated with sampling activities will ensure that the data collected in support of activities for the Off-Site IRM will meet the precision, accuracy, representativeness, completeness and comparability (PARCCs) requirements, as presented in the QAPP (Attachment A-1, Section 4.3 – Decontamination). Field equipment decontamination procedures are presented in detail in the QAPP and include decontamination procedures associated with non-dedicated well evacuation and sampling equipment (e.g., probes and pumps), and personal protective equipment, as applicable.

6. Waste Disposal

All liquid waste generated during sampling activities including, but not limited to, well purge and decontamination water, will be containerized in drums, carboys, or other suitable containers for eventual disposal. Each container shall be properly labeled and staged in a designated area(s) at the site. Containerized water will be disposed of through treatment in the Off-Site IRM or OU-1 Groundwater Treatment System. Fluid waste that cannot be treated through Off-Site IRM or OU-1 Groundwater Treatment System will be placed in drums or other suitable containers for characterization and off-site disposal.

Attachment A-1

Quality Assurance Project Plan

BBL
ENVIRONMENTAL SERVICES, INC.
Remedial Management & Construction

Attachment A-1
Quality Assurance Project Plan

Off-Site Interim Remedial Measure
Former Unisys Facility
Great Neck, New York

NYSDEC Site ID# 130045

March 2006

BBL
ENVIRONMENTAL SERVICES, INC.
Remedial Management & Construction

Table of Contents

Tables

Attachments

1. Introduction

ARCADIS G&M, Inc. (ARCADIS) originally prepared this Quality Assurance Project Plan (QAPP) on behalf of Lockheed Martin Corporation (Lockheed Martin) for the Off-Site Interim Remedial Measure (IRM) for Operable Unit 2 (OU-2) associated with the former Unisys Corporation (Unisys) facility located in Great Neck, New York (see Figure 1 of the Operations, Maintenance and Monitoring [OM&M] Manual). This QAPP was subsequently revised by BBL Environmental Services, Inc. (BBLES), in conjunction with Blasland, Bouck & Lee, Inc. The former Unisys site, located at 365 Lakeville Road in Great Neck, New York, is classified by the New York State Department of Environmental Conservation (NYSDEC) as a Class 2 Site in the Registry of Inactive Hazardous Waste Disposal Sites in New York State (Site No. 130045) due to the presence of volatile organic compounds (VOCs) in soil and groundwater. The former Unisys site, which is currently owned by i.park, Lake Success, LLP (i.park), is designated as Operable Unit 1 (OU-1), whereas OU-2 addresses off-site areas.

The QAPP addresses specific quality control (QC) checks and quality assurance (QA) auditing processes. This QAPP is provided as Attachment A-1 of the Sampling and Analysis Plan (SAP); the SAP is provided as Appendix A of the OM&M Manual.

The overall objective of the QAPP is to produce data of the highest quality that can be used to support the OM&M of the Off-Site IRM. This QAPP has been prepared in accordance with the United States Environmental Protection Agency (USEPA) guidance, "EPA Guidance for Quality Assurance Project Plans" (USEPA 2002) and considering requirements of the Order on Consent (NYSDEC, October 29, 1997), and is intended to address the field sampling and analysis component of the OM&M for the Off-Site IRM. Therefore, this QAPP presents the project organization and responsibilities, and QA/QC protocols related to field sampling and analysis activities associated with various monitoring requirements presented in the OM&M Manual (i.e., operational, performance, and compliance). The procedures in this QAPP will be implemented to ensure that precision, accuracy, representativeness, completeness, and comparability (PARCC) parameters of the data can be documented.

2. Site Description

The site was a former manufacturing facility of mainly electronic components for military and commercial applications. The Site is located both in Village of Lake Success and the Town of North Hempstead in Nassau County at 365 Lakeville Road in Great Neck, New York. The Site is bounded by Marcus Avenue to the north, Union Turnpike to the south, Lakeville Road to the west and Triad Business Park to the east. A site location map is presented on Figure 1 of the OM&M Manual.

The subject area has been separated into two project areas, which represent portions of the site and/or surrounding areas. OU-1 consists of the on-site area and OU-2 consists of the off-site area. The off-site area includes the Off-Site IRM located between the Long Island Expressway (LIE) and Northern State Parkway, as shown on Figure 2 of the OM&M Manual.

3. Project Organization and Responsibilities

The responsibilities of the key project personnel are detailed below.

- The Project Officer is responsible for overseeing the implementation of the project. The Project Officer will review all documents and other correspondence concerning the activities performed pursuant to the requirements contained in the Order on Consent (NYSDEC, December 13, 1991). The Project Officer is also responsible for the overall QA including technical adequacy of the project activities and reports, and conformance to the scope of work.

- The Project Manager is responsible for the following: sampling QC; overall project coordination; adherence to the project schedule; directing, reviewing, and assessing the adequacy of the performance of the technical staff and subcontractors assigned to the project; implementing corrective action, if warranted; interacting with the Project Officer; preparing reports; and maintaining full and orderly project documentation.

- The project team members include the task managers, sampling team, field technicians, and support staff (e.g., data processors, secretaries, and in-house experts in engineering, etc.) whom are responsible for work in their respective specialty areas that are or may be required to meet the project objectives.

- The Project QA/QC Officer is responsible for performing system audits, and for providing independent data quality review of project documents and reports.

- The Project Health and Safety Officer is responsible for implementing the site-specific health and safety directives in the Health and Safety Plan (HASP) and for contingency response.

- The Site Engineer/Geologist and/or Site Supervisor/Technician is responsible for coordination of the activities of field personnel and/or of subcontractors, if applicable; adherence of the field work to the scope and procedures specified in the OM&M Manual (including plans incorporated therein such as the SAP); and documentation of the fieldwork. The Site Engineer/Geologist and/or Site Supervisor/Technician is also designated as the Site Health and Safety Officer.

- The Data Validator is responsible for review of laboratory data for compliance with the QA objectives for the PARCC parameters, and notifications to the project manager of any QC deficiencies.

- Lockheed Martin representatives must be notified by their authorized agent in the unlikely event that emergency response procedures must be implemented. Notification of Lockheed Martin by its authorized agents shall not preclude the authorized agent from first responding to the emergency situation as specified in the Contingency Plan (Appendix I) and reporting it to the appropriate State authorities.

4. Quality Assurance/Quality Control

The overall QA objective for this aspect of the project is to develop and implement procedures for field measurements, sampling, and analytical testing that will provide data of known quality that is consistent with the intended use of the information. Generally, the specific field sampling and analysis activities to be conducted during this project that require QA/QC protocols include: (1) groundwater sampling associated with groundwater quality operational monitoring; and (2) water and air sampling associated with system performance and compliance monitoring, including system start-up. Standard procedures (as outlined in detail in the SAP) are used so that known and acceptable levels of PARCC parameters are maintained for each data set. More detail on the methodologies associated with these activities is provided in the SAP, including calibration and maintenance of field instruments.

QA/QC protocols will be used to ensure the PARCC parameters of data collected during these field activities meet the objectives of the overall project. Specifically, all data will be gathered or developed using procedures appropriate for the intended use. The field measurements and laboratory analyses will be used to support one or more steps in evaluating the operation of the Off-Site IRM based on associated monitoring objectives. Descriptions of the QA/QC protocols are presented in the following subsections of the QAPP. The QA/QC protocols for this aspect of the project include laboratory analysis and validation procedures, field decontamination procedures, calibration and maintenance of field instruments, and QA/QC sampling procedures.

4.1 Field QA/QC

To ensure that data collected in the field is consistent and accurate, forms will be utilized for documentation of the data collected, such as the measurement of depth to water in wells, etc. These forms include the Daily Log, Water Level/Pumping Test Record, Groundwater Sampling Log, Water Sampling Log, and Well Inspection Checklist. Sample forms are provided in Attachment A-1-1 of this QAPP.

QA/QC samples will be collected and will represent all sampling locations to assure QC for the groundwater quality operational monitoring component (during both short-term and long-term operation of the Off-Site IRM) and for the system performance and compliance monitoring component (during both short-term and long-term operation of the Off-Site IRM, including system start-up). Analyses of QA/QC samples will enable data evaluation for accuracy and integrity. QA/QC samples for volatile organic compound (VOC) analyses will be collected for groundwater and water samples associated with the two monitoring components identified above, and for air samples. Where indicated, blanks and duplicate samples will be used to verify the quality of the field sampling results. Demonstrated analyte-free water will be supplied by the laboratory for the preparation of QA/QC samples; documentation for the analysis of QA/QC blank water will be provided if contamination is detected in the blanks. A brief description of these QA/QC samples follows.

4.1.1 Field Blanks

A field (or equipment rinsate) blank is a water sample collected after having been poured through or over a decontaminated piece of sampling or other down-hole equipment to assess or document the thoroughness of the decontamination process. A field blank will be collected from the decontaminated down-hole equipment by pouring analyte-free water over the sampling equipment and into sample containers before use in sampling.

One field blank per 20 samples or one per week (whichever is greater) will be utilized during groundwater monitoring well sampling activities. These QA/QC samples will only be collected for samples collected for operational groundwater quality monitoring (see Table 1).

4.1.2 Trip Blanks

A trip blank containing analyte-free water will be prepared by the lab and will be transported to the site along with the other sample containers. Trip blanks will be returned to the laboratory without opening. This will serve as a check for contamination originating from sample transport, shipping, and from site conditions. One trip blank per day will be utilized during groundwater monitoring well sampling activities and system performance and compliance monitoring activities (see Table 1). The maximum number of samples per trip blank is 20.

4.1.3 Blind Duplicates

One blind duplicate sample per 20 samples or one per week (whichever is greater) will be used during monitoring well sampling activities and system performance and compliance monitoring activities, including air analyses (see Table 1). The analytical results for the sample and blind duplicate will be used to determine if the data reported by the laboratory are precise, accurate, representative, and comparable. The blind duplicate samples will be assigned fictitious sample identifications. The correct sample identification number will be recorded in the field log book.

4.1.4 MS/MSD Samples

Site-specific Matrix Spike (MS) and Matrix Spike Duplicate (MSD) samples will be collected and submitted to the laboratory as separate samples to provide site-specific matrix-interference data. Upon arrival at the laboratory, the MS/MSD samples will be spiked with appropriate analytes and analyzed by the appropriate method. The purpose of spiking and analyzing the samples is to evaluate any site-specific matrix interference on the analytical results. One MS/MSD sample set will be collected for every 20 samples per matrix or one per week (whichever is greater) during groundwater monitoring well sampling activities and short-term system performance and compliance monitoring activities (see Table 1). These QA/QC samples will only be collected for aqueous samples collected for chemical analysis.

4.1.5 Field Records

All information pertinent to field sampling activities will be recorded in bound, waterproof field books or on the logs provided in Attachment A-1-1. Duplicates of all notes will be prepared and kept in a secure place away from the site. Proper documentation will consist of all field personnel maintaining records of all work accomplished including the following items:

- Date and time of work events;
- Purpose of work;
- Description of methods;
- Description of samples;

- Number and size of samples;
- Description of sampling point;
- Date and time of collection of sample;
- Sample collector's name;
- Field observations; and
- Field measurements with portable instruments.

4.2 Preparation and Preservation of Sample Containers

Laboratory pre-cleaned sample containers will be provided by the laboratory. Each sample container will be provided with a label for sample identification purposes. The information on the label will include a sample identification number, time, date and initials of the sample collector. All sample containers will be accompanied by a complete chain-of-custody form.

All sample containers will be thoroughly pre-cleaned at the laboratory prior to sampling. Appropriate sample preservatives will be pre-added in the containers. Procedures vary according to the type of analysis to be performed. Individual procedures are outlined below. It is laboratory practice to pre-preserve sample containers in order to minimize potential contaminants in the field and to reduce unnecessary sample handling in the field. Table 2 provides a summary of sample analysis methods, sample containers, holding times and preservation procedures to be used.

4.3 Decontamination

Proper decontamination of all non-dedicated sampling equipment will ensure that the data collected in support of OM&M of the Off-Site IRM will meet the PARCC requirements.

4.3.1 Decontamination Zone

The decontamination zone will be located near the OU-2 IRM South Treatment System building, at a centralized location, or at a specific sampling location (e.g., monitoring well), depending on the logistics associated with planned field activities. All non-dedicated sampling equipment shall be decontaminated in the designated area(s). Wash waters from equipment requiring decontamination will be disposed of in the Off-Site IRM or the OU-1 Groundwater System, as specified in more detail in the SAP in Section 6 – Waste Disposal.

4.3.2 Decontamination Procedures

Field equipment will be decontaminated between well/sampling locations using the following procedures.

4.3.2.1 Field Decontamination for Non-Dedicated Sampling Equipment

Field decontamination of non-dedicated well evacuation and sampling equipment (i.e., probes and pumps) shall consist of the procedures outlined below. These items will then be stored in such a manner as to preserve their decontaminated condition prior to use at the next sampling location.

Prior to each use, the electronic water-level indicator probe will be decontaminated using the following procedure:

- Surficial wash and manual scrubbing with detergent (e.g., Micro) and potable water solution; and
- De-ionized water rinse.

Prior to each use, the submersible pump will be decontaminated using the following procedure:

- Surficial wash and manual scrubbing with detergent (e.g., Micro) and potable water solution to remove foreign materials;
- Run pump for approximately 5 minutes in detergent (e.g., Micro) and potable water solution;
- Potable water rinse;
- Run pump for approximately 5 minutes in potable water; and
- De-ionized water rinse.

4.3.2.2 Personnel Protective Equipment Decontamination Procedures

The personnel protective equipment (PPE) decontamination procedure shall consist of the minimum decontamination stations outlined in the HASP (incorporated here by reference and provided as Appendix H of the OM&M Manual), as applicable for the planned field activities or in the case that non-disposable PPE is used while conducting the planned field activities.

4.4 Sample Custody

To maintain and document sample possession, chain-of-custody procedures will be followed. A chain-of-custody form contains the signatures of individuals who have possession of the samples after collection in the field.

A sample is under custody if it is:

1. In one's actual possession; or
2. In one's view, after being in your physical possession; or
3. Was in one's physical possession and then was locked up or sealed to prevent tampering; or
4. It is in a designated secure place restricted to authorized personnel.

Each person involved with the samples will know chain-of-custody procedures. A detailed discussion of the stages of possession (i.e., field collection, transfer, and laboratory custody) is presented below in the following sections.

4.4.1 Environmental Samples Chain-of-Custody

The laboratory initiates the chain-of-custody procedure with the preparation of the sample bottles. The field sampler continues the chain-of-custody procedure in the field and is the first to sign the form upon collection of samples. The field sampler is personally responsible for the care and custody of the samples until they are

transferred and properly dispatched. Sample labels shall be completed for each sample, using waterproof ink, subjected to proper preservation, and packaged to preclude breakage during shipment. Every sample shall be assigned a unique identification number that is entered on the chain-of-custody form. Samples can be grouped for shipment using a single form.

4.4.2 Transfer of Custody and Shipments

All samples will be accompanied by a chain-of-custody record. When transferring the possession of samples, the individuals relinquishing and receiving will sign, date, and note the time of transfer. This record documents transfer of custody of samples from the sampler to another person to the analytical laboratory.

Samples will be properly packed for shipment and dispatched to the appropriate laboratory for analysis, with a separate signed custody record enclosed in each sample cooler. Chemical analytical samples should be delivered to the laboratory within 24 hours of collection.

Whenever samples are split with a facility or government agency, a separate chain-of-custody record will be prepared for those samples and marked to indicate with whom the samples were split.

4.4.3 Laboratory Sample Custody

The laboratory utilized for chemical analysis will have standard operating procedures for documenting receipt, tracking and compilation of sample data. Sample custody related to sampling procedures and sample transfers are described below.

1. Shipping or Pickup of Cooler.

   (a) Samplers pack cooler and check for any external damage (such as leaking).
   (c) Chain-of-Custody form filled out by field sampling personnel.
   (b) Cooler wrapped with evidence tape.
   (d) Samplers sign packing slip with shipper.

2. Delivery of Cooler to the Analytical Laboratory.

   (a) Samplers pack cooler and check for any external damage (such as leaking).
   (b) Samplers sign the waybill for cooler to the laboratory.
   (c) The laboratory receives cooler and complete chain of custody.

The samples will be stored at the proper temperature prior to analysis. It is the responsibility of the laboratory to properly dispose of samples beyond the holding period.

4.5 Laboratory Analyses

All groundwater and water samples will be analyzed by Severn Trent Laboratories, Inc. (STL). Groundwater and water samples will be analyzed for Target Compound List (TCL) VOCs plus freons using USEPA Statement of Work (SOW) organic low medium (OLM) 04.2 per NYSDEC Analytical Services Protocol (ASP)

Method 2000-1 by the STL facility located in Shelton, Connecticut. The STL Connecticut facility is a New York State Department of Health (NYSDOH) Environmental Laboratory Approval Program (ELAP) certified laboratory. Table 3 summarizes the list of the compounds to be analyzed for in aqueous samples (i.e., groundwater and water) along with the respective required method detection limits and/or laboratory reporting limits.

All air samples will be analyzed for VOCs plus freons using USEPA Method TO-15 by a NYSDOH-approved laboratory. Specific compounds to be analyzed for in air samples will include, but not be limited to, the list of compounds summarized in Table 4.

The internal laboratory Standard Operating Procedures (SOPs) and QA/QC procedures are described in the individual laboratory facility Quality Assurance Plan, an independent plan provided by the analytical laboratory. The STL Laboratories – Connecticut Quality Assurance Plan (QAP) is provided in as Attachment A-1-2.

4.6 Data Validation

Data validation is a process whereby analytical data generated by the laboratory are evaluated against a specific set of requirements and specifications, and determinations of data usability and limitations are made. The data validator examines the criteria pertaining to analytical data generated in accordance with NYSDEC and USEPA protocols (as described below) from four perspectives, as follows:

- Technical requirements;
- Contractual requirements;
- Determination of compliance; and
- Determination and action of how to define the usability or qualify the data.

Validation of the organic data will be performed as described below following the QA/QC criteria set forth in (1) the NYSDEC ASP, 2000-1; and (2) the most recent USEPA National Functional Guidelines for Organic Data Review, as applicable.

For operational monitoring data (i.e., groundwater sample analyses) a full data validation will be conducted on twenty percent of the samples collected. The remaining eighty percent of the samples will be reviewed for completeness and technical compliance. The review of the VOC data packages will include checking the following:

- Chain-of-custody forms;
- Holding times;
- Gas chromatography (GC)/mass spectrum (MS) Instrument Performance checks;
- Instrument calibration;
- Trip, field, and /or laboratory (method) blank-detected constituents;
- Surrogate spike recoveries;
- Matrix spike/spike duplicate precision and accuracy;
- Internal standards;
- Check for transcriptions between quantitation reports and Form Is; and
- Blind duplicate precision.

For performance/compliance monitoring data (i.e., water and air sample analyses), data validation will vary for start-up, short-term, and long-term operation as described below.

The performance/compliance monitoring data resulting from analyses of water and air samples collected during start-up operation will not be validated.

For performance/compliance monitoring data resulting from analyses of water samples collected during short-term operation (the six months following the start-up period), a full data validation will be conducted on 100 percent of the samples collected given the small size of the sample delivery group (SDG). The review of the VOC data packages will include checking the following:

- Chain-of-custody forms;
- Holding times;
- GC/MS Instrument Performance checks;
- Instrument calibration;
- Trip and/or laboratory (method) blank-detected constituents;
- Surrogate spike recoveries;
- Matrix spike/spike duplicate precision and accuracy;
- Internal standards;
- Check for transcriptions between quantitation reports and Form I's; and
- Blind duplicate precision.

The performance/compliance monitoring data resulting from analyses of air samples collected during short-term operation (the six months following the start-up period) will be evaluated for compliance to method guidelines and the following items as appropriate:

- Adherence to specified holding times;
- Laboratory (method) blank-detected constituents; and
- Blind duplicate precision.

The performance/compliance monitoring data resulting from analyses of water and air samples collected during long-term operation will be evaluated for compliance to method guidelines and the following items as appropriate:

- Adherence to specified holding times (water and air);
- Trip (water) and/or laboratory (method) blank-detected constituents (water and air); and
- Blind duplicate precision (air).

An evaluation of the NYSDEC ASP Matrix Spike Blank (MSB) data will be performed. If the MSB recovery is less than the ASP criteria, the positive results should be qualified as J, estimated biased low. If the MSB recovery is less than the ASP criteria, but greater than 10%, the non-detects should be qualified J, biased low. If the MSB recovery is less than 10%, the non-detect data must be rejected.

Final validation of data obtained during the field sampling and analysis activities will be performed by data validators. The laboratory deliverables will be reviewed for accuracy, precision, completeness, and overall quality of data. All laboratory data will be reviewed for adherence to method-specific QA/QC guidelines and to the data validation guidelines that are described above. If specific data quality issues arise based on the data validation and review guidelines described above, the data validation and review guidelines may be modified

(i.e., expanded), as warranted, in order to address the specific data quality issue. Any such modifications will be utilized until the specific data quality issue is resolved.

4.7 Data Usability

The quality assurance officer and/or data validator for the project will review the analytical data for usability including determining if the data are accurate, precise, representative, complete, and comparable. The review of the analytical results will include checking chain-of-custody forms, sample holding times, blank contamination, spike recoveries, surrogate recoveries, internal standards, precision of duplicate sample analysis, and laboratory control samples. This review will be used to classify the data as valid, usable or unusable. Valid data will indicate that all QA/QC review parameters have been met and are acceptable (as per details outlined in the preceding section). Data will be characterized as usable when QA/QC parameters are marginally outside acceptable limits (example: sample holding times were slightly exceeded) where the data may be questionable, but still usable within limitation. Unusable data will be that data that are observed to have gross errors or analytical interference that would render the data invalid for any purpose.

4.8 Performance and System Audits

Performance and system audits will be performed on a periodic basis, as appropriate, to ensure that the work is implemented in accordance with the approved project SOPs and in an overall satisfactory manner. Examples of audits that will be performed during the OM&M activities are presented below.

- The field personnel will supervise and check on a daily basis that monitoring well integrity is intact; that field measurements are made accurately; that equipment is thoroughly decontaminated; that samples are collected and handled properly; and that all field work is accurately and neatly documented.

- On a timely basis, the data packages submitted by the laboratory will be checked for the following information: that all requested analyses were performed; that sample holding times were met; that the data were generated through the approved methodology with the appropriate level of QC effort and reporting; and that the analytical results are in conformance with the prescribed acceptance criteria. The quality and limitations of the data will be evaluated based on these factors.

- The project manager will oversee the field personnel and check that the management of the acquired data proceeds in an organized and expeditious manner.

- Audits of the laboratory are performed on a regular basis by regulatory agencies. Audits will be discussed in the laboratory QAP.

4.9 Preventive Maintenance

Field personnel will be responsible for making sure that the equipment is tested, cleaned, charged, and calibrated in accordance with the manufacturer's instructions before being taken to the field.

The laboratory also follows a well-defined program to prevent the failure of laboratory equipment and instrumentation. This preventive maintenance program will be described in the laboratory QAP.

5. References

U.S. Environmental Protection Agency (EPA), 2002, EPA Guidance for Quality Assurance Project Plans, EPA QA/G-5, EPA/240/R-02/009. December.

Tables

BBL
ENVIRONMENTAL SERVICES, INC.
Remedial Management & Construction

TABLE 1

FORMER UNISYS FACILITY
GREAT NECK, NEW YORK
OFF-SITE IRM

QUALITY ASSURANCE/QUALITY CONTROL SAMPLE SUMMARY

Matrix	Monitoring Program	Sampling Event	Sample Location/Sample Point	Parameters (1)	Estimated Sample Quantity per Event	Frequency of Field Blanks per Event	Frequency of Trip Blanks per Event (2)	Frequency of Blind Duplicate per Event (3)	Frequency of MS/MSD per Event (4,5)
Aqueous	Baseline Operational Monitoring	Groundwater Quality Monitoring	Selected wells (on-site and off-site)	VOCs plus freons	15	one per 20 samples or one per week (whichever is greater)	one per day	one per 20 samples or one per week (whichever is greater)	one per 20 samples or one per week (whichever is greater)
	Performance and Compliance Monitoring	Various	Samples points include: Influent Intermediate Effluent	VOCs plus freons	3	one per 20 samples or one per week (whichever is greater)	one per day	one per 20 samples or one per week (whichever is greater)	one per 20 samples or one per week (whichever is greater)
Air	Performance and Compliance Monitoring	Various	Samples points include: Influent (to each ECU) Intermediate ECU points Effluent	VOCs plus freons	6	0	0	one per 20 samples or one per week (whichever is greater)	0

Notes and Abbreviations:

(1) All water analyses will be performed in accordance with NYSDEC Analytical Services Protocol (ASP) Method 2000-1. All air analyses will be performed in accordance with USEPA Method TO-15.

(2) A trip blank can be grouped with other samples collected the same day. The maximum number of samples per trip blank is 20.

(3) A field (blind) duplicate can be grouped with other samples (up to 20 samples) of the same matrix collected in the same time frame (1-week period).

(4) Matrix spike/matrix spike duplicate (MS/MSD) analysis is performed on a site sample and therefore is not counted as a separate sample. For MS/MSD's, triple sample volume will be provided.

(5) An MS/MSD can be grouped with other samples (up to 20 samples) of the same matrix collected in the same time frame (1-week period).

ECU Emissions control unit.

MS/MSD Matrix spike/matrix spike duplicate.

VOCs Volatile organic compounds.

TABLE 2

FORMER UNISYS FACILITY
GREAT NECK, NEW YORK
OFF-SITE IRM

SUMMARY OF SAMPLE CONTAINERS, PRESERVATION AND HOLDING TIMES

Matrix	Monitoring Program	Parameters (1)	Analytical Laboratory Methodology	Sample Containers	Preservation	Holding Time
Aqueous	Operational Monitoring	VOCs plus freons	EPA SOW OLM04.2 (2)	Three (3) 40 mL glass with Teflon-lined septa	Cool 4 degrees C	7 days VTSR
	Performance and Compliance Monitoring	VOCs plus freons	EPA SOW OLM04.2 (2)	Three (3) 40 mL glass with Teflon-lined septa	Cool 4 degrees C	7 days VTSR
Air	Performance and Compliance Monitoring	VOCs plus freons	EPA Method TO-15	6L SUMMA cannister	NA	28 days

Notes and Abbreviations:

(1) Refer to Table 3 and 4 for specific analyte lists for analysis of aqueous and air samples, respectively.
(2) Per NYSDEC Analytical Service Protocol 2000-1.
C Celsius.
L Liter.
mL Milliliter.
NA Not applicable.
VOCs Volatile organic compounds.
VTSR Verified Time of Sample Receipt at lab.

TABLE 3

FORMER UNISYS FACILITY
GREAT NECK, NEW YORK
OFF-SITE IRM

ANALYTE LIST FOR ANALYSIS OF AQUEOUS SAMPLES

Monitoring Program: Method: Matrix/Sample Type:	Operational Monitoring USEPA SOW OLM04.2 Per NYSDEC ASP 2000-1 Aqueous/Groundwater	Performance/Compliance Monitoring [3] USEPA SOW OLM04.2 Per NYSDEC ASP 2000-1 Aqueous/Water
Constituent [1]	Contract-Required Quantitation Limits (µg/L)	Required Method Detection Limits (µg/L)
Chloromethane	10	1
Bromomethane	10	1
Vinyl Choride	10	1
Chloroethane	10	1
Methylene chloride	10	1
Acetone	10	5
Carbon disulfide	10	1
1,1-Dichloroethene	10	1
1,1-Dichloroethane	10	1
1,2-Dichloroethene (total) [2]	--	--
cis-1,2-Dichloroethene	10	1
trans-1,2-Dichloroethene	10	1
2-Butanone	10	2
Chloroform	10	1
1,2-Dichloroethane	10	1
1,1,1-Trichloroethane	10	1
Carbon tetrachloride	10	1
Bromodichloromethane	10	1
1,2-Dichloropropane	10	1
cis-1,3-Dichloropropene	10	1
Trichloroethene	10	1
Benzene	10	1
Dibromochloromethane	10	1
trans-1,3-Dichloropropene	10	1
1,1,2-Trichloroethane	10	1
Bromoform	10	1
4-Methyl-2-pentanone	10	1
2-Hexanone	10	1
Tetrachloroethene	10	1
1,1,2,2-Tetrachloroethane	10	1
Toluene	10	1
Chlorobenzene	10	1
Ethylbenzene	10	1
Styrene	10	1
Xylene (total)	10	1
Freon 113	10	1
Additional Constituents [4]		
Freon 12	10	1
Freon 22	10	1

Notes and Abbreviations on Page 2

Notes and Abbreviations:

(1) Listed constituents represent the Non-Detect Performance Standards specified in the Remediation Access and Licensing Agreement between Lockheed Martin Corporation (Lockheed Martin) and the Great Neck Union Free School District (Great Neck UFSD), dated April 14, 2003.

(2) 1,2-Dichloroethane (total) represents the sum of the analyses for the cis- and trans-isomers.

(3) The detection limit is the minimum detection limit (MDL) for the analyte by the approved method. However, the MDL is only achievable in samples with little or no analytes present.

(4) Constituents were not addressed in the Off-Site IRM Work Plan or Remediation Access and Licensing Agreement between Lockheed Martin and Great Neck UFSD, dated April 14, 2003, but were detected during the testing period.

ASP Analytical Services Protocol.

µg/L micrograms per liter.

TABLE 4

FORMER UNISYS FACILITY
GREAT NECK, NEW YORK
OFF-SITE IRM

ANALYTE LIST FOR ANALYSIS OF AIR SAMPLES

Monitoring Program:	**Performance/Compliance Monitoring**
Method:	**USEPA Method TO-15**
Matrix:	**Air**
Constituent [1]	**Required Method Detection Limits** [3] **($\mu g/m^3$)**
Chloromethane	1.0
Bromomethane	1.9
Vinyl Choride	1.3
Chloroethane	1.3
Methylene chloride	1.7
1,1-Dichloroethene	2.0
1,1-Dichloroethane	2.0
1,2-Dichloroethene (total) [2]	2.0
Chloroform	2.4
1,2-Dichloroethane	2.0
1,1,1-Trichloroethane	2.7
Carbon tetrachloride	3.2
1,2-Dichloropropane	2.3
cis-1,3-Dichloropropene	2.3
Trichloroethene	2.7
Benzene	1.6
trans-1,3-Dichloropropene	2.3
1,1,2-Trichloroethane	2.7
Tetrachloroethene	3.4
1,1,2,2-Tetrachloroethane	3.4
Toluene	1.9
Chlorobenzene	2.3
Ethylbenzene	2.2
Styrene	2.1
o-Xylene	2.2
m&p-Xylene	4.3
Freon 113	3.8
Additional Constituents [4]	
Freon 12	2.5
Freon 22	TIC

Notes and Abbreviations:

(1) Listed constituents represent the Non-Detect Performance Standards specified in the Remediation Access and Licensing Agreement between Lockheed Martin Corporation (Lockheed Martin) and the Great Neck Union Free School District (Great Neck UFSD), dated April 14, 2003.

(2) 1,2-Dichloroethane (total) represents the sum of the analyses for the cis- and trans-isomers.

(3) The detection limit is the minimum detection limit (MDL) for the analyte by the approved method. However, the MDL is only achievable in samples with little or no analytes present.

(4) Constituents were not addressed in the Off-Site IRM Work Plan or Remediation Access and Licensing Agreement between Lockheed Martin and Great Neck UFSD, dated April 14, 2003, but were detected during the testing period.

TIC Tentatively Identified Compound, concentration can only be estimated. Due to non-availability of standards, a laboratory Method Detection Limit can not be calculated.

$\mu g/m^3$ Micrograms per cubic meter.

Attachment A-1-1

Field Sampling Logs

BBL
ENVIRONMENTAL SERVICES, INC.
Remedial Management & Construction

DAILY LOG
FORMER UNISYS FACILITY
GREAT NECK, NEW YORK

Wells(s)_____ Project No._____Page _____of _____

Site Location_____

Prepared By_____

Date/Time	Description of Activities

Well Inspection Checklist

Well No. _____ Date: _____
Personnel: _____

Exterior	Yes	No	Remarks
1. Cement seal			
Intact			
Cracked			
Missing			
2. Flush Mount well?			
a. Ponding of water around cement seal?			
a. If flush mount, is it in a depression so that puddling could occur over the well head?			
b. Is surface cap secured by bolts/can it be removed?	/	/	/
c. Is there any surface water in the annular space surrounding the casing?			
3. Protective steel pipe and lock (if used)			
Pipe - Intact			
Lock - Intact			
4. Well casing (stick-up) straight			
5. Designated leveling point clearly marked (TOC or TIC)			
6. Well cap vented properly			
a. What type of cap			
7. Well is protected			
8. Well is clearly marked			
9. Any surface obstruction? (i.e., dumpster, soil, debris, etc.)			
10. Bottom soft or hard?			
11. Obstruction in well?			

Interior	
1. Depth to bottom from marked measuring point.	
2. Stick-up height	
a. Material (PVC, stainless)/diameter	/
3. Bottom of well below grade	
4. Remarks on Integrity	
5. Depth to water from measuring point.	
6. PID reading	
7. Product layer e.g., NAPL (circle)	

8. Additional Comments:

WATER SAMPLING LOG
FORMER UNISYS FACILITY
GREAT NECK, NEW YORK

Project _____ Project No._____ Page _____ of _____

Site Location _____ Date_____

Site/Well No. _____ Replicate No._____

Weather _____ Sampling Time: Begin_____ End_____

Excavation Data

Measuring Point _____
Sounded Well Depth (ft bmp) _____
Depth to Water (ft bmp) _____
Depth to Packer (ft bmp) _____
Water Column in Well (ft) _____
Casing Diameter _____
Gallons in Well _____
Gallons Pumped/Bailed
Prior to Sampling _____
Sample Pump Intake
Setting (ft bmp) _____
Packer Pressure (psi) _____
Pumping Rate (gpm) _____
Excavation Method _____
Sampling Method _____
Purge Time Begin_____ End_____

Field Parameters

Color _____
Odor _____
Appearance _____

	I	1V	2V	3V
pH (s.u)				
Conductivity (mS/cm)				
(µmhos/cm)				
Temperature (°C)				
DO (mg/L)				
Turbidity (NTU)				
Time				
DTW (ft bmp)				

Remarks: _____

Constituents Sampled: See COC_____ Sampling Personnel_____

Well Casing Volumes

Gal./Ft.				
	1 1/4" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1 ½" = 0.09	2 1/2" = 0.26	3 ½" = 0.50	6" = 1.47

bmp	below measuring point	mS/cm	Milisiemens per centimeter	VOC	volatile organic compounds
°C	Degrees Celsius	s.u.	Standard units	µmhos/cm	Micromhos per centimeter
ft	feet	NTU	Nephelometric Turbidity Units		
gpm	Gallons per minute	N/A	Not Applicable		
mg/L	Milligrams	COC	Chain of Custody		

3/14/2006
F:\USERS\URUSSO\2005\94551838.doc

Site | Event

GROUNDWATER SAMPLING LOG

Sampling Personnel: | **Well ID:**

Client / Job Number: | **Date:**

Weather: | **Time In:** | **Time Out:**

Well Information

Depth to Water:	(feet)	(from MP)
Total Depth:	(feet)	(from MP)
Length of Water Column:	(feet)	
Volume of Water in Well:	(gal)	
Three Well Volumes:	(gal)	

Well Type:	Flushmount		Stick-Up
Well Material:	Stainless Steel		PVC
Well Locked:	Yes		No
Measuring Point Marked:	Yes		No
Well Diameter:	1"	2"	Other:

Purging Information

Purging Method:	Bailer	Peristaltic	Grundfos	Other:
Tubing/Bailer Material:	St. Steel	Polyethylene	Teflon	Other:
Sampling Method:	Bailer	Peristaltic	Grundfos	Other:

Duration of Pumping: (min)

Average Pumping Rate: (ml/min) Water-Quality Meter Type:

Total Volume Removed: (gal) Did well go dry: Yes No

Conversion Factors				
gal / ft. of water	1" ID	2" ID	4" ID	6" ID
	0.041	0.163	0.653	1.469
1 gal = 3.785 L =3875 ml = 0.1337 cubic feet				

Unit Stability			
pH	DO	Cond.	ORP
± 0.1	± 10%	± 3.0%	± 10 mV

Parameter:	1	2	3	4	5	6	7	8	9
Volume Purged (gal)									
Rate (mL/min)									
Depth to Water (ft.)									
pH									
Temp. (C)									
Conductivity (mS/cm)									
Dissolved Oxygen									
ORP (mV)									
Turbidity (NTU)									
Notes:									

Sampling Information

Analyses	#	Laboratory
BTEX	3	
PAHs	1	
Inorganics (Fe, Mn, nitrate, sulfate, sulfide, TOC)	5	
Sample ID:	Sample Time:	
MS/MSD:	Yes	No
Duplicate:	Yes	No
Duplicate ID	Dup. Time:	
Chain of Custody Signed By:		

Problems / Observations

WATER LEVEL/PUMPING TEST RECORD
FORMER UNISYS FACILITY
GREAT NECK, NEW YORK

Project _____ Well _____ Site _____ Page ___ of ___

Screen Setting _____ Measuring Point Description _____ Height Above Ground Surface _____

Static Water Level _____ Measured With _____ Date/Time _____

Drawdown ☐ Start of Test _____ Pumping Well _____

Recovery ☐ End of Test _____

Distance From Well Measured to Pumping Well ® _____ Discharge Rate _____ Orifice _____

Date & Time	Well or t (mins)	Held (ft)	Wet (ft)	Depth to Water (ft)	S (ft)	Dew. 1) Corr. (ft)	Art. 2) s^1 (ft)	Q (gpm)	Mano-meter (in)	Remarks 3)

1) Dewatering Correction 2) Equivalent Artesian Drawdown 3) pH, Spec. Cond., Temp., Weather, Sand, Turbidity, etc.

Attachment A-1-2

QAP for STL Laboratories

BBL
ENVIRONMENTAL SERVICES, INC.
Remedial Management & Construction

SEVERN TRENT LABORATORIES - CONNECTICUT
LABORATORY QUALITY MANUAL
Revision: 6

128 Long Hill Cross Road
Shelton, Connecticut 06484
Phone: (203) 929-8140
Fax: (203) 929-8142

Approved by:

Peter Frick, Laboratory Director — Date

Marsha K. Culik, Quality Assurance Manager — Date March 22, 2005

Table of Contents

Tables

Figures

1. Introduction, Purpose, and Scope

1.1. Severn Trent Laboratories (STL) Overview

Severn Trent Plc is a leading environmental services group providing water, waste and utility services. The businesses include Severn Trent Water, Biffa, Severn Trent Laboratories (STL) and Severn Trent Services.

The corporate vision is to be at the forefront of the environmental services industry. The corporate values of environmental leadership, service and quality define the business culture and strategic direction.

STL offers a broad range of environmental testing services provided by over two thousand professionals in the US. STL's testing capabilities include chemical, physical, and biological analyses of a variety of matrices, including aqueous, solid, drinking water, waste, tissue, air and saline/estuarine samples. Specialty capabilities include air toxics, radiological testing, tissue preparation and analysis, aquatic toxicology, microbiology, Mycology, asbestos, microscopy services, and on-site technologies including mobile laboratory services.

This plan is intended to describe the quality assurance program of the STL-Connecticut facility located at 128 Long Hill Cross Roads, Shelton, Connecticut. STL operates a corporate wide quality assurance program and this facility QA program complies with the requirements set forth in the corporate program.

1.2. Quality Assurance Policy

It is STL's policy to:

- Provide high quality, consistent, and objective environmental testing services that meet all federal, state, and municipal regulatory requirements.
- Generate data that are scientifically sound, legally defensible, meet project objective, and are appropriate for their intended use.
- Provide STL clients with the highest level of professionalism and the best service practices in the industry.
- Build continuous improvement mechanisms into all laboratory, administrative and managerial activities.
- Maintain a working environment that fosters open communication with both clients and staff and ensures data integrity.

1.3. Management Commitment to Quality Assurance

STL management is committed to providing the highest quality data and the best overall service in the environmental testing industry. To ensure that the data produced and reported by STL meet the requirements of its clients and comply with the letter and spirit of municipal, state and federal regulations, STL maintains a Quality System that is clear, effective, well communicated, and supported at all levels in the company.

STL Vision and Mission Statement

Vision

STL will be the recognized industry leader for environmental analysis.

Mission

Through the innovation and dedication of our people, together with the quality of our systems, we will deliver levels of performance that delight our clients, retain the confidence of our stakeholders and enable the profitable growth of our business.

1.4. Purpose

The purpose of this Laboratory Quality Manual (LQM) is to describe the STL-Connecticut Quality System and to outline how that system enables all employees of STL-Connecticut to meet the Quality Assurance (QA) policy. The LQM also describes specific QA activities and requirements and prescribes their frequencies. Roles and responsibilities of management and laboratory staff in support of the Quality System are also defined in the LQM. In some cases, the requirements in the facility QA program may be more stringent than the corporate program, but in no case can they be less stringent.

1.5. Scope

The requirements set forth in this document are applicable to the STL-Connecticut quality systems and laboratory operations.

STL operates under the regulations and guidelines of the following federal programs:

US Army Corp of Engineers, Hazardous, Toxic and Radioactive Waste (USACE HTRW)
Clean Air Act (CAA)
Clean Water Act (CWA)

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)
New York State Department of Environmental Conservation (NYSDEC)
National Pollution, Discharge, and Elimination System (NPDES, NJPDES)
Resource Conservation and Recovery Act (RCRA)
Safe Drinking Water Act (SDWA)
US Army Corps of Engineers, Hazardous, Toxic and Radioactive Waste (USACE HTRW)

STL also provides services under various state and local municipal guidelines. A current list of Analytical Services and certifications can be provided by the laboratory or viewed on the MySTL webpage at www.MySTL-inc.com.

This QMP was written to comply with the National Environmental Laboratory Accreditation Conference (NELAC) standards and the STL corporate Quality Management Plan, M-Q-001.

1.6 Servicing

Project Managers are the direct client contact and they ensure resources are available to meet project requirements. Although Project Managers do not have direct reports or staff in production, they coordinate opportunities and work with laboratory management and supervisory staff to ensure available resources are sufficient to perform work for the client's project. Project Managers provide a link between the client and laboratory resources.

The laboratory has established procedures for performing and verifying that client servicing meets requirements. Typical services provided are:

- Sample Containers/Supplies – *Container Management: Process Operation* (VCM-001)
- Project QAP preparation – *Project Planning Process* (VPM-002)
- Regulatory advisory functions – *Project Planning Process* (VPM-002)
- Consulting -- *Project Planning Process* (VPM-002)

Regulatory and advisory functions are addressed under the same procedures used for project planning.

2. *References*

The following references were used in preparation of this document and as the basis of the STL Quality System:

EPA Requirements For Quality Management Plans, EPA QA/R-2, United States Environmental Protection Agency Management Staff, Washington, DC, Draft Interim Final, March 2001.

EPA Quality Manual for Environmental Programs, 5360, US EPA Office of Research and Development, National Center for Environmental Research and Quality Assurance, Quality Assurance Division, July 1998.

Good Automated Laboratory Practices, EPA 2185, 1995.

National Environmental Laboratory Accreditation Conference, Constitution, Bylaws, and Standards, EPA600/R-98/151, US EPA Office of Research and Development, July 2000.

Shell for Analytical Chemistry Requirements, US Army Corps of Engineers, 2001.

DOD Quality Systems manual (QSM) for Environmental Laboratories, Version 2

3. *Terms and Definitions*

Accuracy: the degree of agreement between an observed value and an accepted reference value.

Audit: a systematic evaluation to determine the conformance to specifications of an operational function or activity.

Batch: environmental samples, which are prepared and/or analyzed together with the same process, using the same lot(s) of reagents. A preparation batch is composed of one to 20 environmental samples of the same matrix, meeting the above mentioned criteria. Where no preparation method exists (example, volatile organics, water) the batch is defined as environmental samples that are analyzed together with the same process and personnel, using the same lots of reagents, not to exceed 20 environmental samples. An analytical batch is composed of prepared environmental samples, extracts, digestates or concentrates that are analyzed together as a group. An analytical batch can include prepared samples originating from various environmental matrices and can exceed 20 samples.

Chain of Custody (COC): an unbroken trail of accountability that ensures the physical security of samples, data and records.

Clean Air Act: legislation in 42 U.S.C. 7401 et seq., Public Law 91-604, 84 Stat. 1676 Pub. L. 95-95, 91 Stat., 685 and Pub. L. 95-190, 91 Stat., 1399, as amended.

Comprehensive Environmental Response, Compensation and Liability Act (CERCLA/Superfund): legislation (42 U.S.C. 9601-9675 et seq., as amended by the Superfund Amendments and reauthorization Act of 1986 (SARA), 42 U.S.C. 9601et seq.

Compromised Sample: a sample received in a condition that jeopardizes the integrity of the results. See Section 4.7.1 for a description of these conditions.

Confidential Business Information (CBI): information that an organization designates as having the potential of providing a competitor with inappropriate insight into its management, operation or products.

Confirmation: verification of the presence of a component using an additional analytical technique. These may include second column confirmation, alternate wavelength, derivatization, mass spectral interpretation, alternative detectors, or additional cleanup procedures.

Corrective Action: action taken to eliminate the causes of an existing non-conformance, defect or other undesirable situation in order to prevent recurrence.

Data Audit: a qualitative and quantitative evaluation of the documentation and procedures associated with environmental measurements to verify that the resulting data are of acceptable quality.

Demonstration of Capability (DOC): procedure to establish the ability to generate acceptable accuracy and precision.

Equipment Blank: a portion of the final rinse water used after decontamination of field equipment; also referred to as Rinsate Blank and Equipment Rinsate.

Document Control: the act of ensuring that documents (and revisions thereto) are proposed, reviewed for accuracy, approved for release by authorized personnel, distributed properly and controlled to ensure use of the correct version at the location where the prescribed activity is performed.

Federal Water Pollution Control Act (Clean Water Act, CWA): legislation under 33 U.S.C. 1251 et seq., Public Law 92-50086 Stat. 816.

Field Blank: a blank matrix brought to the field and exposed to field environmental conditions.

Field of Testing (FOT): a field of testing is based on NELAC's categorization of accreditation based on program, matrix, analyte.

Good Laboratory Practices (GLP): formal regulations for performing basic laboratory operations outlined in 40 CFR Part 160 and 40 CFR Part 729 and required for activities performed under FIFRA and TSCA.

Holding Time: the maximum time that a sample may be held before preparation and/or analysis and still be considered valid as promulgated in the method.

Initial Demonstration of Capability (IDC): procedure to establish the ability to generate acceptable accuracy and precision. Also referred to as Initial Demonstration of Proficiency.

Internal Chain of Custody: an unbroken trail of accountability that ensures the physical security of samples, data and records. Internal Chain of Custody refers to additional documentation procedures implemented within the laboratory that includes special sample storage requirements, and documentation of all signatures and/or initials, dates, and times of personnel handling specific samples or sample aliquots.

Instrument Detection Limit (IDL): the minimum amount of a substance that can be measured on specific instrument, with a specified degree of confidence that the amount is greater than zero. The IDL is associated with the instrumental portion of a specific method only, and specific sample preparation steps are not considered in its derivation.

A calculated IDL, by definition, has an uncertainty of +100% with 99% confidence, and is the point at which the possibility of detection of false negatives is 50 % and false positives is 1%. The IDL thus represents a range where qualitative detection occurs on a specific instrument. Quantitative results are not produced in this range.

Instrument Blank: a blank matrix that is the same reagents as the processed sample matrix (i.e. extract, digestate, condensate) and introduced onto the instrument for analysis.

Laboratory Control Sample (LCS): a blank matrix spiked with a known amount of analyte(s), processed simultaneously with, and under the same conditions as, samples through all steps of the analytical procedure.

Laboratory Quality Manual (LQM): a document stating the quality policy, quality system and quality practices of the laboratory. The LQM may include by reference other documentation relating to the laboratory's quality system.

Limit of Detection (LOD): the minimum amount of a substance that an analytical process can reliably detect. (see MDL)

Matrix: The substrate of a test sample. For purposes of batch and QC requirements determination, the matrix descriptions in Table 1 are used.

Table 1 Matrix Descriptions

Matrix	Description
Air	Air samples as analyzed directly or as adsorbed into a solution or absorption matrix and desorbed.
Aqueous	Aqueous sample excluded from the definition of Drinking Water or Saline/Estuarine source. Includes surface water, groundwater and effluents.
Drinking Water	Aqueous sample that has been designated a potable water source.
Saline	Aqueous sample from an ocean or estuary, or other salt-water source such as the Great Salt Lake.
Liquid	Liquid with <15% settleable solids.
Solid	Soil, sediment, sludge or other matrices with >15% settleable solids.
Waste	A product or by-product of an industrial process that results in a matrix not previously defined.
Tissue	Sample of a biological origin such as fish tissue, shellfish, or plant material. Such samples shall be grouped according to origin.

Matrix Duplicate (MD): duplicate aliquot of a sample processed and analyzed independently; under the same laboratory conditions; also referred to as Sample Duplicate.

Matrix Spike (MS): field sample to which a known amount of target analyte(s) is added.

Matrix Spike Duplicate (MSD): a replicate matrix spike.

Method Blank: a blank matrix processed simultaneously with, and under the same conditions as, samples through all steps of the analytical procedure.

Method Detection Limit (MDL): the minimum amount of a substance that can be measured with a specified degree of confidence that the amount is greater than zero using a specific method. An MDL, by definition, has an uncertainty of +100% with 99% confidence, and is the point as which the possibly of detection of false negative is 50% and false positive is 1%. The MDL thus represents a range where qualitative detection occurs using a specific method. Quantitative results are not produced in this range. Also referred to as Limit of Detection.

Non-conformance: an indication, judgment, or state of not having met the requirements of the relevant specifications, contract, or regulation.

Precision: the degree to which a set of observations or measurements of the same property, usually obtained under similar conditions, conform to themselves; a data quality indicator.

Preservation: refrigeration and or reagents added at the time of sample collection to maintain the chemical and or biological integrity of the sample.

Proficiency Testing: determination of the laboratory calibration or testing performance by means of inter-laboratory comparisons.

Proficiency Test (PT) Sample: a sample, the composition of which is unknown to the analyst, that is provided to test whether the analyst/laboratory can produce analytical results within specified performance limits. Also referred to as Performance Evaluation (PE) sample.

Proprietary: belonging to a private person or company.

Quality Assurance (QA): an integrated system of activities involving planning, quality control, quality assessment, reporting and quality improvement to ensure that a product or service meets defined standards of quality with a stated level of confidence.

Quality Assurance (Project) Plan (QAPP): a formal document describing the detailed quality control procedures by which the quality requirements defined for the data and decisions pertaining to a specific project are to be achieved.

Quality Control (QC): the overall system of technical activities whose purpose is to measure and control the quality of a product or service so that it meets the needs of users.

Quality Control Sample: an uncontaminated sample matrix spiked with a known amount(s) of an analyte(s) from a source independent from the calibration standards. It is generally used to establish intra-laboratory or analyst specific precision and bias or to assess the performance of all or a portion of the measurement system.

Quality Management Plan (QMP): a formal document describing the management policies, objectives, principles, organizational authority, responsibilities, accountability, and implementation plan of an agency, organization or laboratory to ensure the quality of its product and the utility of the product to its users.

Quality System: a structured and documented management system describing the policies, objectives, principles, organizational authority, responsibilities, accountability, and implementation plan of an organization for ensuring quality in its work processes, products (items), and services. The quality system provides the framework for planning, implementing, and assessing work performed by the organization and for carrying out required QA/QC.

Quantitation Limit (QL): the lowest point at which a substance can be quantitatively measured with a specified degree of confidence using a specific method. The QL can be based on the MDL, and is generally calculated as 3-5 times the MDL, however, there are analytical techniques and methods where this relationship is not applicable. Also referred to a Practical Quantitation Level (PQL), Estimated Quantitation Level (EQL), or Limit of Quantitation (LOQ).

Raw Data: any original information from a measurement activity or study recorded in a laboratory notebook, worksheets, records, memoranda, notes, or exact copies thereof and that are necessary for the reconstruction and evaluation of the report of the activity or study. Raw data may include photography, microfilm or microfiche copies, computer printouts, magnetic media, including dictated observations, and recorded data from automated instruments. Reports specifying inclusion of "raw data" do not need all of the above included, but sufficient information to create the report data.

Record Retention: the systematic collection, indexing and storing of documented information under secure conditions.

Reference Standard: a standard, generally of the highest metrological quality available at a given location, from which measurements made at that location are derived.

Reporting Limit (RL): The level to which data is reported for a specific test method and /or sample. The RL is generally related to the QL. The RL must be minimally at or above the MDL.

Resource Conservation and Recovery Act (RCRA): legislation under 42 USC 321 et seq. (1976).

Safe Drinking Water Act (SDWA): legislation under 42 USC 300f et seq. (1974), (Public Law 93-523).

Sampling and Analysis Plan (SAP): A formal document describing the detailed sampling and analysis procedures for a specific project.

Selectivity: The capability of a method or instrument to respond to a target substance or constituent in the presence of non-target substances.

Sensitivity: the capability of a method or instrument to discriminate between measurement responses representing different levels (e.g., concentrations) of a variable of interest.

Spike: a known amount of an analyte added to a blank, sample or sub-sample.

Standard Operating Procedure (SOP): a written document which details the method of an operation, analysis or action whose techniques and procedures are thoroughly prescribed and which is accepted as the method for performing certain routine or repetitive tasks.

Systems Audit: a thorough, systematic, on-site, qualitative review of the facilities, equipment, personnel, training, procedures, record keeping, data validation, data management, and reporting aspects of a total measurement system.

Storage Blank: a blank matrix stored with field samples of a similar matrix.

Trip Blank: a blank matrix placed in a sealed container at the laboratory that is shipped and held unopened in the field and returned to the laboratory in the shipping container with the field samples.

Test Method: defined technical procedure for performing a test.

Toxic Substances Control Act (TSCA): legislation under 15 USC 2601 et seq., (1976).

Traceability: the property of a result of a measurement that can be related to appropriate international or national standards through an unbroken chain of comparisons.

Verification: confirmation by examination and provision of evidence that specified requirements have been met.

4. Management Requirements

4.1. Organization and Management

4.1.1. Organization

The STL-Connecticut organizational structure is presented on the organizational chart as outlined in the appendix. A QA Manager is designated at the STL facility and reports to the Laboratory Director. The facility QA Manager has an indirect reporting relationship to the Corporate QA Director.

4.1.2. Roles and Responsibilities

President

The President of STL, Inc. has overall management responsibility and authority for Severn Trent's laboratory division, including responsibility for budgeting, resource allocation, long term planning, sales, marketing, and final approval on all management and administrative policies and management plans. The President authorizes the STL Corporate LQM and as such, sets the standards for the Quality System.

Chief Operating Officer (COO)
The COO is responsible for daily management of all STL facilities. The COO's responsibilities include allocation of personnel and resources, long term planning, and development of technical policies and management plans. The COO authorizes the STL Corporate LQM and is responsible for ensuring that business operations are conducted in accordance with its requirements.

Vice President Client and Operations Services (VP COS)
The VP of Operations Services is responsible for all essential elements of offerings to clients, including risk management, legal compliance and contract administration, quality assurance, information technology, and environmental health and safety. The VP COS authorizes the QMP and responsibilities include authorization of Manuals, Policies and Procedures, providing support and direction to the Managers of these areas, and supporting the COO in decisions regarding long term planning, resource allocation, and capital expenditures.

QA Director
The QA Director is responsible for establishing, implementing and communicating STL's quality system. The QA Director monitors compliance with the QMP, provides regulatory and technical updates to the STL facilities, assists in development of management plans and technical policies to be approved by the COO, and coordinates training within STL. The QA Director is available to any employee in STL to resolve data quality or ethical issues. The QA Director is independent of operational functions.

Director of Technical Services
The Director of Technical Services is responsible for establishing, implementing and communicating STL's Technical Policies, Standard Operating Procedures, and Manuals. Other responsibilities include conducting technical assessments as required, acting as a technical resource in national contracts review, coordinating new technologies, establishing best practices throughout STL, advising STL staff on technology advances, innovations, and applications, and organizing and running STL's technical committee.

Chief Information Officer (CIO)
The CIO is responsible for establishing, implementing and communicating STL's IT Policies, Standard Operating Procedures, and Manuals. Other responsibilities include coordinating new technologies, development of electronic communication tools such as STL's intranet and internet sites, ensuring data security and documentation of software, ensuring compliance with Good Automated Laboratory Practices (GALP), and assistance in establishing, updating, and maintaining Laboratory Information Management Systems (LIMS) at the various STL facilities.

Environmental Health and Safety (EH&S) Director
The Health and Safety Coordinator is responsible for the safety and well-being of all employees while at the laboratory. This includes, but is not limited to, administering the Corporate Safety Manual that complies with federal regulations, MSDS training and review, conducting laboratory safety orientation and tours for all new employees, providing instructions on safety equipment, cleaning up laboratory spills, and instructing personnel of laboratory procedures for emergency situations. The Health and Safety Coordinator is on-call 24-hours a day, 7-days a week for all laboratory situations.

The Health and Safety Coordinator responsibilities additionally include waste management of laboratory generated hazardous waste in accordance with appropriate regulations. This includes maintenance of required documentation, such as waste manifests, segregation of waste in accordance with requirements, and training of personnel in proper segregation of waste and preparation of Safety related SOPs.

General Manager (GM)
The GM is directly responsible for the daily operations of one or more operating facilities within STL. The GM's responsibilities include allocation of personnel and resources, long term planning, setting goals, and achieving the financial, business, and quality objectives of STL. The GM ensures timely compliance with corporate management directives, policies, and management systems reviews.

Laboratory Director
The Laboratory Director oversees the daily operations of the laboratory. The Laboratory Director's responsibilities include supervision of staff, setting goals for the employees, and achieving the financial, business, and quality objectives of the facility. The Laboratory Director is to maintain technical understanding of analytical methodology for

the laboratory operations, development of procedural improvements and investigation of non-conformances.

QA Manager

The Quality Assurance Manager (QAM) has the full-time responsibility to evaluate the adherence to policies and to assure that systems are in place to produce the level of quality defined in this LQM. The QAM is responsible for:

- Ensures IDL/MDL studies are completed and documented
- Ensures method validation studies are completed and documented
- Periodically performs data package inspections
- Performs data authenticity audits on 100% of analysts and instruments
- Assist in the preparation, compilation, and submittal of quality assurance project plans
- Reviews program plans for consistency with organizational and contractual requirements and advises appropriate personnel of deficiencies
- Maintains QA records
- Maintains certifications and accreditations
- Initiates and oversees both internal and external audits; documents root cause investigations for all noted deficiencies; and ensures timely audit closure
- Maintains a corrective action process for internally identified issues and ensures timely closure
- Manages the laboratory's PT Program and performs/documents root cause investigations for all failures
- Monitors to ensure the documentation of training and method demonstration are current
- Facilitates SOP development and document control

The QA Manager shall have the final authority to accept or reject data, and to stop work in progress in the event that procedures or practices compromise the validity and integrity of analytical data. The QAM is available to any employee at the facility to resolve data quality or ethical issues. The QA Manager shall be independent of laboratory operations and has an indirect reporting relationship to the QA Director.

Project Managers

The laboratory recognizes the importance of efficient project management. The laboratory Project Managers (PM) are responsible for preparing the project technical profile which summarizes QA/QC requirements for the project, maintaining the laboratory schedule, communicating technical requirements to the laboratory, and advising the Laboratory, QA and Technical Managers of all variances. The laboratory Project Manager will provide technical guidance and the necessary laboratory-related information to the preparer of project-specific QAPPs and provide peer review of the final document to ensure accuracy of the laboratory information.

Technical Managers (Laboratory Departmental Group Leader/Supervisor)

The Laboratory Supervisor oversees the daily operations of their particular laboratory department. The supervisor's responsibilities include supervision of staff, setting goals and objectives for their employees, and achieving the business and quality objectives of the facility.

4.2. Quality System

4.2.1. Objectives of STL-Connecticut Quality System

The goal of the STL-Connecticut Quality System is to ensure that business operations are conducted with the highest standards of professionalism in the industry.

To achieve this goal, it is necessary to provide our clients with scientifically sound, well documented, regulatory compliant data, and to ensure that we provide the highest quality service available in the industry with uncompromising data integrity. A well-structured, organized and communicated quality system is essential in meeting this goal. The laboratory's quality system is designed to minimize systematic error, encourage constructive, documented problem solving, and provides a framework for continuous improvement.

This LQM, Work Instructions and the SOPs are the basis and outline for our quality and data integrity system and contain requirements and general guidelines under which the laboratory conducts operations. In addition, other documents may be used by the laboratory to clarify compliance with quality system or other client requirements. Within the LQM, SOP or Work Instruction numbers are noted in parenthetic text. These numbers refer to the laboratory procedure(s) associated with the subject item. A table listing these quality system policies and procedures is appended to this document.

The QA Manager is responsible for implementing and monitoring the Quality System. The QA Manager reports to the Laboratory Director on the performance of the quality system for review and continuous improvement. The QA Manager has sufficient authority, access to work areas, and organizational freedom (including sufficient independence from cost and schedule considerations) to:

- Initiate action to prevent the occurrence of any nonconformities related to product, process and quality system,
- Identify and record any problems affecting the product, process and quality system,
- Initiate, recommend, or provide solutions to problems through designated channels,
- Verify implementation of solutions, and
- Assure that further work is stopped or controlled until proper resolution of a non-conformance, deficiency, or unsatisfactory condition has occurred and the deficiency or unsatisfactory condition has been corrected.

The QA Manager identifies opportunities for continual improvement. When a situation arises where acceptable resolution of identified issues cannot be agreed upon at the laboratory, direct access to STL's Corporate Quality Director is available. This provides laboratory QA personnel independence, where needed, to ensure that QA policies and procedures are enforced.

The Laboratory Quality Manual is the basis and outline for the STL-Connecticut Quality System and contains guidelines under which the STL-Connecticut facility conducts operations in accordance with the STL Corporate Quality Management Plan (QMP).

4.2.2. Laboratory Quality Manual (LQM)

The following elements are addressed in the STL-Connecticut facility's LQM:

1. Table of Contents, lists of references and glossaries, and appendices.
2. Quality policy statement, including objectives and commitments, by facility management.
3. Organization and management structure of the laboratory, its place in the STL organization and relevant organizational charts.
4. Relationship between management, technical operations, support services and the quality system.
5. Record retention procedure.
6. Document control procedure.
7. Job descriptions of essential staff and reference to job descriptions of other staff.
8. Identification of the laboratory's approved signatories.
9. Procedure for achieving traceability of measurements.
10. List of test methods under which the laboratory performs its testing.
11. Procedure for reviewing new work.
12. Reference to the calibration and/or verification test procedures used.
13. Sample handling procedure.
14. Reference to the major equipment, reference standards, facilities and services used by the laboratory in conducting tests.
15. Reference to procedures for calibration, verification and maintenance of equipment.
16. Reference to verification practices including inter-laboratory comparisons, proficiency testing programs, use of reference materials and internal QC practices.
17. Procedures for feedback and corrective action when testing discrepancies are detected, or departures from policies and procedures occur.
18. Procedure for exceptionally permitting departures from documented policies and procedures or from standard specifications.
19. Procedure for dealing with client complaints.
20. Procedure for protecting client confidentiality and proprietary rights.
21. Procedure for audits and data review.

22. Procedure for establishing that personnel are adequately experienced and trained.
23. Reference to procedures for reporting analytical results.

4.3. Document Control

A system of document control is essential to provide the framework necessary to ensure that methods and procedures are followed in a consistent manner.

The STL-Connecticut laboratory has developed a centralized document control system and is administered by the QA department. The document control system provides for the following:

- A unique document control number for each document
- A central location for all documents
- A systematic method for distribution of approved documents
- A tracking system for existing documents
- Identification of document revisions
- A mechanism for periodic review of documents
- Archival of outdated material
- A focal point for information exchange
- Facilitates the establishment of standardized methods and procedures

4.3.1. Document Control Procedure

Security and control of documents is necessary to ensure that confidential information is not distributed and that all current copies of a given document are from the latest applicable revision. Unambiguous identification of a controlled document is maintained by identification of the following items in the document header: Document Name, Document Number, Effective Date, Number of Pages. Controlled documents are authorized by Management and/or the QA Department. Controlled documents are marked as such and records of their distribution are kept by the QA Department. Controlled documents, such as SOPs will be stamped in red with "Controlled Document #". If this writing is not in red, then that copy will not be considered a controlled document.

4.3.2. Document Revision

Changes to documents occur when a procedural change warrants a revision of the document. When an approved revision of a controlled document is ready for distribution, obsolete copies of the document are replaced with the current version of the document. The previous revision of the controlled document is archived by the QA Department. Laboratory SOPs and quality documents are required to be reviewed annually and updated as needed.

A detailed description of the document control system is contained in STL-Connecticut SOP for Document Control. This document is available for inspection and review during a site visit. The Quality Assurance Manager is responsible for ensuring that the document control system is properly managed. Any new or revised document must be submitted to the QA Manager for review and distribution.

4.4. Request, Tender, and Contract Review

4.4.1. Contract Review

For many environmental sampling and analysis programs, testing design is site or program specific and does not necessarily "fit" into a standard laboratory service or product. It is STL's intent to provide both standard and customized environmental laboratory services to our clients. To ensure project success, technical staff perform a thorough review of technical and QC requirements contained in contracts. Contracts are reviewed for adequately defined requirements and STL's capability to meet those requirements.

Contract review shall include a review of the client's requirements in terms of compound lists, test methodology requested, sensitivity, accuracy, and precision requirements. The STL representative ensures that the laboratory's test methods are suitable to achieve these requirements and must ensure that the laboratory holds the appropriate certifications and approvals to perform the work. The review also includes the laboratory's capabilities in terms of turnaround time, capacity, and resources to provide the services requested, as well the laboratory's ability to provide the documentation, whether hardcopy or electronic. If the laboratory cannot provide all services but intends to subcontract such services, whether to another STL facility or to an outside firm, this must be documented and discussed with the client prior to contract approval.

All contracts entered into by STL are reviewed and approved by the appropriate personnel at the facility or facilities performing the work. Any contract requirement or amendment to a contract communicated to STL verbally is documented and confirmed with the client in writing. Any discrepancy between the client's requirements and STL's capability to meet those requirements is resolved in writing before acceptance of the contract. Contract amendments, initiated by the client and/or STL, are documented in writing for the benefit of both the client and STL.

All contracts, Quality Assurance Project Plans (LQMPs), Sampling and Analysis Plans (SAPs), contract amendments, and documented communications become part of the permanent project record as defined in Section 4.12.1.

4.4.2. Project Specific Quality Planning

Communication of contract specific technical and QC criteria is an essential activity in ensuring the success of site specific testing programs. To achieve this goal, STL assigns a Project Manager (PM) to each client. The PM is the first point of contact for the client. It is the PM's responsibility to ensure that project specific technical and QC requirements are effectively communicated to the laboratory personnel before and during the project. The labnet LIMS system used at STL-CT requires that project information be entered prior to samples being logged into the laboratory.

The STL - Connecticut facility has established many procedures in order to ensure that communication is inclusive and effective. These include project memos, designation and meetings of project teams, and meetings between the laboratory staff and the client. STL has found it very effective to invite the client into this process. STL strongly encourages our clients to visit the laboratories and hold formal or informal sessions with employees in order to effectively communicate client needs on an ongoing basis, as well as project specific details for customized testing programs.

4.4.3. Data Quality Objectives

Data Quality Objectives (DQO) are qualitative and quantitative statements used to ensure the generation of the type, quantity, and quality of environmental data that will be appropriate for the intended application. Typically, DQOs are identified before project initiation, during the development of QAPPs and SAPs. The analytical DQOs addressed in this section are precision, accuracy, representativeness, completeness, and comparability.

The components of analytical variability (uncertainty) can be estimated when QC samples of the right types and at the appropriate frequency are incorporated into measurement process at the analytical laboratory. STL incorporates numerous QC samples to obtain data for comparison with the analytical DQOs and to ensure that the measurement system is functioning properly. The QC samples and their applications, described in Section 5.8.2, are selected based on regulatory, method- or client-specific requirements. Analytical laboratory QC samples for inorganic, and organic analyses may include calibration blanks, instrument blanks, method blanks, LCS, calibration standards, MS, MSD, and surrogate spikes.

The DQOs discussed below ensure that data are gathered and presented in accordance with procedures appropriate for its intended use, that the data is of known and documented quality, and are able to withstand scientific and legal scrutiny.

Precision is an estimate of variability. It is an estimate of agreement among individual measurements of the same physical or chemical property, under prescribed similar conditions. Precision is expressed either as Relative Standard Deviation (RSD) for greater than two measurements or as Relative Percent Difference (RPD) for two

measurements. Precision is determined, in part, by analyzing data from aggregate LCS results, MS, MSD, and MD.

Precision also refers to the measurement of the variability associated with the entire process, from sampling to analysis. Total precision of the process can be determined by analysis of duplicate or replicate field samples and measures variability introduced by both the laboratory and field operations.

Accuracy is the degree of agreement between a measurement and the true or expected value, or between the average of a number of measurements and the true or expected value. It reflects the total error associated with a measurement.

Both random and systematic errors can affect accuracy. For chemical properties, accuracy is expressed either as a percent recovery (R) or as a percent bias (R - 100). Accuracy is determined, in part, by analyzing data from LCS, MS, and MSD.

Representativeness is the degree to which data accurately and precisely represent a characteristic of a population, a variation in a physical or chemical property at a sampling point, or an environmental condition. Data representativeness is primarily a function of sampling strategy; therefore, the sampling scheme must be designed to maximize representativeness. Representativeness also relates to ensuring that, through sample homogeneity, the sample analysis result is representative of the constituent concentration in the sample matrix. STL makes every effort to analyze an aliquot that is representative of the original sample, and to ensure the homogeneity of the sample before sub-sampling.

Completeness is defined as the percentage of measurements that are judged valid or useable. Factors negatively affecting completeness include the following: sample leakage or breakage in transit or during handling, loss of sample during laboratory analysis through accident or improper handling, improper documentation such that traceability is compromised, or sample result is rejected due to failure to conform to QC specifications. A completeness objective of 95% of the data specified by the statement of work is the goal established for most projects.

Comparability is a measure of the confidence with which one data set can be compared to another. Only data of known quality such as precision and bias be readily compared. To ensure comparability, all laboratory analysts are required to use uniform procedures (e.g., SOPs) and a uniform set of units and calculations for analyzing and reporting environmental data.

4.5. Subcontracting

STL Connecticut may find the need to send selected analyses to a subcontract laboratory either within the STL network or outside of the STL organization. The most common reason for utilization of a subcontract facility is that the procedure is not routinely

performed by the STL Connecticut laboratory and the subcontractor has greater experience in day-to-day execution of the method. All subcontract laboratories utilized by STL on a continuing basis require approval of the QA department prior to use, either on a corporate level or locally.

Subcontracting is arranged with the documented consent of the client, in a timely response which shall not be unreasonably refused. All QC guidelines specific to the client's analytical program are transmitted to the subcontractor and agreed upon before sending the samples to the subcontract facility. Proof of required certifications from the subcontract facility are maintained in STL project records. Where applicable, specific QC guidelines, LQMPs, and/or SAPs are transmitted to the subcontract laboratory. Samples are subcontracted under formal Chain of Custody (COC).

Subcontract laboratories may receive an on-site audit by a representative of the STL network's QA staff if it is deemed appropriate by the QA Manager. The audit involves a measure of compliance with the required test method, QC requirements, as well as any special client requirements.

Project reports from external subcontract laboratories are not altered and are included in original form in the final project report provided by STL.

Subcontracting may also occur between STL facilities. Subcontracting within STL is subject to the same requirements as detailed above.

4.6. Purchasing Services and Supplies

Evaluation and selection of suppliers and vendors is done, in part, on the basis of the quality of their products, their ability to meet the demand for their products on a continuous and short term basis, the overall quality of their services, their past history, and competitive pricing. This is achieved through evaluation of objective evidence of quality furnished by the supplier, which can include certificates of analysis, recommendations, and proof of historical compliance with similar programs for other clients. To ensure that quality critical consumables and equipment conform to specified requirements, all purchases from specific vendors are approved by a member of the supervisory or management staff. A list of current vendors used by the lab is on file with the QA dept along with any documented quality issues.

Chemical reagents, solvents, glassware, and general supplies are ordered as needed to maintain sufficient quantities on hand. Purchasing guidelines for equipment and reagents meet with the requirements of the specific method and testing procedures for which they are being purchased. Solvents and Acids are pretested in accordance with the SOP, S-T-001, Testing Solvents and Acids, at a predefined STL laboratory. Documentation of lot certification is communicated to the QAMs and posted on the STL intranet.

4.6.1 Solvent and Acid Lot Verification

Pre-purchase approval is performed for solvents and acids purchased in large quantities unless a certificate of conformance has been furnished. These may include acetone, ethyl ether, hexane, methylene chloride, nitric acid, hydrochloric acid, sulfuric acid, and hydrogen peroxide. Each lot of incoming supplies requiring pre-approval is checked against the previously approved lot number. If the lot number is not approved, the lot is refused. If the lot number is an approved lot number, it is accepted and documented. Solvents and acids are pre-tested in accordance with STLs Corporate *Testing Solvents and Acids* procedure (S-T-001) for all of the STL laboratories. A Certificate of Analysis is requested for all standards and reagents as applicable and kept on file at the laboratory.

4.7. Service to the Client

Each client is assigned a Project Manager . The PM is the focal point for setting up projects, placing bottle orders, reviewing sample receipts, monitoring jobs within the lab, communicating any analytical issues and reviewing the final report.

4.7.1. Sample Acceptance Policy

Samples are considered "compromised" if the following conditions are observed upon sample receipt:

- Cooler and/or samples are received outside of temperature specification.
- Samples are received broken or leaking.
- Samples are received beyond holding time.
- Samples are received without appropriate preservative.
- Samples are received in inappropriate containers.
- COC does not match samples received.
- COC is not properly completed or not received.
- Breakage of any Custody Seal.
- Apparent tampering with cooler and/or samples.
- Headspace in volatiles samples.
- Seepage of extraneous water or materials into samples.
- Inadequate sample volume.
- Illegible, impermanent, or non-unique sample labeling.

When "compromised" samples are received, it is documented in the project records and the client is contacted for instructions. If the client decides to proceed with analysis, the project report will clearly indicate any of the above conditions and the resolution.

4.7.2. Client Confidentiality and Proprietary Rights

Data and sample materials provided by the client or at the client's request, and the results obtained by STL, shall be held in confidence (unless such information is generally available to the public or is in the public domain or client has failed to pay STL for all services rendered or is otherwise in breach of the terms and conditions set forth in the STL and client contract) subject to any disclosure required by law or legal process. STL's reports, and the data and information provided therein, are for the exclusive use and benefit of client, and are not released to a third party without written consent from the client.

4.8. Complaints

STL believes that effective client complaint handling processes have important business and strategic value. Listening to and documenting client's concerns captures 'client knowledge' that helps to continually improve processes and outpace the competition. Implementing a client complaint handling process also provides assurance to the data user that the laboratory will stand behind its data, service obligations and products.

Client complaints or noted discrepancies are documented, communicated to management, and addressed promptly and thoroughly. Client complaints are documented by the employee receiving the complaint. The documentation can take the form of a corrective action report (as described in Section 4.10) or in a format specifically designed for that purpose. The Laboratory Director, PM, Customer Service Manager, and QA Manager are informed of all client complaints, and assist in resolving the complaint.

The nature of the complaint is identified, documented, and investigated, and an appropriate action is determined and taken. In cases where a client complaint indicates that an established policy or procedure was not followed, the QA department is required to conduct a special audit to assist in resolving the issue. A written confirmation, or letter to the client, outlining the issue and response taken is strongly recommended as part of the overall action taken.

The number and nature of client complaints is reported to the Corporate QA Manager in the QA Monthly report submitted by each facility. The overall number of complaints received per facility is tracked and the appropriateness of the response to client complaints is assessed. Monitoring and addressing the overall level and nature of client complaints and the effectiveness of the solutions is part of the Management Systems Review.

4.9. Control of Non-conformances

Non-conformances include any out of control occurrence. Non-conformances may relate to client specific requirements, procedural requirements, or equipment issues. All non-conformances in the laboratory are documented at the time of their occurrence.

All non-conformances that affect a sample and/or sample data become part of the affected project's permanent record. When appropriate, reanalysis is performed where QC data falls outside of specifications, or where data appears anomalous. If the reanalysis comes back within established tolerances, the results are approved. If the reanalysis is still outside tolerances, further reanalysis or consultation with the Supervisor, Manager, PM, Laboratory Director, or QA Manager for direction may be required. All records of reanalysis are kept with the project files.

Where non-conformances specifically affect a client's sample and/or data, the client is informed and action must be taken. Action can take the form of reporting and flagging the data, and including the non-conformance in the project narrative or cover letter.

4.10. Corrective Action

4.10.1. General

The STL-Connecticut facility has an established, documented corrective action process. Each corrective action is thoroughly investigated, and the investigation, outcome of the investigation, action taken, and follow-up is documented. Corrective action reports are reviewed, approved, and maintained by the QA department.

All corrective actions, whether immediate or long-term, will comprise the following steps to ensure a closed-loop corrective action process:

- Define the problem.
- Assign responsibility for investigating the problem.
- Determine a corrective action to eliminate the problem.
- Assign, and obtain commitment to, responsibility for implementing the corrective action.
- Implement the correction.
- Assess the effectiveness of the corrective action and verify that the corrective action has eliminated the problem.

4.10.1.1 Immediate Corrective Action

Immediate corrective actions to correct or repair non-conforming equipment and systems are generally initiated in response to adverse conditions identified through QC procedures. The analyst has relatively quick feedback that a problem exists, e.g., calibration does not meet or QC check samples exceed allowable criteria, and can take immediate action to repair the system.

The initial responsibility to monitor the quality of a function or analytical system lies with the individual performing the task or procedure. DQOs are evaluated against laboratory-established or against method or client specified QA/QC requirements. If the assessment reveals that any of the QC acceptance criteria are not met, the analyst must immediately assess the analytical system to correct the problem. When the appropriate corrective action

measures have been defined and the analytical system is determined to be "in-control" or the measures required to put the system "in-control" have been identified and scheduled, the problem and resolution or planned action is documented in the appropriate logbook or NCM. Data generated by an analytical system that is determined to be out-of-control must never be released without approval of the Section Manager, QA Manager, Laboratory Director and client notification.

4.10.1.2 Long-term Corrective Action

Long-term corrective action is generally initiated due to QA issues, which are most often identified during internal and external audits. Typically, a deeper investigation into the root cause of the nonconformance is warranted, and the problem may take much longer to identify and resolve. Staff training, method revision, replacement of equipment, and LIMS reprogramming are examples of long-term corrective action.

4.10.2. Initiation

Any employee in STL is authorized to initiate a corrective action. The initial source of corrective action can also be external to STL (i.e. corrective action because of client complaint, regulatory audit, or proficiency test). When a problem that requires corrective action is identified, the following items are identified by the initiator on the corrective action report: the nature of the problem, the name of the initiator, and the date. If the problem affects a specific client project, the name of the client and laboratory project number is recorded, and the PM is informed immediately.

4.10.3. Cause analysis

The corrective action process must be embarked upon as a joint, problem solving and constructive effort. Identification of systematic errors, or errors that are likely to occur repetitively due to a defect or weakness in a system, is particularly valuable in maintaining an environment of continuous improvement in laboratory operations.

When a corrective action report is initiated, the initiator works with the affected employee(s) and/or department(s) to identify the root cause of the problem. An essential part of the corrective action process is to identify whether the problem occurred due to a systematic or isolated error.

If the initiator of the corrective action report is uncertain as to what would constitute appropriate corrective action or is unable to resolve the situation, the problem is identified to the Supervisor, Manager, Laboratory Director or the QA Manager who provides assistance in the corrective action process.

The root cause of the problem and associated cause analysis is documented on the corrective action form.

4.10.4. Corrective Action

Once the root cause of a problem is identified, the initiator and affected employee(s) and/or department(s) examine potential actions that will rectify the present problem to the extent possible, and prevent recurrence of future, similar occurrences. An appropriate corrective action is then recommended. The corrective action must be appropriate for the size, and nature of the issue.

Implementation of the corrective action and the date of implementation are documented on the corrective action report.

Copies of the corrective action form are given to the appropriate department(s) and, if related to a specific project report, included in the project file. An essential part of the corrective action process is communication and awareness of the problem, the cause, and the action taken to prevent future occurrences and/or rectify the immediate problem.

4.10.5. Monitoring Corrective Action

All corrective action reports are forwarded to the QA Department. The QA department reviews all corrective actions and selects one or more of the more significant corrective actions for inclusion in the annual systems audit. The QA Department also may implement a special audit. The purpose of inclusion of the corrective action process in both routine and special audits is to monitor the implementation of the corrective action and to determine whether the action taken has been effective in overcoming the issue identified.

4.11. Preventative Action

Preventative action is defined as noting and correcting a problem before it happens, because of a weakness in a system, method, or procedure. Preventative action includes analysis of the Quality System to detect, analyze, and eliminate potential causes of non-conformances. When potential problems are identified, preventative action is initiated to effectively address the problem to eliminate or reduce the risk identified. The preventative action process takes the same format as the corrective action process.

4.12. Records

It is the responsibility of all members of the laboratory to maintain complete records of all operations performed. All records shall be neat and organized. All laboratory records are the property of the laboratory and shall not be removed from the premises without permission from supervisors. All records are considered confidential and must be safeguarded. Unauthorized changes, loss or destruction of records can be grounds for dismissal from the laboratory. Consult the Severn Trent Laboratories Ethics Policy regarding integrity of data and employee conduct.

Measurement records must be recorded in pre-printed electronic record logs or pre-printed measurement logs. This policy will facilitate the organization and archival of all laboratory data for future reference. In some departments records maybe kept electronically using the labnet LIMS system. This may include standard prep, reagent prep or sample prep. Electronic records are backed up and safeguarded as per STL's IT policies.

All injection forms, instrumentation forms, sample prep forms, QC forms, etc. which are used to process samples and measurement results are described and attached to each analytical SOP. The SOP specifies where these records and forms are cataloged and stored.

All measurement data is recorded in pre-numbered, bound, logbooks in permanent ink. Transcriptions will be avoided whenever possible. The record will reflect the measurement performed and all appropriate details for conclusions related to the measurement. The record must be initialed and dated by the individual performing the measurement on the day the measurement is performed. Corrections shall be made by drawing a single line through the error, initialing and dating the error. All forms will be reviewed by the QA Manager annually. If it is found that the document does not meet the requirements of the SOP, the discrepancy is forwarded to the group/section leader through the corrective action process (reference SOP on Corrective Action Reports). Further detail on laboratory document control is found in the SOP on Document Control.

4.12.1. Record Types

Record types are described in Table 2.

Table 2 STL Record Types

Revision Controlled Documents		QA Records	Project Records	Administrative Records
Calibration	LQM	Audits/ Responses	COC Documentation	Accounting
Computer Tapes/Disks	LQM	Certifications	Contracts and Amendments	EH&S, Manual, Permits, Disposal Records
QC Samples	SOPs	Corrective Action	Correspondence	Employee Handbook
Sample data		Logbooks*	QAPP	OSHA 29 CFR Part 1910
Software (Version control)		Method & Software Validation, Verification	SAP	Personnel files, Employee Signature & Initials, Training Records
		Standards Certificates	Telephone Logbooks	Technical and Administrative Policies

*Examples of Logbooks: Maintenance, Instrument Run, Preparation (standard and samples), Standard and Reagent Receipt, Archiving, Balance Calibration, Temperature,

4.12.2. Record Retention

Table 3 outlines STL's standard record retention time. For raw data and project records, record retention is calculated from the date the project report is issued. For other records, such as Controlled Documents, QC, or Administrative Records, the retention time is calculated from the date the document is formally retired. Drinking Water records are required to be stored for 10 years.

Table 3 STL Record Retention

Record Type	Department	Archival Requirements
Raw Data	All	5 Years from project completion
Controlled Documents	All	5 Years from document retirement date
QC	All	5 Years from archival
Project	All	5 Years from project completion
Administrative	Personnel/Training	7 years
	Accounting	See Accounting and Control Procedures Manual

4.12.3. Programs with Longer Retention Requirements

Specific client projects and regulatory programs have longer record retention requirements than the STL standard record retention length. In these cases, the longer retention requirement is noted in the archive. If special instructions exist such that client data cannot be destroyed prior to notification of the client, the container or box containing that data is marked as to who to contact for authorization prior to destroying the data.

4.12.4. Archives and Record Transfer

Archives are indexed such that records are accessible on either a project or temporal basis. Archives are protected against fire, theft, loss, deterioration, and vermin. Electronic records are protected from deterioration caused by magnetic fields and/or electronic deterioration. Access to archives is controlled and documented.

STL ensures that all records are maintained as required by the regulatory guidelines and per the LQM upon facility location change or ownership transfer.

Stored information may consist of hardcopy or electronic data stored on a magnetic media.

All hardcopy information is stored at the laboratory that generated the data or off-site at a commercial document storage facility equipped with a professional security system.

All electronic data is stored on-site at the laboratory that generated the data or off-site at a commercial document storage facility equipped with a professional security system and a controlled environment suitable for storage of magnetic media.

Access to archived information is controlled by the appropriate data management custodian or facility manager.

At STL-Connecticut, reports for the current year are filed by the data management department. The report files along with any data package are then stored in numbered boxes. The number of the box is recorded into the cross reference logs and then stored in the designated storage area. The previous year's data is stored off-site at a secure storage facility. All jobs must be signed out in a logbook if being removed from the data management area.

STL ensures that all records are maintained as required by the regulatory guidelines and per the LQM upon facility location change or ownership transfer. Upon STL facility location change, all archives are retained by STL in accordance with the LQM. Upon ownership transfer, record retention requirements are addressed in the ownership transfer agreement and the responsibility for maintaining archives is clearly established without disclosing client confidentiality. Clients shall be notified in the case of ownership transfer.

In the event that the laboratory is closed, all final test reports generated by the laboratory will be submitted to the clients if not previously provided. All records will then be transferred to STL's corporate record storage location. All boxes and contents will be appropriately labeled with the dates of destruction (Refer to Tables 5 and 6) and managed in accordance their policies.

4.13. Internal Audits

4.13.1. Audit Types and Frequency

A number of types of audits are performed at STL. Audit type and frequency are categorized in Table 4.

Table 4. Audit Types and Frequency

Audit Type	Performed by	Frequency
Systems	QA Department or Designee	Annual

Audit Type	Performed by	Frequency
Data	QA Department or Designee	**Data Report Review:** As necessary to ensure an effective secondary review process **Analyst Data Audits:** 100% of all analysts annually **Electronic Data Audits:** 100% of all organic instruments
Special	QA Department or Designee	As Needed

4.13.2. Systems Audits

Facility systems audits are technical in nature and are conducted on an ongoing basis by the QA Manager or his/her designee at each facility. Systems audits cover all departments of the facility, both operational and support.

The audit report is issued by the Internal Auditor of the facility within 30 calendar days of the audit. The audit report includes the following elements: Introduction, Scope of Audit, Type of Audit, Improvements and Innovations, Deficiencies, and a timeframe within which the audit must be addressed. The audit report is addressed to the Laboratory Director and copied to the General Manger. If the internal audit is performed by someone other than the facility QA Manager, the report must also be addressed to that QA Manger.

Written audit responses are required within 30 calendar days of audit report issue. The audit response follows the format of the audit report, and corrective actions and time frames for their implementation are included for each deficiency. The audit response is directed to all individuals copied on the audit report. Where a corrective action requires longer than 30 days to complete, the target date for the corrective action implementation is stated and evidence of the corrective action is submitted to the QA Department in the agreed upon time frame.

4.13.3. Data Audits

Data audits are focused to assess the level of customer service, method compliance, regulatory compliance, accuracy and completeness of test results and reports, documentation, and adherence to established QC criteria, laboratory SOPs, technical policy, and project specific QC criteria. Data audits may be accomplished through electronic instrument data audits, analyst data authenticity audits or final project report review.

A data auditing frequency target of 5% has been established. The QA Department provides feedback and/or corrections and revisions to project reports where necessary.

Data audits include spot-checking of manual integrations by QA personnel in order to determine that the manual integration is appropriate and documented according to Section 5.3.6.

Records of the data audits are kept, and the frequency of data audits is included in the monthly QA report. In performing data audits, it is essential that data be assessed in terms of differentiating between systematic and isolated errors. Upon noting anomalous data or occurrences in the data audits, the QA Department is responsible for seeking clarification from the appropriate personnel, ascertaining whether the error is systematic or an isolated error, and overseeing correction and/or revision of the project report if necessary. Errors found in client project reports are revised and the revision sent to the client. The QA Department is also responsible for assisting in the corrective action process where a data audit leads to identification of the need for process evaluation and change.

Where specific clients and regulatory programs require more frequent data auditing, the individual facility meets the data auditing frequency for that program. For projects falling under the DOD QSM, a 10% data audit frequency shall be followed.

4.13.3.1 Data Authenticity Audits

Data authenticity audits shall be performed on 100% of all analysts by the QA department or a designee independent from the operations. Performing data authenticity checks will typically include verifying raw data, evaluating calculation tools and independently reproducing the final results and comparing it to the hardcopy on randomly selected batches of data. The QA manager will report the percentage of analysts reviewed (for the year) in the monthly QA report and should average about 8% per month.

4.13.3.2 Electronic Data Audits

Electronic data audits are performed on 100% of all organic instruments by the QA department or a designee independent from the operations. This may include Mint Miner® scanning of randomly selected batches of electronic data followed by a chromatography system review. The QA manager will report the percentage of instruments reviewed (for the year) in the monthly QA report and should average about 8% of instruments per month. Electronic data audits include spot-checking of manual integrations by QA personnel in order to determine that the manual integration is appropriate and documented.

4.13.3.3 Final Reports Reviews

The frequency of auditing final reports depends on the effectiveness of the laboratory's secondary review process. If the laboratory infrequently finds report errors or there is a low percentage of revised reports due to analytical error, audits may be less frequent.

4.13.4. Special Audits

Special audits are conducted on an as needed basis, generally as a follow up to specific issues such as client complaints, corrective actions, proficiency testing results, data audits, systems audits, validation comments, or regulatory audits. Special audits are focused on a specific issue, and report format, distribution, and timeframes are designed to address the nature of the issue.

4.13.5. External Audits

STL facilities are routinely audited by clients and external regulatory authorities. STL is available for these audits and makes every effort to provide the auditors with the personnel, documentation, and assistance required by the auditors. STL recommends that the audits be scheduled with the QA Department so that all necessary personnel are available on the day of the audit.

4.14. Management Reviews

4.14.1. QA Reports to Management

A monthly QA report is prepared by QA Manager and forwarded to the Laboratory Director, the GM, and the Corporate QA Manager. The reports include statistical results that are used to assess the effectiveness of the Quality System. The format of the monthly report is shown in Figure 1.

4.14.2. Management Systems Review

A Quality Management Systems review of the facility is performed at least annually by either the Laboratory Director, QAM or his/her designee. The management systems review ensures that the laboratory's quality system is adequate to satisfy the laboratory's policies and practices, government requirements, certification, accreditation, approval requirements, and client expectations. Management systems reviews are accomplished through monthly quality assurance reporting, goal setting and an annual LQM review and revision.

4.14.3 Monthly QA Report and Metrics

By the 3rd day of the month, the QA manager prepares a monthly QA report. The report is sent to the Laboratory Director, General Manager and Corporate Quality Director. The report contains a narrative summary and metrics spreadsheet . At a minimum, the report content contains the items listed below (Figure 1). During the course of the year, the Laboratory Director, General Manager or Corporate Quality Director may request that additional information be added to the report.

Figure 1. Monthly QA Report Format

1	Audits
	Internal System Audits External System Audits
2	Revised Reports / Client Feedback
	Revised Reports Client Complaints Client Compliments
3	Certification Changes
	Changes Losses / Revocations
4	Proficiency Testing
	Study participation and scores Combined PT scores Repeat failures
5	SOP Status
	Report the percentage of SOPs that have been revised or reviewed within the last 24 months.
6	Miscellaneous QA and Operational Issues
	Narrative outlining improvements, regulatory compliance issues and general concerns.
Appended	Metrics Spreadsheet
	Summarize metrics in template provided by the Corporate Quality Director

5. *Technical Requirements*

5.1. Personnel

5.1.1. General

The STL-Connecticut management believes that its highly qualified and professional staff is the single most important aspect in assuring the highest level of data quality service in the industry.

STL-Connecticut staff consists of over forty professionals and support personnel that include:

- Laboratory Director
- Senior Management
- Quality Assurance Manager
- Information Systems Analyst
- Analytical Chemists
- Laboratory Technicians
- Sample Custodian
- Health and Safety/Waste Management Coordinators
- Customer Service Staff
- Account Executives

In order to ensure that employees have sufficient education and experience to perform a particular task, job descriptions are defined for each laboratory position. Job descriptions are located on the STL Intranet HR web page.

The personnel who are responsible for operations of sample analyses and data validation are outlined in Section 5 of the Appendix. Section 1 of the appendix presents professional profiles of key personnel within the STL-Connecticut organization. Profiles of additional STL staff members are available for review during a facility visit or are available upon special request.

5.1.2. Training

STL is committed to furthering the professional and technical development of employees at all levels. The QA Manager and the Laboratory Management may periodically review the training needs of the staff and make recommendations for any additional training. Each department within the laboratory is responsible for personnel training. Each training session, whether it be individual or group training must be documented utilizing the forms attached to the SOP for Employee Training. The completed forms must be submitted to the Human Resource department for placement into the employee training files.

Orientation to the laboratory's policies and procedures, in-house method training, and employee attendance at outside training courses and conferences all contribute toward employee proficiency. The QA section, in conjunction with the Human Resources section are responsible for maintaining documentation of these activities.

Project specific training may also take place. Prior to work on a new project, the dissemination of project information and/or project opening meetings may occur to discuss schedules and unique aspects of the project by the Project Manager. Items to be discussed may include the project technical profile, turnaround times, holding times, methods, analyte lists, reporting limits, deliverables, sample hazards, or other special requirements. Group Leader will then hold departmental meeting to discuss upcoming projects. These meetings provide direction to the laboratory staff in order to maximize production and client satisfaction, while maintaining quality.

The following evidence items are maintained in the employees technical training file for each technical employee:

- Initial Demonstration of Capability (IDOC)
- The employee has read and understood the latest version of the laboratory's quality documentation.
- The employee has read and understood the latest, approved version of all test methods and/or SOPs for which the employee is responsible.
- Annual evidence of continued DOC that may include successful analysis of a blind sample on the specific test method; a similar test method; an annual DOC; or four successive and acceptable LCSs.
- An ethic Agreement signed by each staff member (renewed each year)
- A confidentiality agreement signed by each staff member (renewed each year)
- Documentation of external training courses attended
- All training regarding QA policies and procedures

Human Resources maintains documentation and attestation forms on employment status & records; benefit programs; timekeeping/payroll; and employee conduct (e.g., ethics). This information is maintained in the employee's secured personnel file. This includes:

- An Ethics Agreement signed by each staff member (renewed each year).
- A Confidentiality Agreement signed by each staff member (renewed each year).

Minimum training requirements for STL-Connecticut employees are outlined in Table 5.

Table 5 STL Employee Minimum Training Requirements

Required Training	Time Frame[1]	Employee Type
Environmental Health & Safety	Month 1	All
Ethics	Two Weeks	All
Data Integrity	Two Weeks	Technical and PMs
Ethics Refresher	Annually	All
Quality Assurance	Quarter 1	All
Initial Demonstration of Capability (IDOC)	Prior to unsupervised method Performance	Technical

[1] From the date of initial employment unless otherwise indicated.

Technical training is accomplished within each laboratory by management to ensure method comprehension. All new personnel are required to demonstrate competency in performing a particular method by successfully completing an Demonstration of Capability (DoC) before conducting analysis independently on client samples.

DoCs are performed by analysis of four replicate QC check samples. Results of successive LCS analyses can be used to fulfill the DoC requirement. The accuracy and precision, measured as average recovery and standard deviation (using n-1 as the population), of the 4 replicate results are calculated and compared to those in the test method (where available). If the test method does not include accuracy and precision requirements, the results are compared to target criteria set by the laboratory. The laboratory sets the target criteria such that they reflect the data quality objectives of the specific test method or project data quality objectives. An DoC Certification Statement is recorded and maintained in the employee's training or personnel file. Figure 2 shows an example of a DoC Certification Statement.

Continuing DoCs certification is required annually and must be documented in the same manner as the DoC.

Figure 2 Demonstration of Capability Certification Statement

Demonstration of Capability
Certification Statement

Laboratory Name: Date:
Laboratory Address:

Method:_____
Matrix: _____

Analyst Name:

We the undersigned certify that:

1. The analyst identified above, using the cited test method, which is in use at this facility for the analysis of samples under the National Environmental Laboratory Accreditation Program, have met the Initial Demonstration of Capability.
2. The test method was performed by the analyst identified on this certification.
3. Copies of the test method and SOP are available for all personnel on site.
4. The data associated with the DoC are true, complete and representative.
5. All raw data (including a copy of this certification form) necessary to reconstruct and validate these analyses have been retained at the facility, and that the associated information is available for review by authorized inspectors.

Laboratory Manager/Supervisor	Signature	Date
Quality Assurance Manager	Signature	Date

5.1.3. Ethics Policy

Establishing and maintaining a high ethical standard is an important element of a quality system. In order to ensure that all personnel understand the importance the company places on maintaining high ethical standards at all times, STL has established an Ethics Policy P-L-006 and an Ethics Agreement (Figure 4). Each employee shall sign the Ethics Agreement, signifying agreed compliance with its stated purpose.

Violations of this Ethics Policy will not be tolerated. Employees who violate this policy will be subject to disciplinary actions up to and including termination. Criminal violations may also be referred to the Government for prosecution. In addition, such actions could jeopardize the Company's ability to do work on Government contracts, and for that reason, the Company has a Zero Tolerance approach to such violations.

Ethics is also a major component of the STL training program. Each employee must be trained in ethics within three months of hire in a training program that includes an overview of regulatory programs and program goals, a review of the ethics statement, and group discussions about data integrity and data misrepresentation. Employees must be trained as to the legal and environmental repercussions that result from data misrepresentation. A data integrity hotline is maintained by STL and administered by the QA Director. An annual refresher in ethics will be held for each employee.

Figure 3 STL Ethics Agreement

Severn Trent Laboratories, Inc.

I understand that STL is committed to ensuring the highest standard of quality and integrity of the data and services provided to our clients. I have read the Ethics Policy of the Company.

With regard to the duties I perform and the data I report in connection with my employment at the Company, I agree that:

- I will not intentionally report data values that are not the actual values obtained;
- I will not intentionally report the dates, times, sample or QC identifications, or method citations of data analyses that are not the actual dates, times, sample or QC identifications, or method citations;
- I will not intentionally misrepresent another individual's work;
- I will not intentionally misrepresent any data where data does not meet Method or QC requirements. If it is to be reported, I will report it with all appropriate notes and/or qualifiers;
- I agree to inform my Supervisor of any accidental reporting of non-authentic data by me in a timely manner; and I agree to inform my Supervisor of any accidental or intentional reporting of non-authentic data by other employees; and
- If a supervisor or a member of STL management requests me to engage in or perform an activity that I feel is compromising data validity or quality, I will not comply with the request and report this action immediately to a member of senior management, up to and including the President of STL.

As a STL employee, I understand that I have the responsibility to conduct myself with integrity in accordance with the ethical standards described in the Ethics Policy. I will also report any information relating to possible kickbacks or violations of the Procurement Integrity Act, or other questionable conduct in the course of sales or purchasing activities. I will not knowingly participate in any such activity and will report any actual or suspected violation of this policy to management.

The Ethics Policy has been explained to me by my supervisor or at a training session, and I have had the opportunity to ask questions if I did not understand any part of it. I understand that any violation of this policy subjects me to disciplinary action, which can include termination. In addition, I understand that any violation of this policy which relates to work under a government contract or subcontract could also subject me to the potential for prosecution under federal law.

EMPLOYEE SIGNATURE _____ Date _____

Supervisor/Trainer: _____ Date _____

5.2. Facilities

The laboratory is a secured facility with controlled and documented access. Access is controlled by various measures including locked doors (key access), and a staffed reception area. All visitors sign in and are escorted by STL Connecticut personnel while at the facility. The laboratory is locked at all times, unless a receptionist is present to monitor building access (e.g., between the hours of 8:30 a.m. and 5:00 p.m. Monday through Friday).

The laboratory currently maintains a staff of approximately 40 environmental professionals and occupies a facility of approximately 14,000 sq. ft. Separate laboratory areas are dedicated to GC instrumentation, GC/MS instrumentation, extractions for organic parameters, sample preparation for metals analysis, metals analysis and wet chemistries. The floor plan of the analytical laboratory is included in Section 4 of the Appendix.

The volatiles analysis laboratory containing GC/MS instrumentation has a separate air handling system which is maintained at a positive pressure at all times. The organic sample preparation laboratory has a separate HVAC system that creates negative pressure in the area. This design results in a contaminant-free environment for trace-level volatiles analysis.

Critical instrumentation such as GC/MS units, ICP's, AA's, data systems, gas chromatographs and LIMS are tied into an uninterruptible power supply system (UPS) to minimize instrument downtime and damage for short duration power interruptions.

The sample receipt and storage area is under the responsibility of the sample custodian. A locked walk-in refrigeration unit and 10 locked commercial refrigerator units are used to house samples waiting for analysis. Samples for volatile analysis are stored in separate units. Locked laboratory refrigerators, located throughout the laboratory, are used to maintain sample extracts or laboratory reagents. Each laboratory refrigerator is dedicated to sample, sample extract, or reagent storage.

All STL facilities are equipped with structural safety features. Each employee is familiar with the location, use, and capabilities of general and specialized safety features associated with their workplace. STL also provides and requires the use of protective equipment including safety glasses, protective clothing, gloves, respirators, etc.

5.3. Test Methods

5.3.1. Method Selection

Most of the test methods performed at STL-Connecticut originate from test methods published by a regulatory agency such as the US EPA and other state and federal

regulatory agencies. These include, but are not limited to, the following published compendiums of test methods:

Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air, US EPA, January, 1996.

Guidelines Establishing Test Procedures for the Analysis of Pollutants Under the Clean Water Act, and Appendix A-C; 40 CFR Part 136, USEPA Office of Water.

Methods for Chemical Analysis of Water and Wastes, EPA 600 (4-79-020), 1983.

Methods for the Determination of Inorganic Substances in Environmental Samples, EPA-600/R-93/100, August 1993.

Methods for the Determination of Metals in Environmental Samples, EPA/600/4-91/010, June 1991.

Methods for the Determination of Organic Compounds in Drinking Water, EPA-600/4-88-039, December 1988, Revised, July 1991, Supplement I, EPA-600-4-90-020, July 1990, Supplement II, EPA-600/R-92-129, August 1992.

Statement of Work for Inorganics Analysis, ILM04.1, USEPA Contract Laboratory Program Multi-media, Multi-concentration.

Statement of Work for Organics Analysis, OLM03.2, USEPA Contract Laboratory Program, Multi-media, Multi-concentration.

Statement of Work for Organic Analysis, Multi-Media, Multi-Concentration, OLM04.2/OLM04.3, USEPA Contract Laboratory Program, September 1998.

Standard Methods for the Examination of Water and Wastewater, 18th/19th edition; Eaton, A.D. Clesceri, L.S. Greenberg, A.E. Eds; American Water Works Association, Water Pollution Control Federation, American Public Health Association: Washington, D.C.

Test Methods for Evaluating Solid Waste Physical/Chemical Methods (SW846), Third Edition, September 1986, Final Update I, July 1992, Final Update IIA, August 1993, Final Update II, September 1994; Final Update IIB, January 1995; Final Update III, December 1996.

Annual Book of ASTM Standards, American Society for Testing & Materials (ASTM), Philadelphia, PA.

5.3.2. SOPs

Each STL facility maintains an SOP Index for all standard, non-standard, and laboratory developed methods. SOPs are also maintained for describing processes that are not related to a specific method. Method SOPs are maintained to describe a specific test method. Process SOPs are maintained to describe function and processes not related to a specific test method.

Method SOPs contain the following information:

Title Page with Document Name, Document Number, Revision Number, Effective Date, Page Numbers and Total # of Pages, Authorized Signatures, Dates and Proprietary Information Statement (Figure 4).

1. Identification of Test Method
2. Applicable Matrix
3. Reporting Limit
4. Scope and Application, including test analytes
5. Summary of the Test Method
6. Definitions
7. Interferences
8. Safety
9. Equipment and Supplies
10. Reagents and Standards
11. Sample Collection, Preservation, Shipment and Storage
12. Quality control
13. Calibration and Standardization
14. Procedure
15. Calculations
16. Method Performance
17. Pollution Prevention
18. Data Assessment and Acceptance Criteria for Quality Control Measures
19. Corrective Actions for Out-of-Control Data
20. Contingencies for Handling Out-of-Control or Unacceptable Data
21. Waste Management
22. References
23. Tables, Diagrams, Flowcharts and Validation Data

Process SOPs contain the following information:

Title Page with Document Name, Document Number, Revision Number, Effective Date, Page Numbers and Total # of Pages, Authorized Signatures, Dates and Proprietary Information Statement (Figure 4).

1. Scope
2. Summary
3. Definitions
4. Responsibilities
5. Safety
6. Procedure
7. References
8. Tables, Diagrams, and Flowcharts

Reference the STL-Connecticut SOP on SOPs for the exact format.

The QA Department is responsible for maintenance of SOPs, archival of SOP historical revisions, and maintenance of an SOP index. SOPs, at a minimum, undergo annual review. Where an SOP is based on a published method, the laboratory maintains a copy of the reference method.

Figure 4 Proprietary Information Statement

This documentation has been prepared by Severn Trent Laboratories (STL) solely for STL's own use and the use of STL's customers in evaluating its qualifications and capabilities in connection with a particular project. The user of this document agrees by its acceptance to return it to Severn Trent Laboratories upon request and not to reproduce, copy, lend, or otherwise disclose its contents, directly or indirectly, and not to use if for any other purpose other than that for which it was specifically provided. The user also agrees that where consultants or other outside parties are involved in the evaluation process, access to these documents shall not be given to said parties unless those parties also specifically agree to these conditions.

THIS DOCUMENT CONTAINS VALUABLE CONFIDENTIAL AND PROPRIETARY INFORMATION. DISCLOSURE, USE OR REPRODUCTION OF THESE MATERIALS WITHOUT THE WRITTEN AUTHORIZATION OF SEVERN TRENT LABORATORIES IS STRICTLY PROHIBITED. THIS UNPUBLISHED WORK BY SEVERN TRENT LABORATORIES IS PROTECTED BY STATE AND FEDERAL LAW OF THE UNITED STATES. IF PUBLICATION OF THIS WORK SHOULD OCCUR THE FOLLOWING NOTICE SHALL APPLY:

©COPYRIGHT 2005 SEVERN TRENT LABORATORIES, INC. ALL RIGHTS RESERVED.

SOP Appendix
In some cases, a standard laboratory procedure is modified slightly for a specific client or project at the client or regulatory agency's request. In these cases, an Appendix to the SOP may be attached that indicates the modifications to the SOP which are specific to that project. SOP appendices shall not be used to alter test methods required by regulation such that the modifications would results in non-compliances.

5.3.3. Method Validation

Laboratory developed methods are validated and documented according to the procedure described in Section 5.3.5.

5.3.4. Method Verification

Method verification is required when a validated standard test method or a method modification is implemented. The level of activity required for method verification is dependent on the type of method being implemented, or on the level of method modification and its affect on a method's robustness. Method modification often takes advantage of a method's robustness, or the ability to make minor changes in a method without affecting the method's outcome. Method verification commonly will minimally require Determination of Method Sensitivity and Determination of Accuracy and Precision as described in Section 5.3.5. When implementing new, but previously validated methodologies, method verification may require additional activities such as Determination of Range.

5.3.5. Method Validation and Verification Activities

Before analyzing samples by a particular method, method validation and/or method verification must occur. A complete validation of the method is required for laboratory developed methods. While method validation can take various courses, the following activities are generally required as part of method validation. Method validation records are designated QC records and are archived accordingly.

Determination of Method Selectivity
Method selectivity is demonstrated for the analyte(s) in the specific matrix or matrices. In some cases, to achieve the required selectivity for an analyte, a confirmation analysis is required as part of the method.

Determination of Method Sensitivity
Sensitivity can be both estimated and demonstrated. Whether a study is required to estimate sensitivity depends on the level of method development required when applying a particular measurement system to a specific set of samples. Where estimations and/or demonstrations of sensitivity are required by regulation or client agreement, such as the procedure in 40 CFR Part 136 Appendix B, under the Clean Water Act, these shall be followed. The laboratory determines MDLs are described in Section 4.4.3.6 and the corporate procedure S-Q-003.

Relationship of Limit of Detection (LOD) to the Quantitation Limit (QL)
An important characteristic of expression of sensitivity is the difference in the LOD and the QL. The LOD is the minimum level at which the presence of an analyte can be reliably concluded. The QL is the minimum level at which both the presence of an analyte and its concentration can be reliably determined. For most instrumental measurement systems, there is a region where semi-quantitative data is generated around the LOD (both above and below the estimated MDL or LOD) and below the QL. In this region, detection of an analyte may be confirmed but quantification of the analyte is unreliable within the accuracy and precision guidelines of the measurement system. When an analyte is detected below the QL, and the presence of the analyte is confirmed by meeting the qualitative identification criteria for the analyte, the analyte can be reliably reported, but the amount of the analyte can only be estimated. If data is to be reported in this region, it is done so with a qualification that denotes the semi-quantitative nature of the result.

Determination of Interferences
A determination that the method is free from interferences in a blank matrix is performed.

Determination of Range
Where appropriate, a determination of the applicable range of the method is performed. In most cases, range is determined and demonstrated by comparison of the response of an analyte in a curve to established or targeted criteria. The curve is used to establish the range of quantitation and the lower and upper values of the curve represent upper and lower quantitation limits. Curves are not limited to linear relationships.

Demonstration of Capability
DoCs are performed prior to method performance.

Determination of Accuracy and Precision
Accuracy and precision studies may be required as a separate determination from the IDC. Accuracy and precision studies are generally performed using four replicate analyses, with a resulting percent recovery and measure of reproducibility (standard deviation, relative standard deviation) calculated and measured against a set of target criteria.

Documentation of Method
The method is formally documented in an SOP. If the method is a minor modification of a standard laboratory method that is already documented in an SOP, an SOP Appendix describing the specific differences in the new method is acceptable in place of a separate SOP.

Continued Demonstration of Method Performance
Continued demonstration of Method Performance is addressed in the SOP. Continued demonstration of method performance is generally accomplished by batch specific QC samples such as Laboratory Control Samples and Method Blanks.

5.3.6 Data Reduction and Review

Analytical data are entered/downloaded directly into LIMS or recorded on pre-formatted bench sheets that are paginated and bound into laboratory logbooks. These logbooks are issued and controlled by the laboratory's QA Section. A unique document control code is assigned to each book to assure that chronological record keeping is maintained.

Analytical data is referenced to a unique sample identification number for internal tracking and reporting. Both LIMS entries and logbook pages contain the following information, as applicable: analytical method, analyst, date, sequential page number, associated sample numbers, standard concentrations, and raw data. Entries are in chronological order and maintained so as to enable reconstruction of the analytical sequence.

The analyst is responsible for entering / recording all appropriate information, and for signing and dating all logbook entries daily. All entries and logbook pages are reviewed for completeness by a supervisor, peer reviewer. Data review checklists document the analytical review of the LIMS entries, logbook and associated QC indicators. Copies of instrument outputs (chromatograms, mass spectra, etc..) are maintained on file or electronically with the analyst's signature/initials and date.

5.6.3.1 Data review

All data, regardless of regulatory program or level of reporting, are subject to a thorough review process. All levels of the review are documented.

Initial Review

The initial review is often referred to as a "bench-level" review. In most cases, the analyst who generates the data (i.e. logs in, prepares and/or runs the samples) is the initial reviewer. In some cases, an analyst may be reducing data for samples run by an auto-sampler set up by a different analyst. In this case, the identity of both the analyst and the initial reviewer is identified in the raw data.

One of the most important aspects of primary review is to make sure that the test instructions are clear, and that all project specific requirements have been understood and followed. If directions to the analyst are not clear, the analyst must go to the Supervisor, Manager, or PM, who must clarify the instructions.

Once an analysis is complete, the initial reviewer ensures that:

- Sample preparation information is complete, accurate, and documented.
- Calculations have been performed correctly.
- Quantitation has been performed accurately.
- Qualitative identifications are accurate.
- Manual integrations are appropriate.

- Data flags to indicate manual integrations are recorded.
- Manual integrations are authorized by a date and signature or initials of primary analyst.
- Client specific requirements have been followed.
- Method and process SOPs have been followed.
- Method QC criteria have been met.
- QC samples are within established limits.
- Dilution factors are correctly recorded and applied.
- Non-conformances and/or anomalous data have been documented and communicated.
- COC procedures have been followed.
- Initial review is documented by date and initials/signature of primary analyst.

Any anomalous results and/or non-conformances noted during the Initial Review are communicated to the Supervisor and the PM for resolution. Resolution can require sample reanalysis, or it may require that data be reported with a qualification. Non-conformances are documented per Section 4.9.

The laboratory employs a system of QA sign-off sheets called QC Batch Approval Forms and Quality Control Approval Reports (QCAR's), where each analyst must sign off that their respective part of the analysis is complete and meets the QA/QC requirements of the governing SOP. Both the Volatile and semi-volatile computer systems produce batch-specific QC summary reports to check various analytical parameters. Analysis QCAR's are filed with the analysis batches while the final deliverable QCAR's are signed and placed in each job folder along with any Corrective Action Forms (CAF) which details any problems which were encountered in the measurement of samples. Any deviations from SOPs are noted on CAF's and explained in the SDG narrative which is incorporated into the final report. The group leader has final sign-off responsibility on the QCAR and is responsible for assuring the overall quality of the data.

Secondary Review

The secondary review is a complete technical review of a data set and is performed by the Group/Section or designee. The secondary review is documented and the secondary reviewer is identified. The following items are reviewed:

- Qualitative Identification
- Quantitative Accuracy
- Calibration
- QC Samples
- Method QC Criteria
- Adherence to method and process SOPs
- Accuracy of Final Client Reporting Forms
- Manual Integrations – 100% as verified by signature of secondary data reviewer
- Completeness
- Special Requirements/Instructions

If problems are found during the secondary review, the reviewer must work with the appropriate personnel to resolve them. If changes are made to the data, such as alternate qualitative identifications, identifications of additional target analytes, re-quantitation, or re-integration, the secondary reviewer must contact the laboratory analyst and/or primary reviewer of the data so that the primary analyst and/or reviewer is aware of the appropriate reporting procedures. It is at this time the case narrative is written for the report.

Completeness Review

The completeness review performed by the Project Manager, the includes the review of a project narrative and/or cover letter which outlines anomalous data and non-compliances using project narrative notes and non-compliance reports generated during the primary and secondary review. The completeness review addresses the following items:

- Is the project report complete with all samples present?
- Does the data meet with the client's expectations?
- If available, were the data quality objectives of the project met?
- Are QC outages and/or non-conformances approved and appropriately explained in the narrative notes?

5.3.6.1 Data Reduction

The complexity of the data reduction depends on the analytical method and the number of discrete operations involved (e.g., extractions, dilutions, instrument readings and concentrations). The analyst calculates the final results from the raw data or uses appropriate computer programs to assist in the calculation of final reportable values.

For manual data entry, e.g., Wet Chemistry, the data is reduced by the analyst and then verified by the section manager or alternate analyst prior to updating the data in LIMS. The spreadsheets, or any other type of applicable documents, are signed by both the analyst and alternate reviewer to confirm the accuracy of the manual entry(s).

Manual integration of peaks will be documented and reviewed and the raw data will be flagged in accordance with the STL Corporate SOP entitled *Acceptable Manual Integration Practices* (S-Q-004).

Copies of all raw data and the calculations used to generate the final results, such as bound logbooks, are retained on file for a minimum of 5 years or as otherwise requested by the client/project.

Calculations and data reduction steps for various methods are summarized in the respective analytical SOPs or program requirements.

The following sections will describe the general procedures which are employed at the STL-Connecticut laboratory. More specific detail can be found in the standard operating procedures.

- Gas Chromatography

Data from the Gas Chromatographs is acquired through interfaces with a computer system utilizing Perkin Elmer Turbo Chrom chromatography software. After acquisition, the data is automatically copied to the Thermo analytical systems Target software package for data processing and quantitation. Data is reviewed at the bench level by the analyst. The data is reviewed for chromatographic scaling and dilutions. Necessary reintegrations and rescalings are done using Target. On column result data is then transferred to the labnet LIMS system. Prep data is manually entered and then linked to the analyses for final result calculation. If the data meets QC requirements, final reports are printed.

- GC/Mass Spectrometry

GC/MS data is acquired utilizing Hewlett Packard Chemstation computer systems with Environquant software. After acquisition, the data is automatically copied to the Thermo analytical systems Target software package for data processing and quantitation. This software allows for the comparison of sample non-target spectrum against reference library spectra. The most recent NIST/EPA mass spectral library supported by the system must be used. On column result data is then transferred to the labnet LIMS system. Prep data is manually enter and then linked to the analyses for final result calculation. Data is reviewed by the analyst. If the data meets QC requirements, final reports are printed.

- Atomic Spectroscopy

ICAP metals are analyzed by a Thermo-Jarrel Ash 61E or 61E Purge. The raw data collected is transferred via a network system to the labnet LIMS system. Mercury data is analyzed on the mercury analyzer and is transferred via a network system to the labnet LIMS system. Prep data is manually entered and then linked to the analysis for finally result calculation.

- Classical Chemistry

Routine wet chemistry analyses have pre-printed logbooks, such as distillation logs and digestion logs. The less frequent analyses are recorded in analysts' notebooks. Raw data is then entered into the LIMS for data calculation. This includes the calibration curve data which may have been previously entered. Semi-automated analyses performed on the Lachat produce results. These results are then electronically transferred to the LIMS system. Any associated prep data is manually entered and then linked to the analysis for final result calculation. Any raw data produced is stored in a central file.

5.3.7 Data Integrity and Security

This section details those procedures that are relevant to computer systems that collect, analyze, and process raw instrumental data, and those that manage and report data. STL Connecticut uses Labnet, STL's propriety LIMS, for Quotes, Project setup, sample login, standard and reagent traceability, data and report generation.

Security and Traceability

Access to computer systems that collect, analyze, and process raw instrumental data, and those that manage and report data is both controlled and recorded. There are various systems at STL to which this applies, which include the Laboratory Information Management System (LIMS), as well as specific systems such as a chromatography data system.

Control of the system is accomplished through limitation of access to the system by users with the education, training and experience to perform the task knowledgeably and accurately. System users are granted privileges that are commensurate with their experience and responsibilities.

Computer access is tracked by using unique login names and passwords for all employees that have access to the computer system. Entries and changes are documented with the identity of the individual making the entry, and the time and date. Where a computer system is processing raw instrumental data, the instrument identification number as described in Section 5.4.1 is recorded. Many of these systems, such as the Target Data System, have the capability of maintaining audit trails to track entries and changes to the data. This function is activated on any computer system that has that capability.

Outputs from all instruments are monitored for readability and consistency. If clarity is less than desired, corrective actions are undertaken to rectify the output based on instrument manufacturers' recommendations.

Verification

All commercially obtained software is verified prior to use and after version upgrade. Verification involves assessing whether the computer system accurately performs its intended function. Verification generally is accomplished by comparing the output of the program with the output of the raw data manually processed, or processed by the software being replaced. The records of the verification are required to contain the following information: software vendor, name of product, version, comparison of program output and manual output, raw data used to verify the program, date, and name of the individual performing the verification. Records of verification are retained as QC records.

Validation

Software validation involves documentation of specifications and coding as well as verification of results. Software validation is performed on all in house programs. Records of verification include original specifications, identity of code, printout of code, software name, software version, name of individual writing the code, comparison of program output with specifications, and verification records as specified above. Records of validation are retained as QC records.

Auditing

The QA Department systems audit includes review of the control, security, and tracking of Information Technology (IT) systems and software.

STLs LIMS System Managers continually review the control, security, and tracking of IT systems and software.

Version Control
The laboratory maintains copies of outdated versions of software and associated manuals for all software in use at the laboratory for a period of 5 years from its retirement date. The associated hardware, required to operate the software, is also retained for the same time period.

5.4. Equipment

5.4.1. Equipment Operation

STL facilities maintain state of the art instrumentation to perform the analyses within the QC specifications of the test methods. Each STL facility maintains an equipment list that includes the following information:

- Identity
- Date Installed
- Manufacturer's Name, Model Number, Serial Number
- Current Location
- Preventative Maintenance Schedule

All equipment is subject to rigorous checks upon its receipt, upgrade, or modification to establish that the equipment meets with the selectivity, accuracy, and precision required by the test method for which it is to be used. All manufacturer's operations and maintenance manuals are kept up to date and accessible for the use of the equipment operator. Documentation of equipment usage is maintained using analytical run and maintenance logbooks. Table 6 lists STL's major equipment.

Table 6 Major Equipment List

Instrument Type	Number
Gas Chromatograph (GC)	6
Gas Chromatograph/Mass Spectrometer (GC/MS)	8
Air Desorber	1
Inductively Coupled Argon Plasma Emission Spectrophotometer (ICP)	2
Mercury Cold Vapor Analyzer	1
Infrared Spectrophotometer (IR)	1
Wet Chemistry Autoanalyzer	2
Ion Chromatograph	1
UV-Visible Spectrophotometer	2
TOC Analyzer	2

5.4.2. Equipment Maintenance

STL employs a system of preventative maintenance in order to ensure system up time, minimize corrective maintenance costs and ensure data validity. All routine maintenance is performed as recommended by the manufacturer and may be performed by an analyst, instrument specialist or outside technician. Maintenance logbooks are kept on all major pieces of equipment in which both routine and non-routine maintenance is recorded. Notation of the date and maintenance activity is recorded each time service procedures are performed. The return to analytical control following instrument repair is documented in the maintenance logbook. Maintenance logbooks are retained as QC records. Section 5 of the Appendix outlines the Preventive Maintenance performed at STL Connecticut.

Where it is desirable, the STL-Connecticut laboratory has service contracts for major instruments. These contracts provide routine preventive maintenance according to the manufacturer's requirements. Additionally the laboratory maintains an inventory of expendable parts and supplies to minimize downtime and to allow laboratory personnel to make minor repairs if necessary.

5.4.3. Equipment Verification and Calibration

All equipment is tested upon receipt to establish its ability to meet the QC guidelines contained in the test method for which the instrumentation is to be used. This testing is documented in instrument run and maintenance logbooks. Once an instrument is placed in routine service, ongoing instrument calibration is demonstrated at the appropriate frequency as defined in the test method. The calibration data, which includes instrument conditions and standard concentrations, is documented in pre-formatted instrument runlogs or within LIMS itself. The preparation of all reference materials used for calibration is documented via LIMS. Refer to Corporate SOP P-T-001, Selection of Calibration Points for Proper handling of Calibration data. Any instrument that is deemed to be malfunctioning is clearly marked and taken out of service. When the instrument is brought back into control, this is documented in the instrument maintenance log.

5.5. Measurement Traceability

5.5.1. General

Traceability of measurements is assured using a system of documentation, calibration, and analysis of reference standards. Laboratory equipment that are peripheral to analysis and whose calibration are not necessarily documented in a test method analysis or by analysis of a reference standard is subject to ongoing certifications of accuracy.

These include procedures for checking specifications ancillary equipment: balances, thermometers, temperature, Deionized (DI) and Reverse Osmosis (RO) water systems, automatic pipettes and other volumetric measuring devices. With the exception of Class A Glassware (including glass microliter syringes that have a certificate of accuracy), quarterly accuracy checks are performed for all mechanical volumetric devices. Eppendorf pipets shall be verified monthly and checked prior to use. Wherever possible, subsidiary or peripheral equipment is

checked against standard equipment or standards that are traceable to national or international standards.

The accuracy of any non standard lab ware, such as plastic digestion cups or sample vials, used to measure initial sample volumes or final sample extract volumes must be verified one per lot. Class A glassware such as flasks, pipets, graduated cylinders and volumetrics shall be verified one per lot prior to being put into service within the lab. Accuracy must be verified to within 3 percent in accordance with ASTM procedures.

An external certified service engineer services laboratory balances on an annual basis. This service is documented on each balance with a signed and dated certification sticker. Balances are calibrated on each day of use. All thermometers are calibrated annually against a traceable reference thermometer. Temperature readings of ovens, refrigerators, and incubators are checked on each day of use.

Laboratory SOPs specify the required level of accuracy in volumetric glassware. In all cases, volumetric glassware meets the requirements specified in the published test method.

5.5.2. Reference Standards

The receipt of all reference standards is documented in labnet. References standards are purchased from commercial vendors and labeled with a unique Standard Identification Number, date received, and the expiration date. The expiration dates for ampulated solutions shall not exceed the manufacturer's expiration date. Expiration dates for laboratory-prepared stock and diluted standards shall be no later than the expiration date of the stock solution or material first. Expiration dates for pure chemicals shall be established by the laboratory and be based on chemical stability, possibility of contamination, and environmental and storage conditions. All documentation received with the reference standard is retained as a QC record and references the Standard Identification Number.

The preparation of all daughter solutions, whether a single or multiple-component stock, intermediate, or working standard solution, is documented in a standard solution preparation logbook, in a designated section of the analytical logbook or in the LIMS systems reagent program. This documentation references the Standard ID of the respective parent solution(s) used in its preparation, providing a solid trail back to the solution or chemical received from the vendor. These records include the standard name, final volume, matrix, final concentration, analyst initials, prep date and expiration date. A daughter solution should not have an expiration date which post-dates any of the parent solutions used in its preparation.

Where possible standards are purchased with an accompanying Certificate of Analysis that documents the standard purity. If a standard cannot be purchased from a vendor that supplies a Certificate of Analysis, the purity of the standard is documented by analysis. The documentation of standard purity is archived, and references the Standard Identification Number.

All efforts are made to purchase standards that are $\geq$ 97.0% purity. If this is not possible, the purity is used in performing standards calculations.

The accuracy of calibration standards is checked by comparison with a standard from a second source. In cases where a second standard manufacturer is not available, a different lot is acceptable for use as a second source. The appropriate QC criteria for specific standards are defined in laboratory SOPs. In most cases, the analysis of an ICV or LCS is used as the second source confirmation.

Storage conditions, such as shelf life, ambient or chilled, controlled or restricted access, wet or desiccated, etc.., are in conformance with the specifications set in the associated method, the program requirements, or the manufacturer's recommendation, as appropriate.

Analytical Calibration Standards

The calibration standards used for instruments and equipment are described in the specific analytical methods, or instrument manufacturers' operational guides. All standard preparations are recorded in a bound "Standards Preparation Log Book" or entered into labnet, with the lot number, method of preparation, date and analyst's initials. The labnet system and or log provides the internal documentation which traces the internal working standards to primary and secondary (purchased) stocks.

Samples shall not be stored in the same areas as the standards.

Records on the traceability of the standards are maintained within each department. These records include sources, dates of receipt, lot numbers (if applicable) and expiration dates (if applicable). All purchased standards shall be traceable to NIST Standards including EPA/A2LA standards.

Table 7 provides an overview of the standard sources, types and preparation by instrument group.

- Metals Calibration Standards

Commercially available at 1000 ppm levels from Inorganic Ventures and prepared from primary standard material traceable to NIST Standards including EPA/A2LA standards. Stock standards solutions are prepared every six months or when needed as multi-element stocks.

- Inorganic Calibration Standards

Calibration standards described in the methodology use ACS Reagent Grade materials. Some reference materials are available from NIST to standardize titrating solutions. Stock solutions are prepared every three months while diluted working standards are prepared daily at the time of analysis

- Organic Calibration Standards

Pure compounds, Calibration mixes and Spike solutions for organic compounds are available through, Protocol, Supelco, Inc., Restek, Inc. and Accustandard, Inc. Volatile organic stocks are

prepared every six months and diluted working standards are prepared weekly. Stock non-volatile solutions can be prepared every six months and diluted working standards are prepared as needed.

- pH Calibration Standards

Calibration materials which are certified by the manufacturer to be standardized against NIST Standards are commercially available and are used by the laboratory. Three standards - 4,7, and 10 are used daily to calibrate the pH meters.

- Weighing Calibration Standards

Analytical balances are certified annually. Calibration is performed on a weekly or daily basis using class "S" weights (0.50, 5.00, and 50g). All Class S weights shall be calibrated within 5 years and traceable to NIST.

- Oven Calibration Standards

Daily calibration by monitoring oven temperature with a thermometer calibrated annually with a NIST Certified Thermometer. Digital thermometers shall be calibrated on a quarterly basis.

- Conductivity Calibration Standard

Conductivity solutions are described in Standard Methods, 18th edition, Section 502.

- Turbidity Standards

Formazin solution prepared from CMS neat standard according to EPA Method 180.1-2. Four standards are used to prepare a calibration curve and are made fresh daily. The stock formazin standard is prepared every three months and kept under refrigeration.

- Photometer Calibration Standard

Spectronic Standards - Catalog #331-31-50 (wavelength calibration).

TABLE 7 .STANDARD SOURCES AND PREPARATION

Inst. Group	Source	Form Received	Storage	Preparation from Source	Laboratory Storage	Preparation Frequency
GC/MS-Volatiles	Restek, Inc. EPA Supelco Accustandard Protocol	Neat Solutions> 1000 ppm	Frozen	Primary stocks are prepared from source stocks	Freezer	Semi-annual
				Intermediate stocks are prepared from primary or source stocks	Refrigerator	Weekly
				Working stocks are prepared from intermediates	N/A	Weekly
GC/MS GC - SV	Restek, Inc. EPA RTP Supelco Accustandard	Neat Solutions >1000 ppm	Frozen	Primary stocks are prepared from source stocks	Freezer	Semi-annual
				Intermediate stocks are prepared from primary or source stocks	Refrigerator	Semi-annually
				Working stocks are prepared from intermediates	Refrigerator Certain Pesticies stored at room temperature	Semi-annually
ICP	Inorganic Ventures	Solutions of 1000ppm	Room temp.	Primary stocks (1 - 10 ppm) are prepared from source	0.15% HNO_3 at room temperature	Annually
				Intermediate stocks (1ppb - 1 ppm)	0.15% HNO_3 at room temperature	Semi-annually or as needed
				Working stocks	0.15% HNO_3 at room temperature	Daily

The accuracy of calibration standards is checked by comparison with a standard from a second source. In cases where a second standard manufacturer is not available, a different lot is acceptable for use as a second source. The appropriate Quality Control (QC) criteria for specific standards are defined in laboratory SOPs. In most cases, the analysis of an Initial Calibration Verification (ICV) or Laboratory Control Sample (LCS) is used as the second source confirmation.

5.5.3. Reagents

Reagents are, in general, required to be analytical reagent grade unless otherwise specific in method SOPs. Reagents must be at a minimum the purity required in the test method.

With the exception of the cycletainers, all solvents are pretested at an alternate STL facility. Documentation of approval is submitted to QA and posted on the STL intranet. All reagents are entered into the labnet lims system for tracking. The date of reagent receipt or preparation, and the date the reagent was opened are documented on the preprinted labnet label.

Cycletainers

STL-CT utilizes cycletainers for the organic Extractions solvents such as Hexane and Methylene Chloride. To access certification of these containers the distributor will fax a certificate of analysis from the manufacturer for the lots to be used to the QA Manager. These are kept on file. Cycletainers that do not come with a Certificate of Analysis must be pre-tested at the lab prior to being put into use. A sample of the solvent shall be concentrated and analyzed by the appropriate method. Solvents are tested and accepted in accordance with STLs Corporate *Testing Solvents and Acids* procedure (S-T-001). Documentation of lot verification must be in the extraction log and data kept on file with QA.

5.6. Sampling

Sample representativeness and integrity are the foundations upon which meaningful analytical results rely. Where documented and approved SAPs and/or LQMPs are in place, they must be made available to the laboratory before sample receipt, and approved by laboratory management before sample receipt.

5.7. Sample Handling, Transport, and Storage

5.7.1. General

Chain of Custody (COC) can be established either when bottles are sent to the field, or at the time of sampling. STL can provide all of the necessary coolers, reagent water, sample containers, preservatives, sample labels, custody seals, COC forms, ice, and packing materials required to properly preserve, pack, and ship samples to the laboratory.

Samples are received at the laboratory by a designated sample custodian and a unique Laboratory Project Identification Number is assigned thru the labnet system. The following information is recorded for each sample shipment: Client/Project Name, Date and Time of Laboratory Receipt, Laboratory Project Number, and Signature or initials of the personnel receiving the cooler and making the entries.

Upon inspection of the cooler and custody seals, the sample custodian opens and inspects the contents of the cooler, and records the cooler temperature. All documents are immediately inspected to assure agreement between the test samples received and the COC.

Any non-conformance, irregularity, or compromised sample receipt as described in Section 4.7.1 is documented on the labnet checklist and brought to the immediate attention of the PM for resolution with the client. The COC, shipping documents, documentation of any non-conformance, irregularity, or compromised sample receipt, record of client contact, and resulting instructions become part of the permanent project record. The sample data is then logged into the LIMS system by the Sample Management department.

Samples that are being tested at another STL facility or by an external subcontractor are repackaged, iced, and sent out under COC.

Following sample labeling as described in Section 5.7.1, the sample is placed in storage. Sample storage is required to be access controlled. All samples are stored according to the requirements outlined in the test method, and in a manner such that they are not subject to cross contamination or contamination from their environment. Unless specified by method or state regulation, a tolerance range of $\pm 2^{\circ}C$ is used. The walk-in storage unit is monitored daily, all others are monitored each business day.

The National Enforcement Investigations Center (NEIC) of EPA defines custody of evidence in the following ways:

- It is in your actual possession; or
- It is in your view, after being in your physical possession; or
- It was in your possession and then you locked or sealed it up to prevent tampering; or it is in a secure area

At STL-Connecticut, chain of custody begins with shipment of the sample bottles and coolers. STL-Connecticut has a printed external chain-of-custody form that accompanies each sample shipment. An example of this form is found in Section 3 of the appendix.

Upon receipt of the samples in the laboratory the sample custodian and the sample control group are responsible for obtaining all necessary shipping documentation and verification of all data entered into the laboratory sample custody records. The internal laboratory custody form is generated at this point.

All samples and projects entering the laboratory are identified with a job/project number. Individual sample bottles are then identified using the job number and sample counter. The samples are then stored according to the requirements of the analytical protocols (refrigeration) and preservative type.

Preliminary sample receipt notifications are distributed to each department to notify department of sample arrival and facilitate the analysis of parameters with short holding times. Each department has a system of tracking sample analysis throughout their respective departments to ensure protocol holding times are met.

All documentation received with samples is reviewed by the sample custodian at the time of receipt. The project manager then reviews the paperwork and checks off the login review in labnet. If there are any discrepancies noted by the sample custodian, the client is then contacted for resolution.

The specific procedures and requirements for receiving samples are specified in the SOP for sample control - "Sample Processing Methods Performed at Sample Arrival". STL's chain-of-custody record is designed to meet the legal requirements of federal, state and local government agencies and the courts of law. The record covers:

- Labeling of sample bottles, packing the shipping container and transferring the shipping container under seal to the custody of a shipper;
- Outgoing shipping manifests;
- The chain-of-custody form completed by the person(s) breaking the shipping container seal, taking the sample, resealing the shipping container and transferring custody to a shipper;
- Incoming shipping manifests;
- Breaking the shipping container's reseal;
- Storing each labeled sample bottle in a secured area;
- Disposition of each sample to an analyst or technician; and
- The use of the sample in each bottle in a testing procedure appropriate to the intended purpose of the sample.

For each link in this process the records indicate the following:

- The person with custody; and
- The time and date each person accepted or relinquished custody.

STL has implemented the following standard operating procedures with regard to laboratory chain-of-custody:

- Samples are stored in a secure area;
- Non-employee access to the laboratories are controlled through the use of limited access points at each facility. Outside personnel can access the facility either through the front receptionist or the sample receipt area. Other access doors to the laboratory are maintained in a secure manner at all times;

- All visitors to each facility are required to sign-in at the reception area and must be escorted by an STL representative at all times while in the laboratory;

- The designated sample custodian and authorized personnel control access to the sample storage units; and

- Samples remain in secured sample storage until removed for sample preparation or analysis; and

All samples are stored in either the walk-in refrigerator or in a separate locked refrigerator. Samples must be stored at 4 ± 2° C. All unused portions of samples, including empty sample containers, are returned to the secure sample control area.

5.7.2. Sample Identification and Traceability

Each sample container is assigned a unique Sample Identification Number that is cross-referenced to the client identification number such that traceability of test samples is unambiguous and documented. Each sample container is affixed with a sample identification label. Access to samples is controlled and documented, identifying the identity of the sample handler, and date and time of sample access. All unused portions of th sample are returned to the Sample control area.

5.7.3 Subsampling

Taking a representative sub-sample from a container containing a soil or solid matrix is necessary to ensure that the analytical results are representative of the sample collected in the field. The size of the sample container, the quantity of sample fitted within the container, and the homogeneity of the sample need consideration when sub-sampling for sample preparation.

After thoroughly mixing the sample within the sample container or transfer to a wip bag (or other suitable plastic bag), a sub-sample from various quadrants and depths of the sample are taken to acquire the required sample weight. Any non-homogenous looking material is avoided and noted as such within the sample preparation record.

The procedure used for subsampling with the laboratory is outlined in the SOP for Compositing, Homogenization and splitting Environmental Samples.

5.7.4 Sample Preparation

Sample preparation procedures are documented in the laboratory's analytical SOPs.

5.7.5 Sample Disposal

Samples are retained in the STL-Connecticut storage facilities for 30 days after the project report is sent unless prior arrangements have been made with the client. Samples may be held longer or returned to the client per written request. Unused portions of samples found or suspected to be hazardous according to state or federal guidelines may be returned to the client upon completion of the analytical work. All radioactive or dioxin containing samples will be returned to the client.

The STL-Connecticut laboratory has a designated hazardous waste storage area with bermed floors and separate ventilation. This area and satellite accumulation areas are the direct responsibility of the Hazardous Waste Manager (HWM). The HWM routinely inspections each area to ensure regulatory adherence.

Samples designated for disposal are removed from sample control and brought to the hazardous waste storage area. Samples designated for disposal may be returned to clients for disposal, on a case-by-case basis.

The laboratory sample waste to be disposed of is segregated by waste streams. Waste profiles have been generated for the following streams: acid liquid waste, NaOH liquid waste, vials (GC, GC/MS), waste organic solvent and waste pyridine. Other laboratory waste is disposed of through the established compatible waste streams. If no compatible waste stream is available the waste is sent out via lab pack procedure.

A Hazard Waste Minimization Plan has been prepared for the STL-Connecticut facility and is designed to minimize the volume and toxicity of all waste streams being generated whenever possible. This Hazard Waste Minimization Plan is designed to meet or exceed the requirements set forth in 54 FR 25056, June 12, 1989.

Each process that generates waste will be assessed to determine if there are ways to either reduce the volume or toxicity of waste being generated. It is unlikely that most processes will be changed due to the stringent EPA standard operating procedures which must be followed. Strong emphasis will, however, be placed on efficient use of products used to prevent excessive amounts from becoming waste.

5.8. Assuring the Quality of Test Results

5.8.1. Proficiency Testing

STL analyzes Proficiency Test (PT) samples as required for certification and as outlined in the National Environmental Laboratory Accreditation Conference (NELAC). Each STL facility participates in the PT program semi-annually for each area of testing and matrix (e.g. organics, inorganics, microscopy, radiological, microbiological; aqueous and drinking water) for which it is accredited. In addition to the PT program required for NELAC accreditation, STL participates in a number of additional PT programs, as appropriate for the specific facility, such as the Army Corps of Engineers Laboratory Assessment program.

PT samples are handled and tested in the same manner (procedural, equipment, staff) as environmental samples. PT test sample data is archived using the requirements for project and raw data record retention.

Double Blind Performance Evaluation

STL CT also participates in a double blind performance. An external vendor is contracted by the corporate QA Director to submit double blind samples to the STL facility. Both the level of customer service and the accuracy of the test results are assessed objectively by the external contractor, who provides a detailed report to the QA Director and to each of the STL facilities. This is administered as a double blind program in order to assess all facets of STL operations.

5.8.2. Control Samples

Control samples are analyzed with each batch of samples to monitor laboratory performance in terms of accuracy, precision, sensitivity, selectivity, and interferences. Each regulatory program and each method within those programs specify the control samples that are prepared and/or analyzed with a specific batch. There are also a number of QC sample types that monitor field sampling accuracy, precision, representativeness, interferences, and the effect of the matrix on the method performed Note that frequency and criteria of control samples vary with specific regulatory, methodology and project specific criteria.

5.8.2.1 Method Performance Control Samples: Preparation Batch

Sample preparation or pre-treatment is commonly required before analysis. Typical preparation steps include homogenization, grinding, solvent extraction, sonication, acid digestion, distillation, reflux, evaporation, drying and ashing. During these pre-treatment steps, samples are arranged into discreet manageable groups referred to as preparation (prep) batches. Prep batches provide a means to control variability in sample treatment.

Control samples are added to each prep batch to monitor method performance (Table 8) and are processed through the entire analytical procedure with investigative/field samples.

Table 8. Preparation Batch Control Samples

Control Sample Type	Details	
Method Blank (MB)	Use	Monitors for potential contamination introduced during the sample preparation and analytical processes.
	Typical Frequency [1]	1 per batch of ≤ 20 samples per matrix type per sample extraction or preparation method.

Table 8. Preparation Batch Control Samples

Control Sample Type	Details	
	Description	Organics: Laboratory pure water for water samples or a purified solid matrix for soil or solid samples (when available or when requested); solid matrices commonly include sodium sulfate, vendor or agency supplied soil or solid, or purchased sand; these solids may require purification at the laboratory prior to use. Inorganics: Laboratory pure water for both water and soil or sediment samples. ***Volume/weights are selected to approximately equal the typical sample volume/weight used in sample preparation; and final results in a soil/solid batch may be calculated as mg/kg or ug/kg, assuming 100% solids and a weight equivalent to the aliquot used for the corresponding field samples, to facilitate comparison to actual field samples.***
Laboratory Control Sample (LCS)	Use	Measures the accuracy of the method in a blank matrix and assesses method performance independent of potential field sample matrix affects.
	Typical Frequency [1]	1 per batch of ≤ 20 samples per matrix type per sample extraction or preparation method. For multi-analyte methods, the LCS may consist of surrogates in the blank matrix, and or a representative selection of target analytes/internal standards.
	Description	Prepared from a reference source of known concentration and processed through the preparation and analysis steps concurrently with the field samples. Aqueous LCS's may be processed for solid matrices unless a solid LCS is requested; final results may be calculated as mg/kg or ug/kg, assuming 100% solids and a weight equivalent to the aliquot used for the corresponding field samples, to facilitate comparison with the actual field samples.
Known QC Sample	Use	Comply with regulatory requirements; check the accuracy of an analytical procedure; troubleshoot method performance problems; verify an analyst in training's ability to accurately perform a method; to verify the return-to-control after method performance problems; and may also be used as an LCS.
	Typical Frequency [1]	As defined by the client or QAPP.
	Description	Obtained from outside suppliers or agencies; generally require preparation from concentrated materials by dilution into a standard matrix; contain known analytes or compounds; acceptance limits are provided by the vendor.

[1] Denotes an STL required frequency.

Field blanks, equipment blank and trip blanks, when received, are analyzed in the same manner as other field samples. However, a field blank should not be selected for matrix QC,

as it does not provide information on the behavior of the target compounds in the field samples. Usually, the client sample ID will provide information to identify the field blanks with labels such as "FB", "EB", or "TB".

5.8.2.2 Method Performance Control Samples: Matrix

Matrix control samples include sample duplicates (MD), sample matrix spikes (MS), and sample surrogate spikes. These control samples help monitor for potential physical and chemical effects which may interfere with the precision and/or accuracy of the selected analytical method. Since interferences can enhance or mask the presence of target analytes, matrix control samples measure the degree of interference and are used to assist in the interpretation of the analytical results. The laboratory avoids performing matrix QC on known field blank samples, such as trip blanks and rinsates, since these samples are not indicative of the sample matrix.

Table 9. Matrix Control Samples

Control Sample Type	Details	
Matrix Duplicate (MD)	Use	Monitors the effect of site matrix on the precision of the method; and of the reproducibility of laboratory preparation and measurement techniques. **Note:** Precision may also be affected by the degree of homogeneity of the sample, particularly in the case of non-aqueous samples or aqueous samples with particulates. Sample homogeneity and matrix effect should be considered when field samples are used to assess reproducibility. **Note:** A field duplicate, when received, measures Representativeness of sampling and the effect of the site matrix upon precision.
	Typical Frequency [1]	1 per 20 samples per matrix or per SAP/QAPP [2].
	Description	***Performed by analyzing two aliquots of the same field sample independently; analyzed for each associated sample matrix (e.g., when requested by the client or the analytical method).***
Matrix Spike (MS)	Use	Measures the effect of site sample matrix on the accuracy of the method.
	Typical Frequency [1]	1 per 20 samples per matrix or per SAP/QAPP.

Table 9. Matrix Control Samples

Control Sample Type	Details	
	Description	Aliquot of a field sample which is spiked with the analytes or compounds of interest; analyzed for each associated sample matrix (when requested by the client or analytical method). The determination of MS percent recovery (% R) requires an analysis of a fortified sample and a non-fortified sample under the same procedural conditions (e.g., sample volumes, dilutions, procedural conditions, etc..). The concentration determined in the non-fortified sample is subtracted from the fortified sample concentration before determining the %R. The degree of homogeneity of the sample, particularly in the case on non-aqueous samples or samples with particulates, may affect the ability to obtain representative recoveries.
Matrix Spike Duplicate (MSD)	Use	Measures effect of site sample matrix on precision of method.
	Typical Frequency [1]	1 per 20 samples per matrix, when requested by the client or the analytical method, or per SAP/QAPP [2].
	Description	Alternative to sample duplicate. Generally, inorganic protocols specify an MD/MS and organic protocols specify an MS/MSD.
Surrogate Spike	Use	Measures method performance to sample matrix (organics only).
	Typical Frequency [1]	Every QC and analytical sample.
	Description	Compounds similar to the target analytes in structure, composition and chromatography, but not typically found in the environment, are added to each QC and analytical sample, prior to preparation (e.g., extraction). If the surrogates in an analytical batch do not all conform to established control limits, the pattern of conformance in investigative and control samples is examined to determine the presence of matrix interference or the need for corrective action.
Internal Standards	Use	Monitor the qualitative aspect of organic and inorganic analytical measurements.
	Typical Frequency [1]	All organic and ICP/MS methods as required by the analytical method.
	Description	Used to correct for matrix effects and to help troubleshoot variability in analytical response and are assessed after data acquisition. Possible sources of poor internal standard response are sample matrix, poor analytical technique or instrument performance.

[1] Denotes an STL required frequency.
[2] Either an MSD or an MD is required per 20 samples per matrix or per SAP/QAPP.

5.8.3 Statistical Control Limits and Charts

Statistical control limits and control charts are used to establish method performance of a given analysis and to monitor trends of QC results graphically over time. Once a data base

of the laboratory results for a method/matrix/QC analyte combination is established, the acceptability of a given analysis of that QC parameter (and of the analytical batch to which it belongs) can be evaluated in light of the laboratory's normal performance. This is intended to help identify problems before they might affect data. Often, patterns of response that are not at all evident in sets of numbers are very distinct when the same values are viewed as a chronological graph.

Establishment of Limits

The purpose of using statistical control limits is to define, for each analyte in a given method/matrix/QC type combination, a range of expected values. This range encompasses the random variation that occurs normally in the laboratory and allows one to evaluate control samples in that context, rather than according to an arbitrary or external set of values. Limits for accuracy and precision are defined below:

Accuracy

As recoveries of a QC analyte in a given matrix are tabulated over time, a mean value for recovery is established, as is the standard deviation (s) of those recoveries. If the analysis is in statistical control (e.g., if the set of QC recoveries over time show random variation about the mean) approximately 99.7% of all recoveries for that QC will fall within three standard deviations (3s) of the mean. Thus, assuming that the mean itself is an acceptable level of recovery, the values corresponding to 3s above and 3s below the mean are defined as the Control Limits. Any single recovery outside these values is assumed to have resulted from some circumstance other than normal variation and shall be investigated.

Roughly 95% of points should fall within 2s of the mean. The values +2s and -2s are the Warning Limits. Any normal result has approximately a 1/20 chance of being between 2s and 3s from the mean, so a result in this region doesn't necessarily warrant corrective action, but attention should be paid to such points.

Precision

Precision is used to indicate matrix variability so that appropriate decisions can be made by the client when repeated analyses vary significantly. The coefficient of variation, expressed as a percentage (e.g., the %RSD) for the data set used to calculate accuracy control limits defines the control limit for precision. Duplicate analyses of the QC samples, such as duplicates or MS/MSD, should have an RPD less than or equal to this established precision control limit to be considered free of matrix interferences.

The laboratory calculates statistical control limits on an annual basis, or more frequently if change have been made to the analytical process which affects the chemistry of the method. Such limits are available on a project or QAPP-specific basis.

In the case where laboratory generated limits do not meet the requirements of a specific project or regulation then the project and regulatory limits shall supersede the laboratory defined limits.

5.8.4 Calibration

Calibration protocols are method specific and defined in STL facility method SOPs.

- Instrument Calibration Procedures

The proper calibration of instrumentation and equipment is a key element in the quality of the analysis done by the laboratory. Each type of instrumentation and each EPA approved method has specific requirements for the calibration procedures, depending on the analytes of interest and the medium of the sample.

Table 10 lists in tabular form the general procedures which are followed by STL Connecticut. The calibration protocols meet or exceed the minimum method criteria requirements. Exact details regarding calibration for each method are outlined in the analytical SOPs. If a method calibration requirement, outlined in a project specific QA Plan, is more stringent than those listed in the Quality Assurance Plan, the more stringent will be followed in each case.

Documentation and records on calibrations are maintained in instrument logs and also with the data sets of the samples which are analyzed and related to them. In addition, laboratory department managers monitor the results of the calibration program to ensure the proper implementation at the analyst level.

TABLE 10 INSTRUMENT CALIBRATION SUMMARY

Analysis	Cal. Type	# Standards	Type of curve	Acceptance/rejection criteria	Frequency
GC Pesticides Herbicides OP pesticides GRO/DRO	Initial Continuing	5 concentration levels 1 standard (mid)	Linear	≤ 20% RSD $r^2 \leq 0.99$ +/- 15% Difference	continuing calibration fails every 12 hrs or 20 samples
GC/MS quadrupole	Initial Continuing	5 concentration levels; tuning with BFB/DFTPP 1 standard; tuning with BFB/DFTPP	Linear; tuned to manufacturer's specifications	≤ 30% RSD $r^2 \leq 0.99$ +/- 20% Diff	continuing calibration failure Every 12 hours
ICP	Initially Daily Continuing	5 concentration levels 2 levels 1 standard	Linear	According to instrument manufacture's instructions	Quarterly Every 10 samples
Lachat Analysis	Initially, Daily Continuing	5 concentration levels 1 standard	Linear	<.995 coefficient of variation $r^2 \leq 0.99$	continuing calibration failure Every 10 samples
pH Meters	Initially and daily Continuing	3 standards 1 standard	Linear	+/- 95% of value $r^2 < 0.99$	Daily Every 10 samples
Spectrophoto-meter	Initially and daily Continuing	5 concentration levels plus set %T with no cuvette in holder 1 standard	Linear	<.995 coefficient of variation $r^2 \leq 0.99$ +/- 95% of value	Daily Every 10 samples
Infrared Spectrophoto-meter	Initially and monthly Continuing	5 concentration levels 1 level	Linear	<.995 coefficient of variation $r^2 \leq 0.99$ +/- 95% of value	Daily Every 10 samples
Conductivity meter	Daily Continuing	3 concentration levels 3 concentration levels	Linear	<.995 coefficient of variation $r^2 \leq 0.99$ +/- 95% of value	Daily Every 10 samples

TABLE 10 INSTRUMENT CALIBRATION SUMMARY

Turbidimeter	Daily Continuing	3 concentration levels 3 concentration levels	Linear	<.995 coefficient of variation $r^2 \leq 0.99$ +/- 95% of value	Daily Every 10 samples
Balance	Daily	3 levels Class "S" weights	Point		Check single weight upon use

5.8.5 Glassware cleaning

STL Connecticut employs rigorous cleaning procedures for all glassware used within the laboratory. Glassware washing procedures are to be posted at all relevant stations. Detailed procedures are outlined in SOP for Glassware Washing.

5.8.6 Procedure for Permitting Departures from Documented Procedure

Where a departure from a documented SOP, test method, or policy is determined to be or perceived to be necessary, or is unavoidable, the departure is documented on a non-conformance summary or in a format specifically designed for that purpose. The departure from procedure must be authorized by the QA Manager, the Laboratory Director or the department Manager. Where a departure affects a specific client project, the PM must be informed of the deviation. In some instances, it is appropriate to inform the client before permitting a departure. Any such occurrence is documented in the cover letter and/or project narrative.

5.8.7 Development of QC Criteria, Non-Specified in Method/Regulation

Where a method or regulation does not specify acceptance and/or rejection criteria, the laboratory must examine the data user's needs and the demonstrated sensitivity, accuracy and precision of the available test methods in determining appropriate QC criteria.

Data users often need the laboratory's best possible sensitivity, accuracy, and precision using a routinely offered test method, or are unsure of their objectives for the data. For routine test methods that are offered as part of STL's standard services, the laboratory bases the QC criteria on statistical information such as determination of sensitivity, historical accuracy and precision data, and method verification data. The method SOP includes QC criteria for ongoing demonstration that the established criteria are met (e.g., acceptable LCS accuracy ranges, precision requirements, method blank requirements, initial and continuing calibration criteria, etc..).

In some cases, a routine test method may be far more stringent than a specific data user's needs for a project. The laboratory may either use the routinely offered test method, or may opt to develop an alternate test method based on the data user's objectives for sensitivity, accuracy, and precision. In this case, it can be appropriate to base the QC criteria on the data user's objectives, and demonstrate through method verification and ongoing QC samples that these objectives are met.

For example, a client may require that the laboratory to test for a single analyte with specific DQOs for sensitivity, accuracy, and precision as follows: Reporting Limit of 10 ppm, Accuracy ±25%, and RSD of <30%. The laboratory may opt to develop a method that meets these criteria and document through the Method Blank results, MDL study, and LCS results that the method satisfies those objectives. In this case, both the method and the embedded QC criteria have been based on the client's DQOs.

In some cases, the data user needs more stringent sensitivity, accuracy, and/or precision than the laboratory can provide using a routine test method. In this case, it is appropriate that the laboratory provide documentation of the sensitivity, accuracy, and precision obtainable to the data user and let the data user determine whether to use the best available method offered by the laboratory, or determine whether method development or further research is required.

5.9. Project Reports

5.9.1. General

Laboratory customers have a wide variety of analytical needs. In order to meet these varied requirements, the laboratory offer several levels of data reporting options ranging from very simple format to an extreme level of documentation. Table 11 presents the contents of various levels of reports offered by the laboratory. Custom reporting beyond those listed is usually available but may require additional cost. The information provided in Table 11 is a summary only. In some cases, individual methods may not include the indicated items. For example, in metals graphite furnace analysis an ICP interference check would not be included since it is inappropriate for that method.

The criteria described in Section 5.9.2 apply to all Project Reports that are generated under NELAC requirements. The criteria described in Section 5.9.3 and 5.9.4 apply to all Project Reports.

5.9.2. Project Report Content

- Title
- Laboratory name, address, telephone number, contact person
- Unique Laboratory Project Number
- Total Number of Pages (report must be paginated)

- Name and address of Client
- Client Project Name (if applicable)
- Laboratory Sample Identification
- Client Sample Identification
- Matrix and/or Description of Sample
- Dates: Sample Receipt, Collection, Preparation and/or Analysis Date
- Definition of Data Qualifiers
- Reporting Units
- Test Method

The following are required where applicable to the specific test method or matrix:

- Solid Samples: Indicate Dry or Wet Weight
- Whole Effluent Toxicity: Statistical package used
- If holding time $\leq$ 48 hours, Sample Collection, Preparation and/or Analysis Time
- Indication by flagging where results are reported below the quantitation limit.

5.9.3. Project Narrative

A Project Narrative and/or Cover Letter is included with each project report and at a minimum includes an explanation of any and all of the following occurrences:

- Non-conformances
- "Compromised" sample receipt (see Section 4.7.1)
- Method Deviations
- QC criteria failures

Project Release

The Project Manager or his/her designee authorizes the release of the project report with a signature. The Laboratory Director or his/her designee authorizes the release of the project report narrative with a signature as required by the data reporting deliverables.

Where amendments to project reports are required after issue, these shall be in the form of a separate document and/or electronic data deliverable. The revised report is clearly identified as revised with the date of revision and the initials of the person making the revision. Specific pages of a project report may be revised using the above procedure with an accompanying cover letter indicating the page numbers of the project revised. The original version of the project report must be kept intact and the revisions and cover letter included in the project files.

5.9.4. Subcontractor Test Results

Project reports from external subcontract shall not be altered, and shall be included in original form in the final project report provided by STL. Data from subcontractors' reports may be added to an STL electronic deliverable.

Subcontracted data shall be clearly identified as such, and the name, address, and telephone number for the laboratory performing the test is included in the project report. If the report is being generated under NELAC requirements, all information outlined in Section 5.9.2 are required for both the originating laboratory and the subcontracting laboratory.

Data subcontracted within STL may be reported on the originating laboratory's report forms provided the following mandatory requirements are met:

- The name, address, and telephone number of the facility are provided.
- Analytical results produced by the STL intra-company subcontractor are clearly identified as being produced by the subcontractor facility.
- The intra-company subcontractor's original report, including the chain of custody is retained by the originating laboratory.
- Proof of certification is retained by the originating laboratory.
- All information as outlined in Section 5.9.2 is included in the final report where the report is required to be compliant with NELAC, for both the originating and subcontracting laboratory.

5.9.5. Electronic Data Deliverables

Electronic Data Deliverables (EDD) are routinely offered as part of STL's services. STL offers a variety of EDD formats including Environmental Restoration Information Management System (ERPIMS), New Agency Standard (NAS), Format A, Excel, Dbase, GISKEY, and Text Files.

EDD specifications are submitted to the IT department by the PM for review and undergo the contract review process in Section 4.4.1. Once the facility has committed to providing diskettes in a specific format, the coding of the format is performed. This coding is documented and validated. The validation of the code is retained as a QC record.

EDDs are subject to a review to ensure their accuracy and completeness. If EDD generation is automated, review may be reduced to periodic screening if the laboratory demonstrates that it can routinely generate that EDD without errors. Any revisions to the EDD format are reviewed until it is demonstrated that it can routinely be generated without errors.

5.9.6. Project Report Format

STL offers a wide range of project reporting formats, including EDDs, short report formats, and complete data deliverable packages modeled on the Contract Laboratory Protocol (CLP) guidelines. Regardless of the level of reporting, all projects undergo the same levels of review as described in Section 5.3.6.

Table 11 Report Content Options

	Data reporting Options			
Wet Chemistry	Level 1	Level 2	Level 3 *	Level 4 (CLP)
Case narrative	Yes	Yes	Yes	Yes
Sample Results	Result forms	Result forms	Result forms	Result forms
Method Blank	Yes	Yes	Yes	Yes
External Chain of Custody	Yes	Yes	Yes	Yes
Internal Chain of Custody	Yes	Yes	Yes	Yes
Duplicate	-	Yes	Yes	Yes
Matrix Spike	-	Yes	Yes	Yes
Initial Calibration Verification (ICV)	-	-	Yes	Yes
Continuing Calibration Verification (CCV)	-	-	Yes	Yes
Laboratory Control Sample (LCS)	-	-	Yes	Yes
EPA Forms 1-14	-	-	Yes	Yes
Metals	Level 1	Level 2	Level 3 *	Level 4 (CLP)
Case Narrative	Yes	Yes	Yes	Yes
Sample Results	Result forms	Result forms	Result forms	Result forms
Method Blank	Yes	Yes	Yes	Yes
External Chain of Custody	Yes	Yes	Yes	Yes
Internal Chain of Custody	Yes	Yes	Yes	Yes
Duplicate	-	Yes	Yes	Yes
Matrix Spike	-	Yes	Yes	Yes
Initial Calibration Verification (ICV)	-	-	Yes	Yes
Continuing Calibration Verification (CCV)	-	-	Yes	Yes
Laboratory Control Sample (LCS)	-	-	Yes	Yes
ICP Interference Check	-	-	Yes	Yes
ICP Linear Range	-	-	Yes	Yes
ICP Post Spike	-	-	Yes	Yes
EPA Forms 1-14	-	-	Yes	Yes
Organics	Level 1	Level 2	Level 3*	Level 4 (CLP)
Case Narrative	Yes	Yes	Yes	Yes
Sample Results	Result forms	Result forms	Result forms	Result forms
Method Blank	Yes	Yes	Yes	Yes
External Chain of Custody	Yes	Yes	Yes	Yes
Internal Chain of Custody	Yes	Yes	Yes	Yes
Matrix Spike	-	Yes	Yes	Yes
Matrix Spike Duplicate	-	Yes	Yes	Yes
Laboratory Control Sample (LCS)	-	-	Yes	Yes
Surrogate Recovery Information	-	Yes	Yes	Yes
Tuning Data (GC/MS only)	-	-	Yes	Yes
Initial Calibration Information	-	-	Yes	Yes
Continuing Calibration Information	-	-	Yes	Yes
Run Sequence Logs	-	-	Client Specific	Client Specific
Sample Preparation Logs	-	-	Yes	Yes
Chromatograms and Mass Spectra	-	-	-	Yes
EPA Forms 1-8	-	-	Yes	Yes

* Raw backup data not provided

Table 12 Correlation of QMP Sections with NELAC Quality Manual Requirements

NELAC Chapter 5.5.2 Quality Manual	Quality Management Plan Sections
a. Quality policy statement, including objectives and commitments	1.2 Quality Assurance Policy 4.2.1 Objectives of the Quality System
b. Organization and management structure	4.1 Organization and Management
c. Relationship between management, technical operations, support services and the quality systems	4.1.2 Roles and Responsibilities 4.2 Quality System
d. Records retention procedures; document control procedures	4.3 Document Control 4.12.2 Record Retention
e. Job descriptions of key staff and references to job descriptions of other staff	4.1.2 Roles and Responsibilities
f. Identification of laboratory approved signatories	4.1 Organization and Management
g. Procedures for achieving traceability of measurements	5.5 Measurement Traceability
h. List of all test methods under which the laboratory performs its accredited testing	5.3.1 Method Selection
i. Mechanisms for assuring the laboratory reviews all new work to ensure that it has the appropriate facilities and resources before commencing such work	4.4.2 Project-Specific Quality Planning
j. Reference to the calibration and/or verification test procedures used	5.4.3 Equipment Verification and Calibration
k. Procedures for handling submitted samples	4.7.1 Sample Acceptance Policy 5.7 Sample Handling, Transport and Storage
l. Reference to the major equipment and reference measurement standards used as well as the facilities and services used in conducting tests	5.2 Laboratory Facilities 5.4.2 Equipment Maintenance 5.4.3 Equipment Verification and Calibration
m. Reference to procedures for calibration, verification and maintenance of equipment	5.4.2 Equipment Maintenance 5.4.3 Equipment Verification and Calibration
n. Reference to verification practices including interlaboratory comparisons, proficiency testing programs, use of reference materials and internal QC schemes	5.8.1 Proficiency Testing 5.8.2 Control Samples
o. Procedures for feedback and corrective action whenever testing discrepancies are detected, or departures from documented procedures occur	4.9 Control of Non-Conformances 4.10 Corrective Action 4.11 Preventive Action 5.8.6 Permitting Departures from Documented Procedures

Table 12 Correlation of QMP Sections with NELAC Quality Manual Requirements

NELAC Chapter 5.5 Quality Manual	Quality Management Plan Sections
p. Laboratory management arrangements for exceptionally permitting departures from documented policies and procedures	4.4.2 Project-Specific Quality Planning 5.8.6 Permitting Departures from Documented Procedures
q. Procedures for dealing with complaints	4.8 Complaints
r. Procedures for protecting confidentiality and proprietary rights	4.7.2 Client Confidentiality and Proprietary Rights
s. Procedures for audits and data review	4.13 Internal Audits 5.3.6 Data Reduction and Review
t. Process/procedures for establishing that personnel are adequately experienced in duties they are expected to carry out and are receiving any needed training	5.1.2 Training
u. Ethics policy statement developed by the laboratory and training personnel in their ethical & legal responsibilities	5.1.3 Ethics Policy
v. Reference to procedures for reporting analytical results	5.3.6 Data Reduction & Review 5.9 Project Reports
w. Table of contents, listing reference, glossaries and appendices	TOC Table of Contents Appendix I: List of Cited SOPs and Misc. Laboratory Information

APPENDIX, Section 1

PROFESSIONAL PROFILES
OF
KEY PERSONNEL

The following professional profiles are presented alphabetically and represent the key quality assurance and laboratory management personnel for the network organization. Additional professional profiles are available for review during a site visit to any of our laboratory facilities.

Qualifications Summary

Mr. Frick has 20 years of experience in environmental and analytical chemistry that includes broad management and leadership experience. He is responsible for the overall direction of the laboratory and has extensive knowledge in environmental analytical chemistry and business management.

Professional Experience

Laboratory Director – 2004 to present

STL Connecticut—Shelton, CT
Mr. Frick directs the growth and development of the laboratory, including strategic plan development and implementation. He is responsible for all phases of operation within the Shelton, Connecticut facility, including; the technical and administrative management of the laboratory. The functional groups of the facility include Sample Control, Sample Preparation, Organic Chemistry, Metals, Wet Chemistry, Project Management, QA/QC and Information Technology, Report Generation, Data Management, and Human Resources. His other responsibilities include adherence to budget, staff development and control, quality assurance and quality control, scheduling, client support/liaison, as well as profit and loss responsibility for the facility. In addition, he is responsible for oversight of the Environmental Health and Safety Program, and was instrumental in the set up of the mixed waste license for the Connecticut laboratory.

Chromatography Product Manager
Supelco Incorporated—Bellefonte, PA—1998 to 2004

Laboratory Director
American Environmental Network—Schaumburg, IL—1996 to 1998

Laboratory Manager
Industrial Environmental Analysts—Schaumburg, IL—1995 to 1996

Group Leader
Industrial Environmental Analysts—Monroe, CT—1988 to 1995

Chemist
Environmental Analysis Corporation—Norwalk, CT—1984 to 1988

Education

- BS in Chemistry – University of Connecticut—Storrs, CT—1984
- MBA in Finance – University of Bridgeport—Bridgeport, CT—1993

Professional Training

- Environmental Laboratory Management —John H. Taylor, ACS Course
- Performance Management Workshop—Cynthia. Barnet, HR Consultant
- Interview Skills Workshop—Cynthia. Barnet, HR Consultant
- Frontline Leadership Development —William Frackler, Ingoldsby, Inc.
- 40 Hour OSHA Training —Lynn Sherman, YWC Midwest
- Radiation Safety Program Training —Radiation Safety Associates, Inc.
- Theory of Constraint Training—Sigma-Aldrich, Inc.
- Strategic Sales Management —Sigma-Aldrich, Inc.
- Corporate Finance Workshops—Sigma-Aldrich, Inc.

Professional Affiliations

- American Chemical Society

Qualifications Summary

Mr. Hobart has 14 years of experience in the environmental laboratory industry that includes management of the client services and sample control departments, project management responsibilities, and experience performing analyses. He possesses excellent presentation skills, communication skills, and writing proficiency. Paul is adept at motivating his team to achieve goals and objectives.

Professional Experience

Client Services Manager – 1999 to present

STL Connecticut – Shelton, CT
Mr. Hobart's responsibilities include the administrative management of the project management, sample control and courier staff of the facility. He coordinates the project management staff with laboratory operations to ensure that projects are executed properly and effectively. He is responsible for generating and tracking price quotations, and for providing detailed forecasting and project schedules to the laboratory director. Additionally, Paul is responsible for the management of key client accounts.

Project Manager – 1996 - 1999
STL Connecticut – Whippany NJ and Shelton, CT

Project Manager – 1993 -1996
Quanterra, Inc. – Edison, NJ and Pittsburgh, PA

Analyst/Project Manager – 1990 - 1993
Analytica, Inc. – Golden, CO

Analyst – 1980 - 1990
Ledoux & Co. – Teaneck, NJ

Education

- BA in Literature – Ramapo College of NJ--Mahwah, NJ--1986

Professional Training

- Seminar- Conference on Customer Service, 2000
- Principles of Mass Spectrometry , 1991

Qualifications Summary

Ms. Culik has over 22 years experience in the environmental laboratory field. Experience includes analysis of drinking water utilizing a variety of organic and inorganic methods and Gas chromatography chemist on environmental samples. Experience also includes supervisor of the Gas Chromatography department responsible for analysis of environmental samples for pesticides/PCB's according to EPA/NYSDEC CLP Protocols, SW846 Methods and EPA "600" Series Methods.

Professional Experience

Quality Assurance Manager – 1991 to present

STL Connecticut (formerly IEA Incorporated)--Shelton, CT--1991 to Present

Ms Culik is responsible for developing and implementing the laboratory's quality system and laboratory quality manual to ensure compliance with STL policies for quality assurance and control (QA/QC). She administrates the laboratory certification and accreditation programs and responds to external audits. She is responsible for the assessment of operations through internal audits, management review and proficiency testing and for the oversight of preventative and corrective actions. Additional responsibilities include document control and archival of laboratory records. In addition, she prepares and submits monthly reports to corporate management, assists in reviewing project QA plans and serves as a laboratory/client support liaison.

Ms. Culik's responsibilities also include maintaining the laboratory's LIMS reporting system.

Gas Chromatography Group Leader

IEA Incorporated –Monroe, CT – 1986 to 1991

Chemist

York Laboratories – Monroe, CT – 1984 to 1986

Laboratory Analyst

American Waterworks Service Company – 1981 to 1984

Lab Technician

Suffolk County Water Authority 1978 to 1981

Lab Technician

Hooker Chemicals & Plastics – 1976 to 1978

Education

- AAS – Medical Technology, S.U.N.Y. at Alfred - Alfred, New York, 1976

Professional Training

- Two day seminar on Environmental Laboratory Management
  John H. Taylor, Analytical Technology.

- Performance Management Workshop
  One day seminar
  Cynthia Barnet, Human Resources Consultant

- Interview Skills Workshop
  One day seminar
  Cynthia Barnet, Human Resources Consultant

- Leadership Development Workshop
  Four day workshop
  William Frackler, Ingoldsby, Inc.

- Mass Spectral Data Interpretation
  One day seminar
  Dr. Frank Rutecek, Cornell University

- Introduction to Analytical Separations
  Four day seminar
  Dr. Dhea Habboush, Sacred Heart University

- ASQC Course
  Auditing of Quality Systems

- ASQC Course
  Introduction to SPC

- Six Sigma Green belt training

Professional Affiliations

Qualifications Summary

Mr. Helfrich has 15 years of experience in the environmental laboratory industry that includes extensive management/leadership experience with full profit and loss responsibility. He has functioned in numerous analytical roles including: Sample prep, furnace analysis, ICP analysis and hazardous waste coordinator. Experienced in data review, and familiar with EPA and NYSDEC protocols. He possesses excellent communication skills. Mr. Helfrich has an exceptional ability to effectively handle multiple projects and tasks. He is action-oriented, with a can-do attitude, a fast learner who has the capacity to adapt quickly to new situations.

Professional Experience

Inorganic Manager – 1998 to present

STL Connecticut - 1998 to Present
Mr. Helfrichs' responsibilities include the technical management of the inorganic analytical laboratory including approximately 10 chemists. The functional groups of the facility include Sample Preparation, Metals, General Inorganic Chemistry, and Report Generation. His other responsibilities include staff development and control, quality assurance and quality control of the inorganic departments, scheduling, as well as profit and loss responsibility for the Inorganic department. In addition, he is responsible for oversight of Waste Management and is part of the Environmental Health and Safety Program team.

Metals Manager
IEA INC – Monroe CT, 1992 to 1998

Metals Chemist
IEA INC – Monroe CT, 1989-1992

Education

- BS in Biology - St. Anselm College, Manchester NH, 1982
- MS in Chemistry - Quinnipiac College, Hamden CT, 1986
- MBA in Finance – Sacred Heart University, Fairfield CT, 1990

Qualifications Summary

Mrs. Maturo has over 19 years of experience in the environmental laboratory industry that includes extensive management/leadership experience.

She started in the Organic Extractions department as a lab technician and worked her way up to supervisor. From there, she transferred to the Gas Chromatography Department in order to expand her knowledge by learning more about the analysis of environmental samples. She is now Group Leader of the GC Department and is experienced in Pesticide and PCB residue analysis as well as a variety of other GC parameters.

Professional Experience

Gas Chromatography Group Leader-1991 to present

STL Connecticut (formery IEA, Inc.)-1991 to present
Mrs. Maturo is Supervisor of the Gas Chromatography Department. She is responsible for the analysis of environmental samples for Organochlorine and Organophosphorous pesticides, PCB's, Diesel Range Organics, and CT. Extractable Petroleum Hydrocarbons according to EPA/NYSDEC CLP Protocols, SW846 Methods and EPA "600" Series Methods.

Other duties include hiring personnel, ordering supplies, tracking samples thru the department, updating SOP's and final data package review.

GC- Senior Lab Technician

STL Connecticut (formerly IEA, formerly AEN)-1988 to 1991
Ms. Maturo's primary duties were the operation of gas chromatographs for a variety of analyses. She has experience in pesticide/PCB determinations as well as other miscellaneous analytes.

Other duties included sample tracking, data entry, report generation, and preparation of standards used for instrument calibration.

Extractions Technician/Extractions Group Leader

STL Connecticut (formerly YWC)-1988 to 1991
Over this time period Ms. Maturo was a member of the extractions group and supervised the operations and staff for the last year. Her duties were primarily extraction of environmental samples for semi-volatile organics, pesticides/PCB's and herbicides.
Other duties included preparation of standard reagents used in the extraction procedures, writing SOP's, and screening of sample extracts by gas chromatography.

Education

- BS in Biology – Southern Connecticut State University—New Haven, CT--1985

Professional Training

- Six Sigma Yellow Belt Management Training, 2003
- HAZWOPER Refresher-Field Safety Corp., 2000
- Perkin Elmer TurboChrom C/S Fundamentals Training Course, 1999
- Gas Chromatography Open Forum-Hewlett Packard, 1999
- "Dealing with Unacceptable Employee Behavior"- SkillPath Seminar, 1999
- Frontline Leadership-Zenger Miller, date Unknown
- 24 Hour Technician Course for Hazardous Waste Operations and Emergency Response-Field Safety Corp., 1999
- RCRA Compliant Hazardous Waste Handler Program-Field Safety Corp., 1999
- "Coaching and Teambuilding Skills for Managers and Supevisors"-SkillPath Seminar, date unknown
- Gas Chromatography Workshop-Env. Research Institute, UCONN., 1995
- "Basic Supervision"-SkillPath Seminar, 1988

Professional Affiliations

Qualifications Summary

Mr. Decker has 18 years of experience in the environmental laboratory industry that includes supervisory and leadership experience. He possesses extensive knowledge in volatile organic analyses and is a resource to the laboratory, project management and customers. He is an action-oriented manager with a can-do attitude; who has the capacity to adapt quickly to new situations.

Professional Experience

GC/MS Manager – 1992 to present

Mr. Decker's responsibilities include the management and overall production of the volatile organics laboratory including 3 employees and 7 analytical systems. Methodologies include SW-846, CLP, EPA 500 and 600 series methods. Other responsibilities include work scheduling, data review, method development and compliance and employee training. He is also proficient in the maintenance and troubleshooting of all analytical systems in his laboratory. In addition, he ensures conformance to STL Environmental Health and Safety and manages costs and expenditures incurred by his laboratory.

GC/MS Section Leader
Industrial Environmental Analysts—Monroe, CT—1991 to 1992

GC/MS Analyst
Industrial Environmental Analysts—Monroe, CT—1986 to 1991

Education

- BA in Biology – Franklin Pierce College—Rindge, NH – 1982

Professional Training

- Mass Spectroscopy Data Interpretation – Dr. Frank Turecek
- GC/MS Software Training – Mark Hartwick
- HP User I Course – Hewlett-Packard
-

Professional Affiliations

American Chemical Society

Qualifications Summary

Mrs. May has 14 years of experience in the environmental laboratory industry that includes extensive experience in all phases of laboratory operations in the organic departments. She began as an analyst for GC volatile organics and quickly became responsible for the analysis of GC/MS volatiles, GC Pesticide/PCB and Herbicides, as well as GC/MS semi-volatiles. She also learned the extractions of all these analyses. She then changed companies to work in GC Pesticide/PCB/Herbicide/DRO analysis and reporting for SW-846 and CLP protocols. She became the Senior analyst in the department and was responsible for any troubleshooting issues with the instruments as well as system manager for the acquisition/analysis software system. She was then promoted to GC/MS Semivolatile Group leader and is now responsible for the day to day operation of the GC/MS Semi-Volatiles group.

Professional Experience

GC/MS Semi-volatile Group Leader – June 1, 2004 to present

STL Connecticut--Shelton, CT—June 1, 2004 to Present
Mrs. May's responsibilities include the supervision of 2 analyst's, sample tracking through the department, the analysis of semi-volatile extracts, target and non-target compound identification, instrument troubleshooting and maintenance, the reporting of data, and the final review of data packages. She provides guidance to staff to ensure that project specific data quality objectives are met. She ensures that the SOP's are updated and that the department is meeting protocol requirements.

GC Analyst II to IV/Reporting

STL Connecticut--Shelton, CT—April 1996 to June 2004

Responsiblities included data reporting as well as analysis of Pesticides, PCB's, Herbicides, CTETPH, DRO's, and Fingerprint Analysis. Responsible for troubleshooting and maintenance of all instrumentation as well as method development. She was the system manager for the Perkin Elmer Turbochrom software system. She perfomed data review of data packages.

GC/MS Semivolatile and Volatile analyst

Averill Environmental Laboratory—Plainville, CT--1993 to 1996

Responsible for the analysis and reporting of volatile and semi-volatile samples using SW-846 and drinking water methodologies. Responsible for the extraction of pesticides, PCB's, semi-volatile and TPH extracts.

GC Analyst

Averill Environmental Laboratory—Plainville, CT--1990 to 1996

Responsible for the analysis and reporting of Volatile, Pesticide, PCB, and Herbicide samples using SW-846 and drinking water methodologies.

Education

- BS in Renewable Natural Resources-Cum laude – University of Connecticut—Storrs, CT–1990

Professional Training

- Capillary Chromatography Training - 1996
- Turbochrom Client/Server System Manager – 2001
- Comprehensive Environmental GC Training - 2001
- RCRA Compliant Hazardous Waste Handler Program – 1999

Qualifications Summary

Ms. Haas has 7 years of experience in the environmental laboratory industry that includes management/leadership experience. Ms. Haas is responsible for the overall operations of the classical chemistry department. These responsibilities include but are not limited to meeting client satisfaction goals, managing the human resources within the department, and ensuring health and safety and quality assurance plan compliance. Ms. Haas serves as a technical resource to department employees, as well as project managers, sales personnel, and clients. She makes recommendations to laboratory management in regard to process improvements.

Professional Experience

Department Manager – Classical Chemistry – 2001 to present

STL Connecticut, Shelton, CT--2001 to Present
Ms. Haas' responsibilities include:

- Coordinating work projects with project managers to appropriately schedule laboratory workload to meet client requirements.
- Prioritizing samples for analysis to ensure that OTD and TAT requirements are met.
- Determining client-specific requirements and testing methodology; communicating requirements to analysts.
- Scheduling employees in regard to workload and backlog to improve efficiency.
- Supervising supervisors to maximize productivity and ensure appropriate testing procedures are used n compliance with QA and SOP requirements.
- Preparing and analyzing samples for analysis based on method requirements.
- Uploading data files to reporting system.
- Reviewing data produced in assigned department and authorizes its release.
- Communicating department issues and providing status reports to Laboratory Director and Projects Managers.
- Recommending process improvements to improve efficiency.
- Partnering with laboratory management to evaluate new work opportunities and plan implementation.

Classical Chemistry Laboratory Analyst/Data Manager

STL Connecticut, Shelton, CT--1997 to 2001

- Analyzed water and soil matrices using Standard Operation Procedures specific to the classical chemistry department.
- Performed tests such as total suspended and dissolved solids, pH, alkalinity, oil and grease, and hexavalent chromium using colorimetric, gravimetric, instrumental, and titrametric methods.
- Oversaw quality control of department.
- Prepared and reviewed client reports using raw data.
- Supervised data management staff.

Veterinary Technician
Mobile Veterinary Clinic, Trumbull, CT--1994-1997

- Performed diagnostic tests and procedures, such as radiographs and blood collection.
- Administered medical treatments.
- Provided surgical assistance and nursing care.
- Supervised kennel workers.
- Educated clients.

Campus Organizer
NJ Public Interest Research Group (NJPIRG), New Brunswick, NJ--1990-1993

- Organized student activities in NJPIRG chapter at Rutgers University.
- Created and implemented environmental programs, such as educating grade-school children about recycling.
- Lobbied for environmental legislation.
- Managed 100 student interns and volunteers.
- Developed relations with administration and faculty.

Education

➢ BS in Biology – Rutgers University—New Brunswick, NJ --1990

Personnel Resume

Johanna L. Dubauskas

Qualifications Summary

Ms. Dubauskas has 24 years of experience in the environmental industry that includes extensive knowledge of laboratory, hazardous waste treatment and project management skills. She possesses excellent organizational and communication ability. Her enthusiasm for the highest achievable level of quality and customer service is apparent. Johanna has an exceptional capability to effectively handle multiple projects and tasks.

Professional Experience

Senior Project Manager – 1991 to present

STL Connecticut – Shelton, CT
Ms. Dubauskas' responsibilities include assisting clients in solving problems, answering client inquiries, discussing technical issues and managing clients through sampling programs with guidance on proper protocols. She is also responsible for scheduling sample pickups, coordinating incoming work within the laboratory, preparing written price quotations and invoicing. In addition, she assists Account Executives on sales calls and in project kick-off meetings.

Client Service Representative – 1987 to 1991
York Labs – Monroe, CT

Inside Sales Representative – 1986 to 1987
The Rockbestos Company – New Haven, CT

Chemical Buyer – 1985 to 1986
Pfaltz & Bauer – Waterbury, CT

Lab Technician – 1984 to 1985
Cecos Treatment Corporation – Bristol, CT

Research and Development Chemist –1983 to 1985
American Chemical and Refining, Inc. – Waterbury, CT

Chemist – 1980 to 1983
Environmental Waste Removal, Inc. – Waterbury, CT

Education

- BA in Biology – Western Connecticut State University – Danbury, CT - 1979

Professional Training

- Certificate Program of Environmental Science – 1985
- Customer Service Seminar - 2000

Qualifications Summary

Mrs. Duhancik has 6 years of experience in the environmental laboratory industry that includes project management and volatile organic compound GC/MS analysis experience. She possesses excellent communication and organizational skills. Jill has a passion for the highest achievable level of quality and customer service. She has an exceptional ability to effectively handle multiple projects and tasks. She is an action-oriented individual with a can-do attitude; a fast learner who has the capacity to adapt quickly to new situations. Jill is also adept at motivating a team to achieve goals and objectives.

Professional Experience

Project Manager – 2002 to present

STL Connecticut -Shelton, CT
Mrs. Duhancik's responsibilities include the coordination and management of customer's projects through all phases of laboratory operations, ensuring fulfillment of Severn Trent Laboratories commitments to client requirements, error-free work, and on-time delivery. She maintains communications with clients and Account Executives and serves as a liaison between clients and laboratory operations to meet client's needs. Mrs. Duhancik works closely with business unit personnel to manage quotations and change orders for existing scopes of work. She monitors compliance with industry regulations, contractual agreements, program management processes, and program specifications. She works towards achieving goals for revenue, profit, and KRI's through the effective utilization of laboratory capacity and definition of customer requirements.

VOA Analyst – 1998-2002
STL Connecticut – Shelton, CT

Waitress – 1996-1998
Olive Garden – Orange, CT

Education

- BS in Environmental Science – Saint Joseph College – West Hartford, CT -1998
- BS in Biology - Saint Joseph College – West Hartford, CT -1998

Qualifications Summary

Mr. Goodman has 3 years of experience in the environmental laboratory industry that includes Semivolatiles extractions and GC/MS analysis and management positions. He possesses excellent communication and writing skills. He has a passion for the highest achievable level of quality and customer service and the ability to effectively handle multiple projects and tasks. He is an action-oriented member of STL-CT with a can-do attitude; a fast learner who has the capacity to adapt quickly to new situations. He is also adept at motivating a team to achieve goals and objectives.

Professional Experience

Project Manager – 2004 to present

STL Connecticut – Shelton, CT--2004 to Present
Mr. Goodman's responsibilities include coordination and management of customers' projects through all phases of laboratory operations, ensuring fulfillment of Severn Trent Laboratories' commitments to client requirements, error-free work, and on-time delivery. Maintains communications with clients and Account Executives and serves as a liaison between clients and laboratory operations to meet client needs. Works closely with business unit personnel to manage quotations and change orders for existing scopes of work. Monitors compliance with industry regulations, contractual agreements, program management processes, and program specifications. Works toward achieving goals for revenue, profit, and customer service through the effective utilization of laboratory capacity and definition of customer requirements.

Extractions Manager
STL-Connecticut—Shelton, CT—02/2004 to 05/2004

Semivolatiles Analyst
STL-Connecticut—Shelton, CT—01/2002 to 02/2004

Extractions Analyst
STL-Connecticut—Shelton, CT—09/2001 to 02/2002

Education

- B.S. Environmental Science, St. Michael's College, Winooski Park, Colchester, VT May 2001.

APPENDIX, Section 2

ETHICS POLICY and QUALITY STATEMENT

SEVERN TRENT STL

Severn Trent Laboratories, Inc.
EMPLOYEE ETHICS STATEMENT

I understand that STL is committed to ensuring the highest standard of quality and integrity of the data and services provided to our clients. I have read the Ethics Policy of the Company.

With regard to the duties I perform and the data I report in connection with my employment at the Company, I agree that:

- I will not intentionally report data values that are not the actual values obtained;
- I will not intentionally report the dates, times, sample or QC identifications, or method citations of data analyses that are not the actual dates, times, sample or QC identifications, or method citations;
- I will not intentionally misrepresent another individual's work;
- I will not intentionally misrepresent any data where data does not meet Method or QC requirements. If it is to be reported, I will report it with all appropriate notes and/or qualifiers;
- I agree to inform my Supervisor of any accidental reporting of non-authentic data by me in a timely manner; and I agree to inform my Supervisor of any accidental or intentional reporting of non-authentic data by other employees;
- If a supervisor or a member of STL management requests me to engage in or perform an activity that I feel is compromising data validity or quality, I will not comply with the request and will report this action immediately to a member of senior management, up to and including the President of STL; and
- I will not share the pricing or cost data of Vendors or Suppliers with anyone outside of the Severn Trent family of companies.

As a STL employee, I understand that I have the responsibility to conduct myself with integrity in accordance with the ethical standards described in the Ethics Policy. I will also report any information relating to possible kickbacks or violations of the Procurement Integrity Act, or other questionable conduct in the course of sales or purchasing activities. I will not knowingly participate in any such activity and will report any actual or suspected violation of this policy to management.

The Ethics Policy has been explained to me by my supervisor or at a training session, and I have had the opportunity to ask questions if I did not understand any part of it. I understand that any violation of this policy subjects me to disciplinary action, which can include termination. In addition, I understand that any violation of this policy which relates to work under a government contract or subcontract could also subject me to the potential for prosecution under federal law.

EMPLOYEE SIGNATURE _____ Date _____

Supervisor/Trainer: _____ Date _____

Reference: STL Ethics Policy, P-L-006, Rev. 5.

SEVERN TRENT STL

Severn Trent Laboratories, Inc.

CONFIDENTIALITY AND PROPRIETARY INFORMATION AGREEMENT

Severn Trent Laboratories, Inc. and its predecessors, in their businesses, have developed and use commercially valuable technical and non-technical information and to guard the legitimate interests of STL and its clients, it is necessary to protect certain information as confidential and proprietary.

I, _____, understand and acknowledge that during the term of my employment by STL, I will be privy to and entrusted with certain confidential information and trade secrets of STL and its clients.

Confidential information and trade secrets include, but are not limited to: customer and client lists; price lists; marketing and sales strategies and procedures; operational and equipment techniques; business plans and systems; quality control procedures and systems; special projects and technological research, including projects, research and reports for any government entity or client; client's plans and processes; client's manner of operation; the trade secrets of clients; client's data; vendor or supplier pricing; and any other records, data, files, drawings, inventions, discoveries, applications, or processes which are not in the public domain.

I agree as follows:

1. I will not in any way, during the term of my employment, or at any time thereafter, except as authorized in writing by the Legal Department of STL or the client where client data is involved, disclose to others, use for my own benefit, remove from STL's premises, copy or make notes of any confidential information and/or trade secrets of STL or its clients, excepting only that information which may be public knowledge. Technical and business information of any previous employer or other third party which I may disclose to STL shall be limited to that which was acquired legitimately and disclosed to me without restriction as to secrecy.

2. I agree that all inventions (whether or not patentable) conceived or made by me during the period of my employment by STL shall belong to STL, provided such inventions grow out of my work for STL and are related to the business of STL. I agree to disclose and assign such inventions to STL. In California, this provision shall not apply to any invention which qualifies fully under Section 2870 of the California Labor Code.

3. On termination of my employment from STL, I will deliver to STL all documents, records, notes, data, memoranda, files, manuals, equipment and things of any nature which relate in any way to confidential information and/or trade secrets of STL or its clients and which are in my possession or under my control.

4. I acknowledge that if I were to breach any provision of this Confidentiality Agreement, money damages will be inadequate, and I hereby agree that STL shall be entitled, where appropriate, to specific performance and/or injunctive relief (i.e. to require me to comply with this Agreement). I further acknowledge that the willingness of STL to hire me or to continue my employment constitutes full and adequate consideration for the agreements, and obligations to which I have agreed as set forth in this document.

I have executed this Agreement, intending to be legally bound.

_____	_____	_____
Printed Name	*Signature*	*Date*

Reference: STL Ethics Policy, P-L-006, Rev. 5.

APPENDIX, Section 3

CHAIN-OF-CUSTODY FORM

Chain of Custody Record

STL Connecticut
128 Long Hill Cross Road
Shelton, CT 06484
Tel: 203-929-8140

SEVERN TRENT **STL**

Severn Trent Laboratories, Inc.

STL-4124 (0901)

Client	Project Manager	Date	Chain of Custody Number 00019
Address	Telephone Number (Area Code)/Fax Number	Lab Number	Page _____ of _____
City / State / Zip Code	Site Contact	Lab Contact	Analysis (Attach list if more space is needed)
Project Name and Location (State)	Carrier/Waybill Number		Special Instructions/ Conditions of Receipt
Contract/Purchase Order/Quote No.	Matrix: Air, Aqueous, Sed., Soil / Containers & Preservatives: Unpres., H_2SO_4, HNO_3, HCl, NaOH, ZnAc/NaOH		

Sample I.D. No. and Description (Containers for each sample may be combined on one line)	Date	Time	Air	Aqueous	Sed.	Soil	Unpres.	H_2SO_4	HNO_3	HCl	NaOH	ZnAc/NaOH

Possible Hazard Identification

☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown

Sample Disposal

☐ Return To Client ☐ Disposal By Lab ☐ Archive For _____ Months

(A fee may be assessed if samples are retained longer than 1 month)

Turn Around Time Required

☐ 24 Hours ☐ 48 Hours ☐ 7 Days ☐ 14 Days ☐ 21 Days ☐ Other_____

QC Requirements (Specify)

1. Relinquished By	Date	Time	1. Received By	Date	Time
2. Relinquished By	Date	Time	2. Received By	Date	Time
3. Relinquished By	Date	Time	3. Received By	Date	Time

Comments

DISTRIBUTION: WHITE - Returned to Client with Report; CANARY - Stays with the Sample; PINK - Field Copy

APPENDIX, Section 4

STL SAMPLE PRESERVATION AND HOLDING TIME REQUIREMENTS

Parameter[1]	Methods	Matrix	Holding Time*	Container	Preservation
Inorganics-Metals					
Metals, excluding Hg	200 Series 7000 Series 6010	Water	6 months	500 ml P,G	HNO3 to PH <2
Mercury	200 Series 7000 Series	Water	28 Days	500 ml P,G	HNO3 to PH <2
Metals, excluding Hg	200 Series 7000 Series 6010	Soil	6 months	100 g P,G	Cool 4°C
Mercury	200 Series 7000 Series	Soil	28 Days	100 g P,G	Cool 4°C
Inorganics-Wet Chemistries					
Acidity	EPA 600	Water	14 Days	100 ml P,G	Cool 4°C
Alkalinity	EPA 600	Water	14 Days	100 ml P,G	Cool 4°C
BOD	EPA 600	Water	48 Hours	1000 ml P,G	Cool 4°C
Bromide	EPA 600	Water	28 Days	50 ml P,G	None Req.
COD	EPA 600	Water	28 Days	50 ml P,G	Cool 4°C, H2SO4 to pH <2
Chloride	EPA 600	Water	28 Days	50 ml P,G	None Req.
Chromium, CR+6	EPA 600	Water	24 Hours	50 ml P,G	Cool 4°C
Cyanide	EPA 600	Water	14 Days[2]	500 ml P,G	Cool 4°C, NaOH to pH > 12 Ascorbic Acid[3]
Fluoride	EPA 600	Water	28 Days	500 ml P,G	None Req.
Hardness	EPA 600	Water	6 Months	100 ml P,G	HNO3 to pH <2
MBAS	EPA 600	Water	48 Hours	500 ml P,G	Cool 4°C
Nitrogen-Ammonia	EPA 600	Water	28 Days	500 ml P,G	Cool 4°C, H2SO4 to pH <2
Nitrogen-TKN	EPA 600	Water	28 Days	500 ml P,G	Cool 4°C, H2SO4 to pH <2
Nitrate	EPA 600	Water	48 Hours	100 ml P,G	Cool 4°C
Nitrate-Nitrite	EPA 600	Water	28 Days	100 ml P,G	Cool 4°C, H2SO4 to pH <2

Parameter	Methods	Matrix	Holding Time*	Container	Preservation
Inorganics-Wet Chemistries-cont.					
Oil and Grease	EPA 600	Water	28 Days	1000 ml P,G	Cool 4°C, HCL or H2SO4 to pH <2
Petroleum Hydrocarbons	EPA 600-418.1	Water	28 Days	1000 ml P,G	Cool 4°C, HCL to pH <2
pH	EPA 600	Water	Immed.	50 ml P,G	NA
Phenols	EPA 600	Water	28 Days	500 ml P,G	Cool 4°C, H2SO4 to pH<2
Phosphorus, Ortho	EPA 600	Water	48 Hours	50 ml P,G	Filter Immed., Cool 4°C
Phosphorus,Total	EPA 600	Water	28 Days	50 ml P,G	Cool 4°C, H2SO4 to pH <2
Residue, TDS	EPA 600	Water	7 Days	100 ml P,G	Cool 4°C
Residue, TSS	EPA 600	Water	7 Days	250 ml P,G	Cool 4°C
Residue, TS	EPA 600	Water	7 Days	250 ml P,G	Cool 4°C
Residue, Volatile	EPA 600	Water	7 Days	250 ml P,G	Cool 4°C
Residue, Settleable	EPA 600	Water	48 Hours	250 ml P,G	Cool 4°C
Specific Conductance	EPA 600	Water	28 Days	100 ml P,G	Cool 4°C
Sulfate	EPA 600	Water	28 Days	250 ml P,G	Cool 4°C
Sulfide	EPA 600	Water	7 days	500 ml P,G	Cool 4°C, ZnAc/NaOH to pH >9
TOC	EPA 600	Water	28 Days	50 ml P,G	Cool 4°C, HCL or H2SO4 to pH <2
TOX	EPA 600	Water	28 Days	40 ml G	Cool 4°C, H2SO4 to pH <2, Sodium Sulfite
Turbidity	EPA 600	Water	48 Hours	100 ml P,G	Cool 4°C
Cyanide	SW846	Soil	14 Days	100 g G	Cool 4°C
Sulfide	SW846	Soil	7 Days	100 g G	Cool 4°C

Parameter	Methods	Matrix	Holding Time*	Container	Preservation
Organics-Parameters by Gas Chromatography					
Volatiles; Halogenated	600 series SW846	Water	7/14 Days[5]	3 x 40 ml vial	Cool 4°C, Thiosulfate[4]
Volatiles; Aromatics	600 series SW846	Water	7/14 Days[5]	3 x 40 ml vial	Cool 4°C, HCL to pH <2 Thiosulfate[4]
Volatiles; Non-Halogenated	SW846 - 8015	Water	7/14 Days[5]	3 x 40 ml vial	Cool 4°C, Thiosulfate[4]
Semi-volatiles	600 series SW846	Water	ext.- 7 Days anal.-40 Days	1L, amber G	Cool 4°C, Thiosulfate[4]
Organochlorine Pesticides/PCBs	600 series SW846	Water	ext.- 7 Days anal.-40 Days	1L, amber G	Cool 4°C, Thiosulfate[4]
Organophosphorus Pesticides	600 series SW846	Water	ext.- 7 Days anal.-40 Days	1L, amber G	Cool 4°C, Thiosulfate[4]
Herbicides	SW846	Water	ext.- 7 Days anal.-40 Days	1L, amber G	Cool 4°C, Thiosulfate[4]
Volatiles; Halogenated	SW846	Soil	14 Days	50 g, G	Cool 4°C
Volatiles; Aromatics	SW846	Soil	14 Days	50 g, G	Cool 4°C
Volatiles; Non-Halogenated	SW846 - 8015	Soil	14 Days	50 g, G	Cool 4°C
Semi-volatiles	SW846	Soil	ext.- 14 Days anal.-40 Days	100 g, G	Cool 4°C
Organochlorine Pesticides/PCBs	SW846	Soil	ext.- 14 Days anal.-40 Days	100 g, G	Cool 4°C
Organophosphorus Pesticides	SW846	Soil	ext.- 14 Days anal.-40 Days	100 g, G	Cool 4°C
Herbicides	SW846	Soil	ext.- 14 Days anal.-40 Days	100 g, G	Cool 4°C

Parameter	Methods	Matrix	Holding Time*	Container	Preservation
Organics-GC/MS Parameters					
Volatiles; Halogenated	600 series SW846	Water	7/14 Days[5]	3 x 40 ml vial	Cool 4°C, Thiosulfate[4]
Volatiles; Aromatics	600 series SW846	Water	7/14 Days[5]	3 x 40 ml vial	Cool 4°C, HCL to pH <2 Thiosulfate[4]
Volatiles; Halogenated	500 series	Water	7/14 Days[5]	3 x 40 ml vial	Cool 4°C, HCL to pH <2 Thiosulfate[4]
Volatiles; Aromatics	500 series	Water	7/14 Days[5]	3 x 40 ml vial	Cool 4°C, HCL to pH <2 Thiosulfate[4]
Semi-volatiles	600 series SW846	Water	ext.- 7 Days anal.-40 Days	1L, amber G	Cool 4°C, Thiosulfate[4]
Volatiles; Halogenated	SW846	Soil	14 Days	50 g, G	Cool 4°C
Volatiles; Aromatics	SW846	Soil	14 Days	50 g, G	Cool 4°C
Semi-volatiles	SW846	Soil	ext.- 14 Days anal.-40 Days	100 g, G	Cool 4°C

* From Collection

1. The following information is based upon WPA requirements outlines in Part 136, title 40 of the Code of Federal Regulations. Various state agencies have differing requirements for both holding times and preservation from those listed above. In such cases, the local requirements supersede the EPA information.

2. Maximum holding time is 24 hours when sulfide is present. Sample must be tested with lead acetate paper be fore pH adjustment in order to determine is sulfide is present.

3. If residual chlorine is present in the sample 0.6 g of ascorbic acid is utilized.

4. If samples contain residual chlorine sodium thiosulfate must be added at the time of sampling.

5. If samples do not received pH adjustment, the holding time is 7 days.

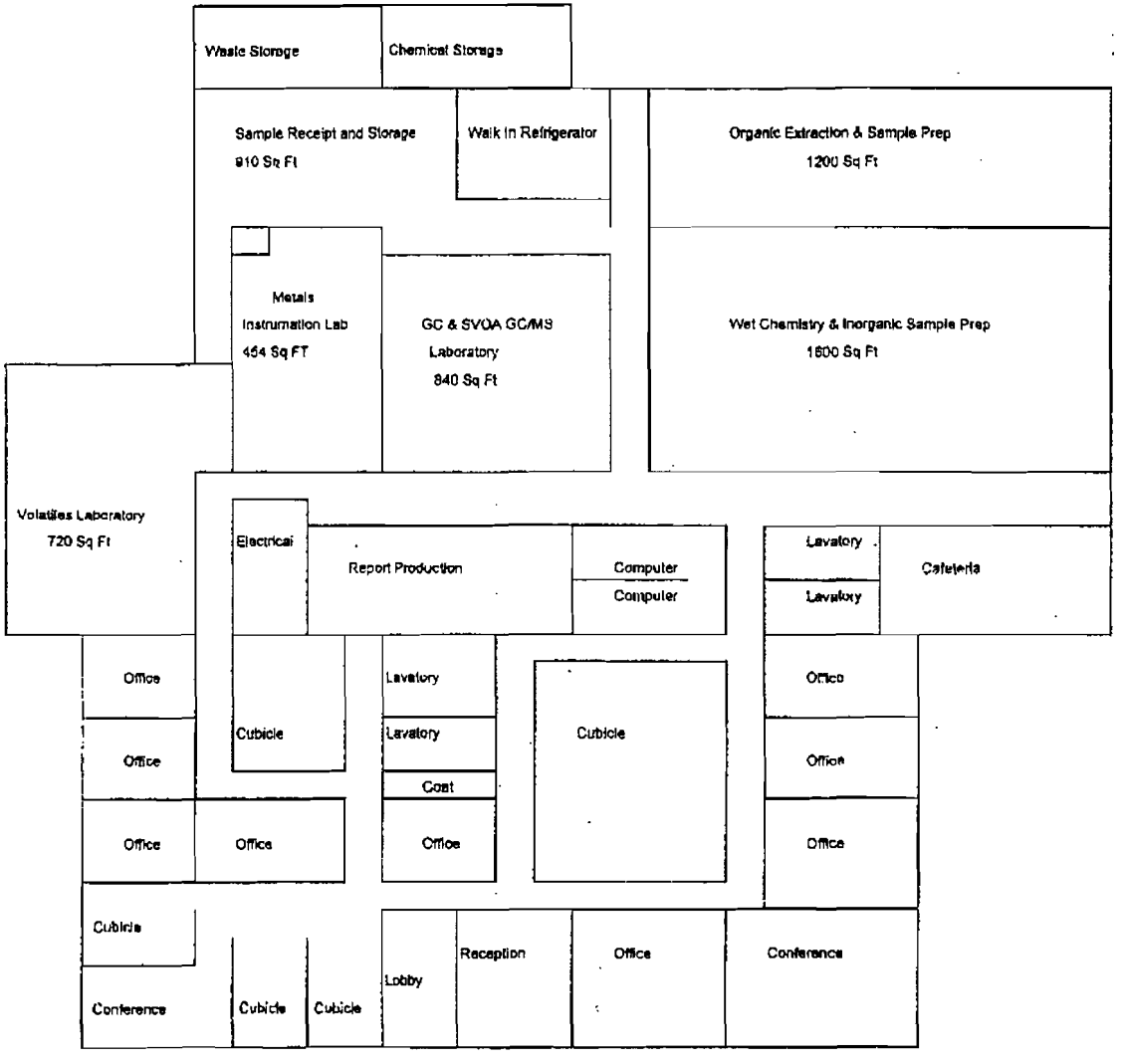
APPENDIX, Section 5

LABORATORY FLOOR PLAN

EQUIPMENT LIST

PREVENTIVE MAINTENANCE

Severn Trent Laboratories
Shelton, CT



STL CONNECTICUT LABORATORY
Instrument List

Instrument Type	Manufacturer	Model	Purchase Date	Autosampler	Method Performed
ICP	Thermo Jarrell Ash (61E) S/N 349490	61E ICAP	1994	Yes	6010B, 200.7
	Thermo Jarrell Ash (61P) S/N 464790	61E Trace	1997	Yes	6010B, 200.7
Mercury Analyzer	Perkin Elmer S/N 1398	FIMS	1999	Yes	7471A, 7470, 245.1
GC/MS Semivolatiles	Hewlett-Packard (U) S/N US33210086	5973/6890	2004	Yes	8270C, 625, SIM
	Hewlett-Packard (Q) S/N US00007319	5890/5971	1992	Yes	8270C, 625, SIM
	Hewlett-Packard (R) S/N US00036181	5890/5971	1992	Yes	8270C, 625, SIM
	Hewlett-Packard (P) S/N US00007291	5890/5971	1992	Yes	8270C, 625, SIM
GC/MS Volatiles	Hewlett-Packard (L) S/N 3240A18492	5890/5971	1992	Yes	8260B, 624
	Hewlett-Packard (K) S/N 3029A30026	5890/5970	1990	Yes	8260B, 624 – waters
	Hewlett-Packard (O) S/N 3203A41807	5890/5971	1991	Yes	8260B, 624 – waters
	Hewlett-Packard (N) S/N 3133A37851	5890/5971	1991	Yes	8260B, 624
	Hewlett-Packard (M) S/N 33033A33746	5890/5970	1991	Yes	8260B, 624 – soils
	Hewlett-Packard (T) S/N 3336A51317	5890/5972	1996	Yes	T0 17 – air
	Hewlett-Packard (v) S/N	6890/5973	2004	Yes	8260B, 624
GC Semivolatiles	Hewlett-Packard (GC1C/D) S/N	5890II - Dual ECD	1994	Yes	8081, 8082, 608
	Hewlett-Packard (GC4C/D) S/N 3033A33529	5890II - Dual ECD	1992	Yes	8082
	Hewlett-Packard (GC5C/D) S/N	5890II - Dual ECD	1989	Yes	8081, 8082, 608
	Hewlett-Packard (GC7C/D) S/N	5890II - Dual ECD	2004	Yes	8081, 8082, 608
	Hewlett-Packard (GC2C/D) S/N 3033A32099	5890II – FID/NPD	1991	Yes	WSO, 8141
	Hewlett-Packard (GC3) S/N 3033A32563	5890 - FID	1991	Yes	8015B (DRO), ETPH
Ion Chromatograph	Lachat S/N A83000-1476	Quickchem 8000	1999	Yes	300.0, 9056 350.1, 351.2 9012, 335.4, 353.2, 420.2
TOC	Dohrmann	Phoenix 8000	2004	No	415.2, 9060

Updated 5/14/04

STL CONNECTICUT LABORATORY
Instrument List

Instrument Type	Manufacturer	Model	Purchase Date	Autosampler	Method Performed
	Dohrmann	DC-190	1998	Yes	415.2, 9060
TKN Digestion System	Scientific Instruments	AD-4020	1994	No	351.2, 351.3
UV/VIS	Barnstead Turner	SP 830	2003	No	7196A, 376.2
UV/VIS	Buck Scientific	HC 404	2000	No	418.1
PH Meter	Orion Research	SA 720	1998	No	9040B, 9045C, 150.1
PH Meter	Beckman	12	1995	No	9040B, 9045C, 150.1
Autotitrator (pH, Alkalinity, Conductance)	Man-Tech (ATZ)	PC 1300	2003	Yes	9040B, 9045C, 150.1, 2320B, 310.1, 310.2, 2510B, 9050A, 120.1
Dissolved Oxygen Meter	YSI	51A	1994	No	405.1
Turbidimeter	HACH	2100 N	1990	No	180.1
Conductivity	Cole-Parmer	1484-20	1996	No	120.1
Automated Distillation Apparatus	Westco S/N 1028	1075 Easy Dist	2003	No	350.1, 420.2, 9066
COD	HACH	45600	1991	No	410.4
Flash Point Apparatus	Precision Scientific	Pensky-Martin	1990	No	1020
Midi Distillation Setups	Andrews Galss	110-10-R	1995	No	9012A, 335.1, 335.3
TCLP Spinners	Dayton	3M137B/5K939B	1990	No	1311, 1312
GPC	ABC	Autoprep 1000	1999	Yes	8270, 8081, 8082

STL- Connecticut LABORATORY PREVENTIVE MAINTENANCE

GC/MS SYSTEMS		
EQUIPMENT	ACTION PERFORMED	FREQUENCY
Hewlett-Packard 5970 MSD / 5971 MSD/5972 MSD	Check oil level in mechanical pumps	Weekly
	Change the oil in the mechanical pumps	Every 6 months
	Inspect the pump hoses and replace if required	Every 6 months
	Change oil in the turbo pump	Every 6 months
	Change exhaust trap absorbent	Every 6 months
	Inspect and refill the calibration sample vial with PFTBA	Every 6 months
	Vacuum fan grills and filters	Every 6 months
	Ion source cleaning and filament replacement	As needed
	Manual tuning	As needed
	Replace electron multiplier	As needed
	Clean out transfer line to GC	After every column removal
Hewlett-Packard 5890 GC	Check helium gas supply	Daily
	Change split vent trap	Every 3 months
	Column replacement and conditioning	As needed
	Column cutting and reinstallation	Daily or as needed
	Change helium gas cylinder	As needed
	Change liner and septum	Daily or as needed
	Clean injection port	As needed
EQUIPMENT	ACTION PERFORMED	FREQUENCY
Hewlett-Packard 7672A Autosampler	Inspect and correct injector alignment	After reseating
	Inspect syringe	Daily
	Check compressed air gas supply	Daily
	Inspect and adjust tension on sample tray	Daily
	Change rinse vials	Daily
	Change waste vials	Weekly
	Replace syringe	As needed
	Sand injector post	As needed
	Realign autosampler arm brackets	As needed

	Change compressed air cylinder	As needed
Hewlett-Packard 7673A Autosampler	Inspect syringe	Daily
	Inspect seating of injector	Daily
	Change rinse vials	Daily
	Change waste vials	Weekly
	Replace syringe	As needed
	Reset control box	As needed
Tekmar Purge and Trap Sample Concentrators and Autosamplers	Inspect spargers and fittings	Daily
	Check purge flow	Daily
	Inspect line and valve temperatures	Daily
	Change and condition trap	As needed
	Adjust purge flow	As needed
	Rinse or clean sparging vessels	As needed
	Rinse sample lines	As needed
	Bake out trap	After each analysis, extend as needed
	Replace lines and fittings	As needed
	Adjust line and valve temperatures	As needed
EQUIPMENT	ACTION PERFORMED	FREQUENCY
Envirochem Aa Sample Concentrator and AS	Inspect fittings	Daily
	Check flows	Daily
	Inspect line and valve temperatures	Daily
	Change and condition internal traps	As needed
	Adjust flow	As needed
	Bake out trap	After each analysis, extend as needed
	Replace lines and fittings	As needed
	Adjust line and valve temperatures	As needed
Archon	Check Syringe	Daily
	Check reagent water and waste bottles	Daily
	Autocalibrate robotic arm	As needed
	Replace inline filter	As needed

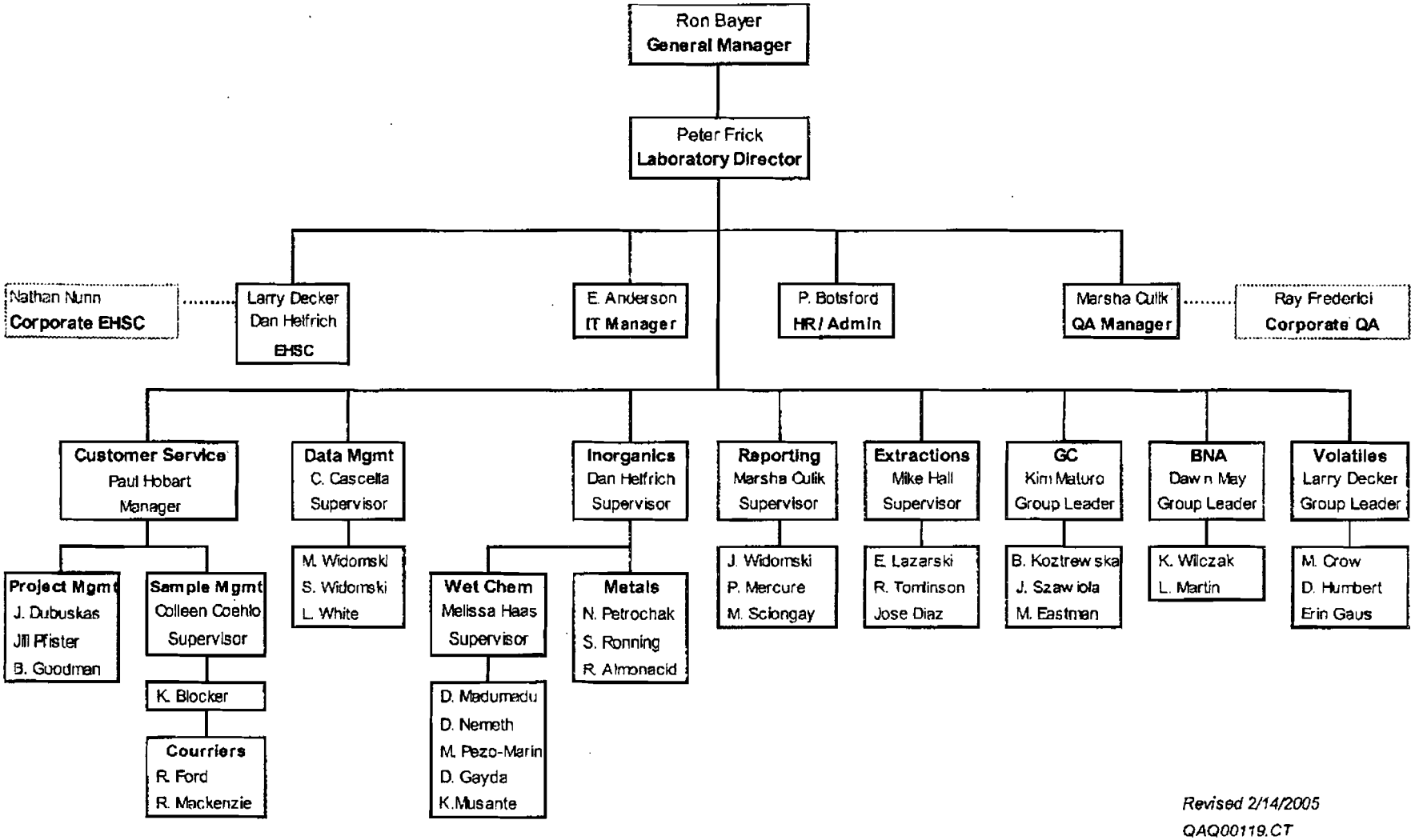
GC SYSTEMS		
EQUIPMENT	ACTION PERFORMED	FREQUENCY
Hewlett-Packard 5890A GC (GC-1,4,5 Dual ECD)	Check gas supply	Daily
	Check breakdown criteria	As required by run sequence
	Vacuum filters and grills	Quarterly
	Column replacement and conditioning	As needed
	Column cutting and reinstallation	As needed
	Change gas cylinders	As needed
	Change liner and septum	As needed
	Replace guard column	As needed
	Clean injection port	As needed
	Recondition ECD	As needed
	Change ECD vent absorbent traps	Quarterly
EQUIPMENT	ACTION PERFORMED	FREQUENCY
Hewlett-Packard 5890A GC (GC-3 FID/NPD)	Check gas supply	Daily
	Vacuum filters and grills	Quarterly
	Column replacement and conditioning	As needed
	Column cutting and reinstallation	As needed
	Change gas cylinders	As needed
	Change liner and septum	As needed
	Clean injection port	As needed
	Replace or reactivate the NPD collector	As needed
Hewlett-Packard 7673A Autosampler	Inspect syringe	Daily
	Inspect seating of injector	Daily
	Inspect rinse and waste vials	Daily
	Vacuum filters and grills	Quarterly
	Replace syringe	As needed
	Change rinse and waste vials	As needed

EQUIPMENT	ACTION PERFORMED	FREQUENCY
METALS SYSTEMS		
Inductively Coupled Plasma	Change capillary and pump tubing	Twice weekly
	Replace liquid argon tank	As required
	Reprofile via slit micrometer	Per manual
	Replace and realign plasma torch	As needed
	Clean nebulizer and spray chamber	As needed
	Check primary imaging mirror	Weekly
Mercury Analyzer	Clean sample cell and tubing	Monthly
	Check sparger condition	Daily
	Check level of mercury scrubber solution	Daily
	Replace lamps	As required
WET CHEMISTRY SYSTEMS		
EQUIPMENT	ACTION PERFORMED	FREQUENCY
pH Meters	Clean electrode if calibration has deteriorated	As needed
	Store pH electrodes in pH 7.0 buffer	Daily
	Check ISE electrodes and meter	Per manual
Analytical Balances	Surfaces cleaned and covered	Daily
	Calibrated and cleaned by manufacturer	Semi-annually
	Accuracy checked by class "S" weights	Prior to use
Conductivity Meters	Instrument surfaces inspected and cleaned	Daily
	Calibrated using 0.01M potassium chloride	Daily
	Spare cells on inventory	As needed
Spectrophotometers	Instrument cleaned	Daily use
Autoanalyzer Systems	Clean all components and flush system	Daily use
	Inspect all pump tubes and sample lines	Daily use
	Inspect line coils, heating baths and filters	Weekly
	Inspect all colorimeter filters	Weekly
	Inspect and clean chemical manifolds	Monthly

APPENDIX, Section 6

ORGANIZATIONAL CHART

STL Connecticut Organization



Revised 2/14/2005
QAQ00119.CT

SEVERN TRENT STL

Leaders in Environmental Testing

APPENDIX, Section 7

CORRECTIVE ACTION FORM

STL

CORRECTIVE ACTION FORM

A. Originator Information **Client Inquiry**

Client:_____ Job/Case:_____

Date/time:_____ Sample Number(s):_____

Client/Lab Contact: _____ Date/Time Response Due:_____

Detailed Description of Potential Problem:

_____

_____

_____

_____

_____

_____

_____

B. Quality Assurance Information **Corrective Action ID#** _____

Recommended Corrective Action:

_____

_____

_____

_____

Groups Involved: __Sample Control __ Wet Chemistry __ Metals __Organic Extraction
__Gas Chromatography __ MS- VOA __ Report Generation __Lab Director
__Client Service __ MS -SV __EDD __ Subcontractor

C. Final Resolution

Describe What Happened and Corrective Action Taken:

_____

_____

_____

_____

Supervisor Signature: _____ Date_____ Date/Time Client Notified:_____

D. Quality Assurance Final Approval (QA Manager or designee use only)

Corrective Action Approved:_____

APPENDIX, Section 8

LISTING OF LABORATORY

STANDARD OPERATING PROCEDURES (SOPs)

Standard Operating Procedures Listing

Dept	Document Number	Revision	Active Date	SOP Title	Document Type
Sample Receipt	SMS00106.CT	6	09/05/04	Bottle Order Preparation	SOP
Sample Receipt	SMS00408.CT	8	09/06/04	Sample Processing and Sample Arrival	SOP
Sample Receipt	SMS00609.CT	9	09/06/04	Storing Water and Soil Samples	SOP
Sample Receipt	SMS00808.CT	8	09/06/04	Documenting Sample and Removal from the Laboratory	SOP
Sample Receipt	SMS00908.CT	8	09/06/04	Securing the Laboraotory and Samples	SOP
Sample Receipt	SMS01006.CT	6	09/06/04	Temperature Control Requirements	SOP
Sample Receipt	SMS01106.CT	6	09/06/04	Compositing, Homogenization and Splitting Environmental Samples	SOP
Sample Receipt	SMS01304.CT	4	09/06/04	Log-In for CLP (OLM04.2) Samples	SOP
Sample Receipt	SMS01402.CT	2	09/06/04	Sample Disposal	SOP
Sample Receipt	SMS01500.CT	0	09/04/04	Handling Samples under a Foreign Soil Permit	SOP
Organic Prep	SPS02804.CT	2	03/06/03	Preparation of Chlorinated Herbicides (W) – 8151A	SOP
Organic Prep	SPS01306.CT	6	05/15/02	Aqueous BNA Methods 3510/3520	SOP
Organic Prep	SPS01205.CT	5	04/25/02	Aqueous Pest/PCB Methods 3510C/3520C	SOP
Organic Prep	SPS01405.CT	5	09/01/02	Soil BNA Method 3550	SOP
Organic Prep	SPS01605.CT	5	06/20/02	Soil Pest/PCB Method 3550	SOP
Organic Prep	SPS01703.CT	3	05/15/02	Aqueous OP Pesticides Methods 3510/3520	SOP
Organic Prep	SPS01805.CT	5	04/03/02	SW846 GPC of BNA extracts	SOP
Organic Prep	SPS01902.CT	2	04/03/02	GPC of Pesticide/PCB extracts method 3640	SOP
Organic Prep	SPS02703.CT	3	09/05/02	Soil OP Pesticides Method 3550	SOP
Organic Prep	SPS03005.CT	5	04/02/02	Waste dilution - BNA	SOP
Organic Prep	SPS03103.CT	3	09/13/02	Waste dilution - Pesticides/PCB (3580)	SOP
Organic Prep	SPS03205.CT	5	05/15/02	Pesticide/PCB extraction method 608	SOP
Organic Prep	SPS03302.CT	2	09/05/02	Prep Soil/Sediment samples for CLP P/P OLM03.2	SOP
Organic Prep	SPS03401.CT	1	04/03/02	GPC of Pesticide extracts OLM03.2	SOP
Organic Prep	SPS03503.CT	3	02/21/03	Prep Soil/Sed samples for CLP BNA's OLM03.2	SOP
Organic Prep	SPS03601.CT	1	04/03/02	GPC of Semivolatile extracts OLM03.2	SOP
Organic Prep	SPS03701.CT	1	02/20/03	Prep of Aqueous samples for CLP BNA's OLM03.2	SOP
Organic Prep	SPS03802.CT	2	05/22/02	Prep of Aqueous samples for CLP P/P OLM03.2	SOP
Organic Prep	SPS03901.CT	1	06/18/97	CLP Extraction Standard Prep	SOP
Organic Prep	SPS02901.CT	1	07/26/96	Alumina Column C/U Method 3611A	SOP
Organic Prep	SPS04001.CT	1	06/05/02	Prep of Aqueous SV OLC10/92	SOP
Organic Prep	SPS04201.CT	1	09/18/02	Prep of Semivolatiles in Tissue samples	SOP
Organic Prep	SPS04305.CT	5	06/20/02	Prep of Pesticides/PCBs in Tissue samples	SOP
Organic Prep	SPS04403.CT	3	02/16/00	Prep of Chlorinated Herbicides -Method 8151 (S)	SOP

Standard Operating Procedures Listing

Department	Document Number	Revision	Revision Date	SOP Title	Document Type
Organic Prep	SPS04502.CT	2	09/18/02	Prep of PUF Samples for Pesticides/PCB T04	SOP
Organic Prep	SPS04602.CT	2	09/09/02	Prep of PUF Samples for Semi-volatiles T013	SOP
Organic Prep	SPS04703.CT	3	05/22/02	Prep of SV Method 625 (Water)	SOP
Organic Prep	SPS04801.CT	1	09/18/02	Prep of Wipe Samples Pesticides/PCBs	SOP
Organic Prep	SPS04903.CT	3	09/18/02	Florisil Cartridge clean-up P/P extracts	SOP
Organic Prep	SPS05002.CT	2	06/05/02	Prep of Low Level PCBs - Method 608	SOP
Organic Prep	SPS05101.CT	1	03/06/03	Prep of Low level PCBs – 3510C	SOP
Organic Prep	SPS05304.CT	4	06/05/02	Prep of Aqueous samples for DRO analysis - 8015B	SOP
Organic Prep	SPS05203.CT	3	06/20/02	Prep of Solid samples for DRO analysis - 8015B	SOP
Organic Prep	SPS05602.CT	2	02/13/03	Prep of Aqueous samples for CLP P/P OLM04.3	SOP
Organic Prep	SPS06702.CT	2	02/20/03	Prep of Soil/Sediment samples for CLP P/P OLM04.3	SOP
Organic Prep	SPS05802.CT	2	02/20/03	GPC CLP P/P Extracts OLM04.3	SOP
Organic Prep	SPS05902.CT	2	02/13/03	Standards Prep for CLP P/P OLM04.3	SOP
Organic Prep	SPS06002.CT	2	02/13/03	Prep of Aqueous samples for CLP BNA's OLM04.3	SOP
Organic Prep	SPS06102.CT	2	02/20/03	Prep of Solid samples for CLP BNA's OLM04.3	SOP
Organic Prep	SPS06202.CT	2	02/20/03	GPC of Semivolatile extracts OLM04.3	SOP
Organic Prep	SPS06301.CT	1	02/20/03	Standards Prep for CLP BNA OLM04.3	SOP
Organic Prep	SPS06400.CT	0	03/17/00	Standards Prep for CLP Pest/PCB OLM03.2	SOP
Organic Prep	SPS06500.CT	0	04/02/02	Prep of BNA Soils – Method 3541	SOP
Organic Prep	SPS06600.CT	0	09/10/02	Prep of Soil Samples for GC Method 3541	SOP
GCMS Semi VOA	MSS01604.CT	4	10/04/04	GC/MS Semivolatiles OLM03.2	SOP
GCMS Semi VOA	MSS02009.CT	9	10/10/04	GC/MS Analysis Method 625	SOP
GCMS Semi VOA	MSS02200.CT	0	10/05/04	GC/MS Semivolatile OLC2.1	SOP
GCMS Semi VOA	MSS02706.CT	6	08/19/04	GC/MS Semivolatile analysis - Method 8270C	SOP
GCMS Semi VOA	MSS03501.CT	1	09/14/04	GC/MS Semi-volatiles OLM04.3	SOP
GCMS Semi VOA	MSS03601.CT	1	10/08/04	GC/MS Semi-volatile screening OLM04.3	SOP
GCMS Semi VOA	MSS03701.CT	1	10/07/04	Semi-volatile Std Prep	SOP
GCMS Semi VOA	MSS03400.CT	0	01/21/03	Semi-volatile by Method T0 13A	SOP
GCMS VOA	MSS00100.CT	0	04/30/93	Volatile Std Prep CLP	SOP
GCMS VOA	MSS01500.CT	0	dft	GC/MS Volatile 524.2 Rev. 3	SOP
GCMS VOA	MSS01801.CT	1	06/27/97	GC/MS Volatiles OLM03.2	SOP
GCMS VOA	MSS02102.CT	2	02/15/00	GC/MS Analysis Method 624	SOP
GCMS VOA	MSS02803.CT	3	09/23/03	GC/MS Volatile analysis - Method 8260B	SOP
GCMS VOA	MSS02900.CT	0	dft	GC/MS Volatiles - OLC02.1	SOP
GCMS VOA	MSS03001.CT	1	03/27/03	GC/MS VOA OLM04.3	SOP

Standard Operating Procedures Listing

Dept	Document Number	Revision	Revision Date	SOP Title	Document Type
GCMS VOA	MSS03300.CT	0	01/27/00	GC/MS Volatile Standards Prep OLM04.2	SOP
GCMS VOA	MSS03802.CT	2	01/24/05	Volatile by Method T0 17	SOP
GC Semivoa	GCS00302.CT	2	01/13/04	Sulfur Removal	SOP
GC Semivoa	GCS00504.CT	4	01/13/04	Analysis of OP Pesticides Method 8141A	SOP
GC Semivoa	GCS00703.CT	3	02/18/04	Misc. Volatiles Method 8015 (DAI)	SOP
GC Semivoa	GCS01302.CT	2	01/13/04	Analysis of Hydrocarbon Fingerprinting	SOP
GC Semivoa	GCS01104.CT	4	01/20/04	Pesticides/PCB Method 608	SOP
GC Semivoa	GCS01503.CT	3	01/13/04	GC/ECD Pesticides/PCB analysis OLM03.2	SOP
GC Semivoa	GCS01804.CT	4	01/13/04	Diesel Range Organics - Method 8015B	SOP
GC Semivoa	GCS02003.CT	3	01/19/04	Pesticide/PCB analysis - Method T04	SOP
GC Semivoa	GCS02104.CT	4	01/13/04	Water soluble Organics - DAI/NPD	SOP
GC Semivoa	GCS02205.CT	5	01/14/04	Analysis of Pesticides - Method 8081A	SOP
GC Semivoa	GCS02306.CT	6	01/14/04	Analysis of PCBs - Method 8082	SOP
GC Semivoa	GCS02403.CT	3	01/20/04	Analysis of Herbicides - Method 8151A	SOP
GC Semivoa	GCS02503.CT	3	01/20/04	GC/ECD Pesticides/PCB CLP OLM04.3	SOP
GC Semivoa	GCS02603.CT	3	01/20/04	Pesticide/PCB Standard Prep OLM04.3	SOP
GC Semivoa	GCS02702.CT	2	01/13/04	CT ETPH - DRO	SOP
Metals	MES00906.CT	6	04/01/04	SW846 Method 3010A	SOP
Metals	MES01006.CT	6	04/01/04	SW846 Method 3050B	SOP
Metals	MES02001.CT	1	01/20/03	Method 6010B - TJA61 Trace ICP	SOP
Metals	MES02201.CT	1	02/12/00	Metals Digestion ILM04.1 (Water)	SOP
Metals	MES02301.CT	1	02/12/00	Metals Digestion ILM04.1 (Soil)	SOP
Metals	MES02401.CT	1	02/12/00	Determination of Mercury in Water ILM04.1	SOP
Metals	MES02501.CT	1	02/12/00	Determination of Mercury in Soil ILM04.1	SOP
Metals	MES02601.CT	1	03/22/00	Determination of Metals - ILM04.1 TJA-61E Trace	SOP
Metals	MES02700.CT	0	08/01/96	Determination of Metals - 200.7 TJA 61E Trace	SOP
Metals	MES02800.CT	0	08/01/96	Determination of Mercury in Water Method 245.1	SOP
Metals	MES02900.CT	0	dft	Metals Digestion of Wipe Samples	SOP
Metals	MES03103.CT	3	03/27/03	Mercury 7470A (Hot Block)	SOP
Metals	MES03202.CT	2	01/20/03	Mercury 7471A (Hot Block)	SOP
Metals	MES03301.CT	1	07/12/02	Metals Digestion 200.7 (Water)	SOP
Wet Chemistry	CVS01004.CT	4	01/28/04	Analysis of Oil & Grease (Gravimetric)- 413.1	SOP
Wet Chemistry	WC:070891:0	0	07/08/91	Analysis of Salinity in Water	SOP
Wet Chemistry	CVS04301.CT	1	02/26/99	Measurement of Conductivity	SOP
Wet Chemistry	WC:071691:0	0	07/16/91	Analysis of Dissolved Oxygen in Water	SOP

Standard Operating Procedures Listing

Dept	Document Number	Revision	Revised Date	SOP Title	SOP Type
Wet Chemistry	CVS00706.CT	6	10/14/04	Analysis of Alkalinity in Water - 310.1	SOP
Wet Chemistry	CVS02603.CT	3	10/14/04	Analysis of Ammonia (method 350.2) in Water	SOP
Wet Chemistry	CVS00900.CT	0	03/31/94	Measurement of pH	SOP
Wet Chemistry	CVS01705.CT	5	10/14/04	Analysis of Sulfide	SOP
Wet Chemistry	CVS00506.CT	6	01/23/04	Analysis of Biochemical Oxygen Demand	SOP
Wet Chemistry	CVS01205.CT	5	02/17/04	Analysis of COD (Method 410.4)	SOP
Wet Chemistry	CVS01101.CT	1	02/04/00	Analysis of Samples for Total Cyanide CLP Protocol	SOP
Wet Chemistry	CVS01502.CT	2	10/8/1999	SOP for Toxicity Characteristic Leaching Procedure - 1311	SOP
Wet Chemistry	CVS04003.CT	3	4/10/2000	Measurement of Turbidity in Water Samples	SOP
Wet Chemistry	CVS00103.CT	3	10/26/1999	Analysis of Total Dissolved Solids in Water	SOP
Wet Chemistry	CVS03403.CT	3	10/19/2004	Analysis of TOC Soil Samples	SOP
Wet Chemistry	CVS03902.CT	2	10/8/1999	Analysis of Chloride (325.2) in Water	SOP
Wet Chemistry	CVS01901.CT	1	10/9/1999	Standard Operating Procedure for Reactivity	SOP
Wet Chemistry	CVS04603.CT	3	6/8/2004	Standard Operating Procedure for Corrosivity	SOP
Wet Chemistry	CVS02303.CT	3	10/19/2004	Standard Operating Procedure for Ignitability (1030)	SOP
Wet Chemistry	CVS00204.CT	4	1/21/2004	Analysis of Total Suspended Solids in Water	SOP
Wet Chemistry	CVS02502.CT	2	10/8/1999	Analysis of Nitrate and Nitrite for Water Samples (Method 353.2)	SOP
Wet Chemistry	CVS02002.CT	2	10/20/2004	SOP for Total Cyanide - Method 335.4	SOP
Wet Chemistry	CVS02102.CT	2	10/4/2004	SOP for Amenable Cyanide - Method 335.1	SOP
Wet Chemistry	CVS00300.CT	0	08/21/93	SOP for Total Solids	SOP
Wet Chemistry	CVS02900.CT	0	3/20/1995	SOP for CEC Method 9081	SOP
Wet Chemistry	CVS03000.CT	0	3/20/1995	SOP for Soil Homogenization	SOP
Wet Chemistry	CVS03303.CT	3	10/19/2004	SOP for Oxidation -Reduction Potential	SOP
Wet Chemistry	CVS03700.CT	0	10/10/1996	SOP for The Determination of Ferrous Iron	SOP
Wet Chemistry	CVS02403.CT	3	10/20/2004	SOP for Phenols method 420.1/420.2	SOP
Wet Chemistry	CVS04100.CT	0	1/6/1997	SOP for Determination of Percent Solids	SOP
Wet Chemistry	CVS04504.CT	4	6/8/2004	SOP for Oil and Grease - Method 1664A	SOP
Wet Chemistry	CVS04703.CT	3	10/20/2004	SOP for Total Petroleum Hydrocarbons - Method 418.1	SOP
Wet Chemistry	CVS04804.CT	4	10/27/2004	SOP for Analysis of Total Phosphorus	SOP
Wet Chemistry	CVS04902.CT	2	11/1/1999	SOP for Sample Screening for Chorine Residual	SOP
Wet Chemistry	CVS05203.CT	3	10/28/2004	SOP for Chlorine Residual	SOP
Wet Chemistry	CVS05102.CT	2	10/28/2004	SOP for Reagent Water Monitoring	SOP
Wet Chemistry	CVS05303.CT	3	11/2/2004	SOP for Ferrous Iron (SM4500)	SOP

Standard Operating Procedures Listing

Dept	Document Number	Revision	Revision Date	SOP Title	SOP Authority Type
Wet Chemistry	CVS05005.CT	5	11/2/2004	SOP for Hexavalent Chromium – 7196A	SOP
Wet Chemistry	CVS05401.CT	1	5/16/2002	SOP for Total Cyanide – 9012A	SOP
Wet Chemistry	CVS05500.CT	0	9/10/1999	SOP for CC Labeling /Coding of Standards	SOP
Wet Chemistry	CVS05601.CT	1	05/16/02	Total Sulfide (W/S) 9030B	SOP
Wet Chemistry	CVS05701.CT	1	10/07/02	Paint Filter	SOP
Wet Chemistry	CVS05802.CT	2	01/29/04	SOP for pH of Soil	SOP
Wet Chemistry	CVS06000.CT	0	04/25/00	SOP for TKN (351.2)	SOP
Wet Chemistry	CVS06100.CT	0	04/25/00	SOP for Ion Chromatography –9065/300	SOP
Wet Chemistry	CVS06200.CT	0	05/21/01	SOP for SPLP Preparation (SW846 1312)	SOP
Wet Chemistry	CVS06400.CT	0	03/12/03	SOP for Flashpoint 1020	SOP
Wet Chemistry	CVS06301.CT	1	02/12/03	SOP for Cyanide – ILM05.2	SOP
Wet Chemistry	CVS06500.CT	0	05/23/03	SOP for Color	SOP
Wet Chemistry	CVS06600.CT	0	08/20/03	SOP for Hardness	SOP
Wet Chemistry	CVS06700.CT	0	02/12/04	SOP for TPH-IR Soils – Soxtherm	SOP
Wet Chemistry	CVS07000.CT	0	01/26/04	SOP for Autotitrator	SOP
Wet Chemistry	CVS07100.CT	0	11/02/04	SOP for TOC -water Phoenix 8000	SOP
Information Systems	SYS01900.CT	0	04/23/97	SOP for GC/MS Chemserver Archive	SOP
Information Systems	SYS02000.CT	0	01/20/98	SOP for Generating Standard E-mail Result Files	SOP
Information Systems	SYS02300.CT	0	04/08/02	SOP for GC Target Deliverables	SOP
Information Systems	SYS02400.CT	0	07/22/02	SOP for GC Labnet Deliverables	SOP
Information Systems	SYS02500.CT	0	DFT	SOP for GC/MS VOA Target Deliverables	SOP
Information Systems	SYS02600.CT	0	DFT	SOP for GC/MS VOA Labnet Deliverables	SOP
Project Management	MKS00101.CT	1	03/06/99	SOP for Taking Client Orders	SOP
Project Management	MKS00201.CT	1	03/06/99	SOP for LIMS Log-in	SOP
Project Management	MKS00400.CT	0	06/22/94	SOP for Telephone Logs	SOP
Quality Assurance	QAS00305.CT	5	02/12/03	SOP for Document Control	SOP
Quality Assurance	QAS00504.CT	4	02/10/03	SOP for Corrective Action Reports	SOP
Quality Assurance	QAS00803CT	3	2/10/2003	SOP for Generating SOPs	SOP
Quality Assurance	QAS00901.CT	1	1/27/2001	SOP for Balance Calibraton	SOP
Quality Assurance	QAS01003.CT	1	10/1/2004	SOP for Document coding, Approval and Revisions	SOP
Quality Assurance	QAS01101.CT	1	2/23/1999	SOP for Thermometer Calibration	SOP
Quality Assurance	QAS01301CT	1	1/10/2003	SOP for Corrections to Lab Documents	SOP
Quality Assurance	QAS01201.CT	1	4/10/2000	SOP for Temperature Monitoring of Lab Equipment	SOP
Quality Assurance	QAS01501.CT	1	3/15/2001	SOP for Glassware Cleaning	SOP
Quality Assurance	QAS01601.CT	1	6/1/2003	SOP for Employee Training	SOP

Standard Operating Procedures Listing

Dept	Document Number	Revision	Active Date	SOP Title	Document Type
Quality Assurance	QAS01700.CT	0	02/22/99	SOP for Conducting MDL Studies	SOP
Quality Assurance	QAS01800.CT	0	03/01/99	SOP for Reagent Control and Coding	SOP
Quality Assurance	QAS01900.CT	0	09/01/99	SOP for Terms and Definitions	SOP
Quality Assurance	QAS02001.CT	1	02/12/03	SOP for PT Testing	SOP
Quality Assurance	QAS02102.CT	2	02/24/03	SOP for Maintenance logs	SOP
Quality Assurance	QAS02200.CT	0	04/10/00	SOP for Sample Prep for MEOH preserved Volatiles	SOP
Quality Assurance	QAS02400.CT	0	05/01/04	SOP for Independent QA Review	SOP
Report Preparation	RPS00304.CT	4	04/25/00	Preparation and Review of Laboratory Reports	SOP
Report Preparation	RPS00400.CT	0	03/21/95	Report Retrieval	SOP
Report Preparation	RPS00600.CT	0	10/07/04	EDD Generation	SOP
Health and Safety	SFS00202.CT	2	06/03/02	Operating and Maintaining Fume Hoods	SOP
Health and Safety	SFS00101.CT	1	01/14/05	Tracking and Collection of Hazardous Waste	SOP
Radiological	RAS00102.CT	2	06/03/02	Tracking and Collection of Mixed Waste	SOP
Radiological	RAS00202.CT	2	06/03/02	Radioactivity Swipe Tests	SOP
Radiological	RAS00302.CT	2	06/03/02	Radiation Screening	SOP
Radiological	RAS00400.CT	0	08/24/94	Management/Disposal of Mixed Waste	SOP

APPENDIX, Section 9

LISTING OF ANALYTICAL CAPABLITIES

STL Analytical Capabilities List

STL Connecticut

Program	Technique	Analyte Group	Method	Source	Description
Solid & Hazardous Waste	Waste Characterization	Waste Characterization	1020A	SW-846	Flashpoint (Setaflash)
Solid & Hazardous Waste	Waste Characterization	Waste Characterization	1030	SW-846	Ignitability of Solids
Solid & Hazardous Waste	Waste Characterization	Waste Characterization	1030	SW-846	Flashpoint of Solids
Non-potable Water	Colorimetric	General Chemistry	110.2	EPA	Color
Non-potable Water	Electrometric	General Chemistry	120.1	EPA	Conductance, Specific
Solid & Hazardous Waste	TCLP	Leach	1311	SW-846	Toxicity Characteristic Leachate Procedure
Solid & Hazardous Waste	SPLP	Leach	1312	SW-846	Synthetic Precipitate Leachate Procedure
Non-potable Water	General Chemistry	General Chemistry	140.1	EPA	Odor
Drinking Water	Electrometric	General Chemistry	150.1	EPA	pH
Non-potable Water	Electrometric	General Chemistry	150.1	EPA	pH
Non-potable Water	Gravimetric	Residue Testing, solids	160.1	EPA	Solids, Total Dissolved
Non-potable Water	Gravimetric	Residue Testing, solids	160.2	EPA	Solids, Total Suspended
Non-potable Water	Gravimetric	Residue Testing, solids	160.3	EPA	Solids, Total
Non-potable Water	Gravimetric	Residue Testing, solids	160.3	EPA	Moisture, Percent (%)
Non-potable Water	Gravimetric	Residue Testing, solids	160.4	EPA	Solids, Total Volatile
Non-potable Water	Gravimetric	Residue Testing, solids	160.4	EPA	Solids, Volatile Suspended
Non-potable Water	Gravimetric	General Chemistry	160.5	EPA	Solids, Settleable
Non-potable Water	Gravimetric	Residue Testing, solids	160.5	EPA	Solids, Settleable
Non-potable Water	Gravimetric	Hydrocarbons	1664A	EPA	Oil & Grease
Non-potable Water	Turbidimetric	General Chemistry	180.1	EPA	Turbidity
Drinking Water	Turbidimetric	General Chemistry	180.1	EPA	Turbidity
Drinking Water	ICP	Metals	200.7	EPA	ICP Metals
Non-potable Water	ICP	Metals	200.7	EPA	ICP Metals
Non-potable Water	Calculation	General Chemistry	200.7	EPA	Hardness (calculation from ICP results)
CLP	ICP	Metals	200.7 CLP-M	CLP ILM04.0	ICP Metals
Non-potable Water	General Chemistry	General Chemistry	2120B	SM	Color
Drinking Water	General Chemistry	General Chemistry	2120B	SM	Color
Non-potable Water	Turbidimetric	General Chemistry	2130 B	SM	Turbidity

Drinking Water	Turbidimetric	General Chemistry	2130 B	SM	Turbidity
Non-potable Water	Titrimetric	General Chemistry	2320 B	SM	Alkalinity, Hydroxide
Non-potable Water	Titrimetric	General Chemistry	2320 B	SM	Alkalinity, Bicarbonate
Non-potable Water	Titrimetric	General Chemistry	2320 B	SM	Alkalinity, Total
Non-potable Water	Titrimetric	General Chemistry	2320 B	SM	Alkalinity, Carbonate
Drinking Water	Titrimetric	General Chemistry	2320B	SM	Alkalinity, Bicarbonate
Drinking Water	Titrimetric	General Chemistry	2320B	SM	Alkalinity, Total
Drinking Water	Titrimetric	General Chemistry	2320B	SM	Alkalinity, Carbonate
Non-potable Water	Calculation	General Chemistry	2340B	SM	Hardness
Drinking Water	Calculation	General Chemistry	2340B	SM	Hardness (by calculation)
Non-potable Water	CVAA	Metals	245.1	EPA	Mercury-Hg (cold vapor)
Drinking Water	CVAA	Metals	245.1	EPA	Mercury-Hg (cold vapor)
CLP	CVAA	Metals	245.1 CLP-M	CLP ILM04.0	Mercury-Hg (water by manual cold vapor)
CLP	CVAA	Metals	245.5 CLP-M	CLP ILM04.0	Mercury-Hg (soil by manual cold vapor)
Drinking Water	Electrometric	General Chemistry	2510B	SM	Conductance, Specific
Non-potable Water	Electrometric	General Chemistry	2510B	SM	Conductance, Specific
Non-potable Water	Gravimetric	General Chemistry	2520B	SM	Salinity
Non-potable Water	Gravimetric	Residue Testing, Solids	2540 B	SM	Solids, Total
Drinking Water	Gravimetric	Residue Testing, Solids	2540 C	SM	Solids, Total Dissolved
Non-potable Water	Gravimetric	Residue Testing, Solids	2540 C	SM	Solids, Total Dissolved
Non-potable Water	Gravimetric	Residue Testing, Solids	2540 D	SM	Solids, Total Suspended
Non-potable Water	General Chemistry	General Chemistry	2710D	SM	Sludge Volume Index
Non-potable Water	Ion Chromatography	Anions	300	EPA	Phosphate (Ortho)
Non-potable Water	Ion Chromatography	Anions	300	EPA	Sulfate, as SO4
Non-potable Water	Ion Chromatography	Anions	300	EPA	Nitrite-Nitrogen
Non-potable Water	Ion Chromatography	Anions	300	EPA	Nitrate-Nitrogen
Non-potable Water	Ion Chromatography	Anions	300	EPA	Anions, by IC (Br, PO4, SO4, NO3, NO2,Cl, F)
Non-potable Water	Ion Chromatography	Anions	300	EPA	Fluoride
Non-potable Water	Ion Chromatography	Anions	300	EPA	Nitrate/Nitrite
Non-potable Water	Ion Chromatography	Anions	300	EPA	Chloride
Non-potable Water	Ion Chromatography	Anions	300	EPA	Bromide
Drinking Water	Ion Chromatography	Anions	300.0	EPA	Phosphate (Ortho)
Drinking Water	Ion Chromatography	Anions	300.0	EPA	Anions, by IC (Br, PO4, SO4, NO3, NO2,Cl, F)
Drinking Water	Ion Chromatography	Anions	300.0	EPA	Nitrite-Nitrogen
Drinking Water	Ion Chromatography	Anions	300.0	EPA	Nitrate/Nitrite
Drinking Water	Ion Chromatography	Anions	300.0	EPA	Fl Fluoride (IC)

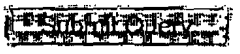
Drinking Water	Ion Chromatography	Anions	300.0	EPA	Sulfate, as SO4
Drinking Water	Ion Chromatography	Anions	300.0	EPA	Nitrate-Nitrogen
Drinking Water	Ion Chromatography	Anions	300.0	EPA	Chloride
Solid & Hazardous Waste	Digestion	Metals	3010A	SW-846	Acid Digest of Aqueous Samples for Total Metals FLAA& ICP
Solid & Hazardous Waste	Digestion	Metals	3050B	SW-846	Acid Digest of Sediments, Sludges & Soils
Non-potable Water	Titrimetric	General Chemistry	310.1	EPA	Alkalinity, Bicarbonate
Non-potable Water	Titrimetric	General Chemistry	310.1	EPA	Alkalinity, Hydroxide
Drinking Water	Titrimetric	General Chemistry	310.1	EPA	Alkalinity, Carbonate
Drinking Water	Titrimetric	General Chemistry	310.1	EPA	Alkalinity, Hydroxide
Non-potable Water	Titrimetric	General Chemistry	310.1	EPA	Alkalinity, Total
Drinking Water	Titrimetric	General Chemistry	310.1	EPA	Alkalinity, Total
Non-potable Water	Titrimetric	General Chemistry	310.1	EPA	Alkalinity, Carbonate
Drinking Water	Titrimetric	General Chemistry	310.1	EPA	Alkalinity, Bicarbonate
Non-potable Water		Hydrocarbons	310.13	NY	Petroleum Hydrocarbons (TPHC)
Drinking Water	Spectrophotometric	General Chemistry	330.5	EPA	Chlorine Residual
Non-potable Water	Spectrophotometric	General Chemistry	330.5	EPA	Chlorine Residual, DPD
Non-potable Water	Spectrophotometric	Cyanides	335.1	EPA	Cyanide, Amenable to Chlorination
CLP	Spectrophotometric	Cyanides	335.2 CLP-M	CLP ILM04.0	Cyanide, Total
Drinking Water	Spectrophotometric	Cyanides	335.4	EPA	Cyanide, Total
Non-potable Water	Spectrophotometric	Cyanides	335.4	EPA	Cyanide, Total (Semi-automated)
Drinking Water	Colorimetric	Nitrogen Series	350.1	EPA	Ammonia, Nitrogen (w. distillation)
Non-potable Water	Spectrophotometric	Nitrogen Series	350.1	EPA	Ammonia, Nitrogen (w. distillation)
Non-potable Water	Spectrophotometric	Nitrogen Series	350.1	EPA	Ammonia, Nitrogen (Automated phenate)
Non-potable Water	Spectrophotometric	Nitrogen Series	350.1	EPA	Nitrogen, Total Organic (TON), automated phenate
Drinking Water	Colorimetric	Nitrogen Series	350.1	EPA	Ammonia, Nitrogen (Automated phenate)
Non-potable Water	Spectrophotometric	Nitrogen Series	350.2	EPA	Ammonia, Nitrogen (w. distillation)
Non-potable Water	Spectrophotometric	General Chemistry	3500-CR D	SM	Chromium (Hexavalent)
Non-potable Water	Spectrophotometric	Metals	3500-FE D	SM	Ferrous Iron
Non-potable Water	Spectrophotometric	Nitrogen Series	351.2	EPA	Nitrogen, Total Kjeldahl (TKN)
Non-potable Water	Spectrophotometric	Nitrogen Series	351.2	EPA	Nitrogen, Total Organic (TON), automated
Non-potable Water	General Chemistry	Nitrogen series	351.2-350.1	EPA	Organic Nitrogen (calculation)
Solid & Hazardous Waste	Extraction	Organics	3510C	SW-846	Separatory Funnel Liquid-Liquid
Solid & Hazardous Waste	Extraction	Organics	3520C	SW-846	Continuous Liquid-Liquid
Non-potable Water	Spectrophotometric	Nitrogen Series	353.2	EPA	Nitrate/Nitrite, Automated Cd Reduction

Non-potable Water	Spectrophotometric	Nitrogen Series	353.2	EPA	Nitrite-Nitrogen, Automated Cd Reduction
Non-potable Water	Spectrophotometric	Nutrients	353.2	EPA	Nitrate-Nitrogen, Automated Cd Reduction
Drinking Water	Spectrophotometric	Nutrients	353.2	EPA	Nitrate-Nitrogen
Drinking Water	Spectrophotometric	Nitrogen Series	353.2	EPA	Nitrite-Nitrogen
Drinking Water	Spectrophotometric	Nitrogen Series	353.2	EPA	Nitrate/Nitrite
Non-potable Water	Spectrophotometric	Nitrogen Series	354.1	EPA	Nitrite-Nitrogen
Solid & Hazardous Waste	Extraction	Organics	3541	SW-846	Soxhlet (Automated)
Solid & Hazardous Waste	Extraction	Organics	3550B	SW-846	Ultrasonic Extraction
Solid & Hazardous Waste	Extraction	Organics	3580A	SW-846	Waste Dilution
Non-potable Water	Potentiometric	General Chemistry	360.1	EPA	Oxygen, Dissolved
Solid & Hazardous Waste	Clean-Up	Organics	3610B	SW-846	Alumina Cleanup
Solid & Hazardous Waste	Clean-Up	Organics	3620B	SW-846	Florisil Cleanup
Solid & Hazardous Waste	Clean-Up	Organics	3640A	SW-846	Gel-Permeation Cleanup
Non-potable Water	Spectrophotometric	Nutrients	365.2	EPA	Phosphate (Ortho)
Non-potable Water	Spectrophotometric	Nutrients	365.2	EPA	Phosphorus (Total), Persulfate digestion
Solid & Hazardous Waste	Clean-Up	Organics	3660B	SW-846	Sulfur Cleanup
Solid & Hazardous Waste	Clean-Up	Organics	3665A	SW-846	Sulfuric Acid/Permanganate Cleanup
Non-potable Water	Titrimetric	Sulfide Species	376.1	EPA	Sulfide, as S
Non-potable Water	Potentiometric	Demand Series	405.1	EPA	BOD5
Non-potable Water	Spectrophotometric	Demand Series	410.4	EPA	COD, Automated
Non-potable Water	Gravimetric	Hydrocarbons	413.1	EPA	Oil & Grease
Non-potable Water	Infrared Spectrophotometric	Carbon	415.1	EPA	Total Organic Carbon (TOC)
Non-potable Water	Infrared Spectrophotometric	Carbon	415.1	EPA	Dissolved Organic Carbon
Non-potable Water	Gravimetric	Hydrocarbons	418.1	EPA	Petroleum Hydrocarbons-IR (TPHC)
Non-potable Water	Spectrophotometric	Phenols	420.2	EPA	Phenols, Total (Automated)
Drinking Water	General Chemistry	General Chemistry	4500-Cl D, E, F, G, I	SM	Chlorine, Total
Drinking Water	General Chemistry	General Chemistry	4500-Cl G	SM	Chlorine Residual
Non-potable Water	General Chemistry	General Chemistry	4500-Cl G	SM	Chlorine Residual
Drinking Water	Spectrophotometric	Cyanides	4500-CN C E	SM	Cyanide, Total
Drinking Water	Colorimetric	General Chemistry	4500-CN E	SM	Cyanide, Total
Non-potable	Spectrophotometric	Cyanides	4500-CN G	SM	Cyanide, Amenable to Chlorination

Water					
Drinking Water	Spectrophotometric	Cyanides	4500-CN G	SM	Cyanide, Amenable to Chlorination
Non-potable Water	Spectrophotometric	Cyanides	4500-CN I	SM	Cyanide, Weak & Dissociable
Non-potable Water	Spectrophotometric	Cyanides	4500-CN I	SM	Cyanide, Free (Weak Acid Dissociable)
Non-potable Water	Electrometric	General Chemistry	4500-H+B	SM	pH
Drinking Water	Electrometric	General Chemistry	4500-H+B	SM	pH
Non-potable Water	Potentiometric	General Chemistry	4500-O G	SM	Oxygen, Dissolved
Solid & Hazardous Waste	Purge and Trap	Volatile Organics	5030B	SW-846	Purge and Trap for Aqueous Samples
Solid & Hazardous Waste	Purge and Trap	Volatile Organics	5035	SW-846	Closed System Purge and Trap for Soils and Waste
Drinking Water	GC/MS	Volatile Organics	524.2	EPA	Volatiles, Drinking Water
Drinking Water	GC/MS	Volatile Organics	524.2	EPA	Tentatively Identified Compounds (TICs)
Solid & Hazardous Waste	ICP	Metals	6010B	SW-846	Metals
Non-potable Water	GC/ECD	Pesticides	608	EPA	Organochlorine Pesticides
Non-potable Water	GC/ECD	Pesticides	608.1	EPA	Organochlorine Pesticides
Non-potable Water	GC/ECD	Pesticides	614	EPA	OP Pesticides
Non-potable Water	GC/MS	Volatile Organics	624	EPA	Volatiles
Non-potable Water	GC/MS	Semivolatile Organics	625	EPA	Polynuclear Aromatic Hydrocarbons (PAHs)
Non-potable Water	GC/MS	Semivolatile Organics	625	EPA	Semivolatiles
Solid & Hazardous Waste	Colorimetric	Metals	7196A	SW-846	Chromium (Hexavalent)
Solid & Hazardous Waste	CVAA	Metals	7470A	SW-846	Mercury in Liquid Waste
Solid & Hazardous Waste	CVAA	Metals	7471A	SW-846	Mercury in Solid or Semisolid Waste
Solid & Hazardous Waste	GC/FID	Hydrocarbons	8015B	SW-846	Diesel Range Organics
Solid & Hazardous Waste	GC/FID Direct Aqueous Injection	Volatile Organics	8015B	SW-846	VOC-DAI-Direct Aqueous Injection
Solid & Hazardous Waste	GC/ECD	Pesticides	8081A	SW-846	Organochlorine Pesticides
Solid & Hazardous Waste	GC/ECD	PCBs	8082	SW-846	PCBs
Solid & Hazardous Waste	GC/NPD	Pesticides	8141A	SW-846	Organophosphorous Pesticides
Solid & Hazardous Waste	GC/MS	Volatile Organics	8260B	SW-846	Volatile Organic Compounds
Solid & Hazardous	GC/MS	Semivolatile Organics	8270C	SW-846	PAHs GC/MS Scan Low Level

Waste					
Solid & Hazardous Waste	GC/MS	Semivolatile Organics	8270C	SW-846	Semivolatiles
Solid & Hazardous Waste	GC/MS	Semivolatile Organics	8270C SIM	SW-846	PAHs GC/MS SIM Low Level
Solid & Hazardous Waste	Spectrophotometric	Cyanides	9012A	SW-846	Cyanide, Amenable to Chlorination
Solid & Hazardous Waste	Spectrophotometric	Cyanides	9012A	SW-846	Cyanide, Total
Solid & Hazardous Waste	Titrimetric	Sulfide Species	9034	SW-846	Sulfide, Acid Insoluble
Solid & Hazardous Waste	Electrometric	General Chemistry	9040B	SW-846	Corrosivity, as pH
Solid & Hazardous Waste	Electrometric	General Chemistry	9045C	SW-846	pH, Solid & Waste
Solid & Hazardous Waste	Ion Chromatography	Nutrients	9056	SW-846	Nitrate-Nitrogen
Solid & Hazardous Waste	Ion Chromatography	Anions	9056	SW-846	Nitrite-Nitrogen
Solid & Hazardous Waste	Ion Chromatography	Anions	9056	SW-846	Chloride
Solid & Hazardous Waste	Ion Chromatography	Anions	9056	SW-846	Phosphate [Ortho]
Solid & Hazardous Waste	Ion Chromatography	Nutrients	9056	SW-846	Nitrate/Nitrite
Solid & Hazardous Waste	Ion Chromatography	Anions	9056	SW-846	Bromide
Solid & Hazardous Waste	Ion Chromatography	Anions	9056	SW-846	Fl Fluoride (IC)
Solid & Hazardous Waste	Ion Chromatography	Anions	9056	SW-846	Anions
Solid & Hazardous Waste	Ion Chromatography	Anions	9056	SW-846	Sulfate, as SO4
Solid & Hazardous Waste	Infrared Spectrophotometric	Carbon	9060	SW-846	Total Organic Carbon (TOC)
Solid & Hazardous Waste	Colorimetric	Phenols	9066	SW-846	Phenols, Total
Solid & Hazardous Waste	General Chemistry	Physical Properties	9095A	SW-846	Paint Filter Test
Solid & Hazardous Waste	Waste Characterization	Waste Characterization	Chapter 7, Ignitability	SW-846	Ignitability
CLP	Digestion	Metals	CLP Metals Digestion	ILM04.0	CLP Metals Digestion
Other	General Chemistry	Leach	D-3987	ASTM	ASTM Leaching Procedure
Non-potable Water	Titrimetric	Carbon	Lloyd Kahn	Region II	Total Organic Carbon (TOC)

Clean Air	GC/MS	Semivolatile Organics	Mod TO-13A	EPA	Polynuclear Aromatic Hydrocarbons (PAHs)
CLP	GC/ECD	Pesticides/PCBs	Pesticides / Aroclors	CLP OLM03.2	Organochlorine Pesticides / PCBs
CLP	GC/ECD	Pesticides/PCBs	Pesticides / Aroclors	CLP OLM04.1	Organochlorine Pesticides / PCBs
CLP	GC/ECD	Pesticides/PCBs	Pesticides / Aroclors	CLP OLM04.2	Organochlorine Pesticides / PCBs
CLP	GC/MS	Semivolatile Organics	Semivolatile Organics	CLP OLC02.1	Semivolatiles, Low Level
CLP	GC/MS	Semivolatile Organics	Semivolatile Organics	CLP OLM04.1	Semivolatiles
CLP	GC/MS	Semivolatile Organics	Semivolatile Organics	CLP OLM04.2	Semivolatiles
CLP	GC/MS	Semivolatile Organics	Semivolatile Organics	CLP OLM03.2	Semivolatiles
Solid & Hazardous Waste	Waste Characterization	Waste Characterization	SW846,Chapter7	SW-846	Sulfide (Reactive)
Solid & Hazardous Waste	Waste Characterization	Waste Characterization	SW846,Chapter7	SW-846	Cyanide (Reactive)
Clean Air	GC/MS	Semivolatile Organics	TO-13	EPA	Polyaromatic Hydrocarbons by GC/MS
Clean Air	GC/ECD	Pesticides	TO-4	EPA	Pesticide by GC
Non-potable Water	Calculation	General Chemistry	Total Cr - Cr+6	SM	Chromium, Trivalent by Difference
CLP	GC/MS	Volatile Organics	Volatile Organics	CLP OLM03.2	Volatiles
CLP	GC/MS	Volatile Organics	Volatile Organics	CLP OLM04.1	Volatiles
CLP	GC/MS	Volatile Organics	Volatile Organics	CLP OLM04.2	Volatiles
CLP	GC/MS	Volatile Organics	Volatile Organics	CLP OLC02.1	Volatiles, Low Level



Appendix B
Groundwater Monitoring Plan

Off-Site Interim Remedial Measure
Former Unisys Facility
Great Neck, New York

NYSDEC Site ID# 130045

March 2006

BBL
ENVIRONMENTAL SERVICES, INC.
Remedial Management & Construction

Table of Contents

Tables

Figure

1. Introduction

ARCADIS G&M, Inc. (ARCADIS) originally prepared this Groundwater Monitoring Plan on behalf of Lockheed Martin Corporation (Lockheed Martin) for the Off-Site Interim Remedial Measure (IRM) for Operable Unit 2 (OU-2) associated with the former Unisys Corporation (Unisys) facility located at 365 Lakeville Road in Great Neck, New York (see Figure 1 of the Operation, Maintenance and Monitoring [OM&M] Manual). This plan was subsequently revised by BBL Environmental Services, Inc. (BBLES), in conjunction with Blasland, Bouck & Lee, Inc. The purpose of this monitoring plan is to establish a monitoring network, define the analytical parameters, and establish a schedule for monitoring the effectiveness of the Off-Site IRM.

The Off-Site IRM utilizes one recovery well (designated as RW-100) whose location is shown on Figure 1 in Appendix B. The remedial goals for the Off-Site IRM are to help protect drinking water wells and minimize further contaminant intrusion into the North Hills Special Groundwater Protection Area (SGPA).

This Groundwater Monitoring Plan describes the monitoring plan objectives, the monitoring network, the water level and groundwater sampling methodologies, the analytical parameters, and the hydraulic and groundwater sampling and reporting schedules. Ultimately this monitoring plan will be incorporated into an overall monitoring plan which covers both of the on-site area, designated Operable Unit 1 (OU-1), and the off-site OU-2 areas. A remedy for the off-site areas will be developed as part of the OU-2 Feasibility Study (FS).

The objectives of this monitoring plan are as follows:

- To monitor groundwater flow patterns and determine the area of influence created by the operation of the Off-Site IRM; and

- To determine and monitor groundwater quality concentration trends at strategic locations.

2. Monitoring Network

Groundwater monitoring in the area of the Off-Site IRM includes both hydraulic (water level) measurements and groundwater quality monitoring. The monitoring network has been established to satisfy the objectives described in Section 1. A total of 28 wells are included in the hydraulic monitoring network (27 monitoring wells and one recovery well). A total of 16 wells are included in the groundwater quality monitoring network. Table 1 summarizes the wells included in the monitoring plan for hydraulic monitoring and groundwater quality. Figure 1 shows the locations of wells in the monitoring network. Table 2 provided more details on the monitoring wells in the monitoring network. The number of wells in the monitoring network may be modified based on a review of the monitoring reports and with prior New York State Department of Environmental Conservation (NYSDEC) approval.

3. Water Level Measurement Methodology

Water level measurements will be collected to the nearest hundredth of a foot (0.01 ft) from the wells in the hydraulic monitoring network using a decontaminated electric water level indicator. A synoptic round of water level measurements will be completed on the same day from the wells listed on Table 1. Additional water-level measurement protocols/requirements are described in the Sampling and Analysis Plan (SAP) included as Appendix A of the OM&M Manual.

4. Groundwater Quality Sampling Methodology

Groundwater samples to be collected as part of the groundwater monitoring program will be analyzed for Target Compound List (TCL) volatile organic compounds (VOCs) plus freons using NYSDEC Analytical Services Protocol (ASP) Method 2000-1, as specified in the SAP (see Appendix A of the OM&M Manual). Evacuation and collection of groundwater samples from monitoring wells will be conducted in accordance with the 1995 United States Environmental Protection Agency (USEPA) Region II Draft Groundwater Sampling Procedure for Low-Flow Pump Purging and Sampling, as discussed in the SAP (see Appendix A of the OM&M Manual). Groundwater samples collected from the recovery well will be collected in accordance with the sampling protocols established in the SAP.

Quality assurance/quality control (QA/QC) samples to be collected as part of the groundwater monitoring program will include blind duplicates, matrix spike/matrix spike duplicate (MS/MSD), field blanks, and trip blanks. QA/QC samples will be collected in accordance with the Quality Assurance Project Plan (QAPP). The QAPP is Attachment A-1 to the SAP (see Appendix A of the OM&M Manual). Decontamination procedures and waste disposal guidelines are also discussed in the SAP. Data validation guidelines are established in the QAPP.

5. Health and Safety

The site-specific Health and Safety Plan (HASP) covering water-level measurement and groundwater sampling procedures is provided in Appendix H of the OM&M Manual.

6. Hydraulic Monitoring Schedule and Reporting

Baseline operational hydraulic monitoring will commence prior to the initial startup of the Off-Site IRM. Hydraulic monitoring will continue following start-up of the Off-Site IRM once per month for six months and then quarterly for the remainder of the first year (two additional water level measurement events). Thereafter, water levels will be measured annually. Initially, groundwater elevations will be measured in the 27 monitoring wells and the recovery well (a total of 28 wells). The number of wells in the baseline operational hydraulic monitoring network may be modified after the first six months of monitoring is complete based on the review of the monitoring reports and with the NYSDEC's prior approval.

Water-level elevation results will be tabulated and added to the existing database. These data will be plotted on maps for all four aquifer zones (upper Glacial, and the upper, middle, and lower portions of the Magothy aquifer) and will be contoured, if possible. The figures will be reviewed to assess the area of influence created by the pumping at recovery well RW-100. Vertical hydraulic gradients will also be analyzed to determine vertical flow gradients.

Upon completion of water-level measurement rounds and the reduction of the field records, the data will be included in the Off-Site IRM Reports. The reports will include a description of the field work, tabulated water level results, tabulated vertical gradients, and groundwater maps. These reports are discussed in more detail in the separately-bound Performance Analysis and Design Modification (PADM) Plan.

These operational water level data will be used, along with the groundwater quality data, to assess the overall performance of the Off-Site IRM. Conclusions will be included based on the data generated in the reporting period and over the period of record. In addition, recommendations, if appropriate, will be provided for changes to the monitoring program, as needed. Changes to the monitoring program and reporting schedule will only be made with prior NYSDEC approval.

7. Groundwater Quality Sampling Schedule and Reporting

Baseline operational groundwater quality sampling will commence following start-up of the Off-Site IRM. Groundwater samples will be collected and analyzed from the 15 monitoring wells and the recovery well (total of 16 locations) twice a year for the first year of operation (after the start-up period). Thereafter, groundwater samples will be collected annually. The number of wells in the groundwater quality network may be additionally modified after the first year of monitoring (i.e., two rounds) is complete based on the review of the analytical reports and with the NYSDEC's prior approval.

Groundwater quality results will be tabulated and added to the existing database. Groundwater Applicable or Relevant and Appropriate Requirements (ARARs) will be included with the tabulated groundwater quality results. The primary VOCs of concern (cis-1,2,dichloroethene, trichloroethene, tetrachloroethene, vinyl chloride, and 1,1,2-trichlorotrifluroethane [freon 113]) will be monitored and compared to the ARARs. Table 3 summarizes the ARARs. In addition, total volatile organic compounds (TVOC) groundwater quality results will be plotted over time for the 16 wells in the groundwater monitoring network. The plots will include historical data, if available. The plots will be reviewed to determine the effectiveness of the Off-Site IRM.

Upon completion of the groundwater quality sampling rounds, receipt of the data from the analytical laboratory and validation of the analytical data, Off-Site IRM Reports will be prepared. Each report will include a description of the field work, tabulated groundwater quality results, and graphs showing groundwater quality over time for select wells sampled. The reports are discussed in more detail in the separately-bound PADM Plan.

The operational groundwater quality data, along with the water-level data, will be used to assess the overall performance of the Off-Site IRM. Conclusions based on the data generated in the reporting period and over the period of record will be included. In addition, recommendations, as appropriate, will be provided for changes to the monitoring program, as needed. Changes in the sampling program and reporting schedule will only be made with prior NYSDEC approval.

Tables

BBL
ENVIRONMENTAL SERVICES, INC.
Remedial Management & Construction

TABLE 1

FORMER UNISYS FACILITY
GREAT NECK, NEW YORK
OFF-SITE INTERIM REMEDIAL MEASURE

GROUNDWATER MONITORING NETWORK

Wells[1]	Screened Zone	Water Quality Sample	Water-Level Measurement
Recovery Well			
RW-100	UM/MM	X	X
Diffusion Wells			
DW-100	MM/BM		X
DW-101	BM		X
DW-102	BM		X
Monitoring Wells			
13ML	MM	X	X
14MI	UM	X	
16GL	UG	X	X
16ML	UM	X	X
17GL	UM	X	X
17ML	BM	X	X
18GL	UG		X
18ML	MM		X
22GL	UM		X
22ML	MM		X
30GL	UG		X
30MI	MM		X
30ML	BM		X
37MU	UM		X
37MI	MM		X
37ML	BM		X
38MU	UM	X	X
38MI	MM	X	X
38ML	BM	X	X
39MU	UM	X	X
39MI	MM	X	X
39ML	BM	X	X
N3905	UM	X	X
N4243	UM	X	X
N5710	MM/BM	X	X
	TOTALS	16	28

Note:
UG - Upper Glacial Aquifer
UM - Upper Magothy Zone
MM - Middle Magothy Zone
BM - Basal Magothy Zone

(1) The wells included in the monitoring network may be modified based on a review of the monitoring and analytical reports, and with New York State Department of Environmental Conservation prior approval.

TABLE 2

FORMER UNISYS FACILITY
GREAT NECK, NEW YORK
OFF-SITE INTERIM REMEDIAL MEASURE

MONITORING WELLS INCLUDED IN THE GROUNDWATER MONITORING NETWORK

Well Destination	Date Installed	Total Depth (feet bls)	Well Diameter (inches) top/bottom	Land Surface Elevation (feet relative to msl)	Measuring Point Elevation (feet relative to msl)	Screened Interval (feet bls)	Screened Interval (feet relative to msl)	Installed by	Notes or Well Use as per Well Completion Report	Screened Aquifier
13ML	April 96	275	4	--	158.97	255 to 275	-96 to -116*	Former Unisys Facility	Monitoring	MM
14MI	April 96	250	4	--	160.52	220 to 250	-59 to -89*	Former Unisys Facility	Monitoring	UM
16GL	April 96	222	4	--	227.08	202 to 222	25 to 5*	Former Unisys Facility	Monitoring	UG
16ML	August 95	326	4	--	227.11	316 to 326	-89 to -99*	Former Unisys Facility	Monitoring	UM
17GL	August 94	170	4	--	138.99	155 to 165	-16 to -26*	Former Unisys Facility	Monitoring	UM
17ML	August 94	428	4	--	138.64	390 to 400	-251 to -261*	Former Unisys Facility	Monitoring	BM
18GL	September 94	170	4	--	150.24	160 to 170	-10 to -20*	Former Unisys Facility	Monitoring	UG
18ML	September 94	345	4	--	149.55	324 to 334	-174 to -184*	Former Unisys Facility	Monitoring	MM
22GL	September 94	168	4	--	135.53	158 to 168	-22 to -32*	Former Unisys Facility	Monitoring	UM
22ML	August 94	340	4	--	135.16	315 to 325	-180 to -190*	Former Unisys Facility	Monitoring	MM
30GL	September 98	210	4	136.13	138.48	190 to 210	-54 to -74	Former Unisys Facility	Monitoring	UM
30MI	August 98	280	4	136.14	138.67	260 to 280	-124 to -144	Former Unisys Facility	Monitoring	MM
30ML	August 98	380	4	136.36	138.5	360 to 380	-224 to -244	Former Unisys Facility	Monitoring	BM
37MU	July 99	252	4	180.11	179.75	242 to 252	-62 to -72	Former Unisys Facility	Monitoring	UM
37MI	June 99	325	4	180.09	179.72	315 to 325	-135 to -145	Former Unisys Facility	Monitoring	MM
37ML	July 99	428	4	180.21	179.80	418 to 428	-238 to -248	Former Unisys Facility	Monitoring	BM
38MU	August 99	242	4	186.84	186.65	232 to 242	-45 to -55	Former Unisys Facility	Monitoring	UM
38MI	August 99	344	4	188.77	188.45	334 to 344	-145 to -155	Former Unisys Facility	Monitoring	MM
38ML	August 99	444	4	188.87	188.16	430 to 440	-241 to -251	Former Unisys Facility	Monitoring	BM
39MU	September 99	206	4	158.7	158.29	196 to 206	-37 to -47	Former Unisys Facility	Monitoring	UM
39MI	September 99	312	4	158.1	157.92	302 to 312	-144 to -154	Former Unisys Facility	Monitoring	MM
39ML	October 99	407	4	159.0	158.52	397 to 407	-238 to -248	Former Unisys Facility	Monitoring	BM
N3905	June 52	259	20/12	150**	--	214 to 254	-64 to -104*	MLWD	Active	UM
N4243	August 53	260	20/12	150**	--	205 to 255	-55 to -105*	MLWD	Active	UM
N5710	January 57	390	20/12	160**	--	325 to 385	-165 to -225*	MLWD	Active	MM/BM

TABLE 2

FORMER UNISYS FACILITY
GREAT NECK, NEW YORK
OFF-SITE INTERIM REMEDIAL MEASURE

MONITORING WELLS INCLUDED IN THE GROUNDWATER MONITORING NETWORK

Notes:

msl	Mean sea level.
bls	Below land surface.
--	Information not available.
*	Elevation of screen interval based on measuring point elevation and depth to screen interval below land surface or an estimated land surface elevation. Therefore the screen interval elevation is only approximate.
**	Estimated.
MLWD	Manhasset-Lakeville Water District.
UG	Upper Glacial. Screen interval located from approximately landsurface to -24 feet relative to msl.
UM	Upper portion of the Magothy. Screen interval located from approximately -24 to -113 feet relative to msl.
MM	Middle portion of the Magothy. Screen interval located from approximately -113 to -204 feet relative to msl.
BM	Basal portion of the Magothy. Screen interval located from approximately -204 to -270 feet relative to msl.

FORMER UNISYS FACILITY
GREAT NECK, NEW YORK
OFF-SITE INTERIM REMEDIAL MEASURE

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

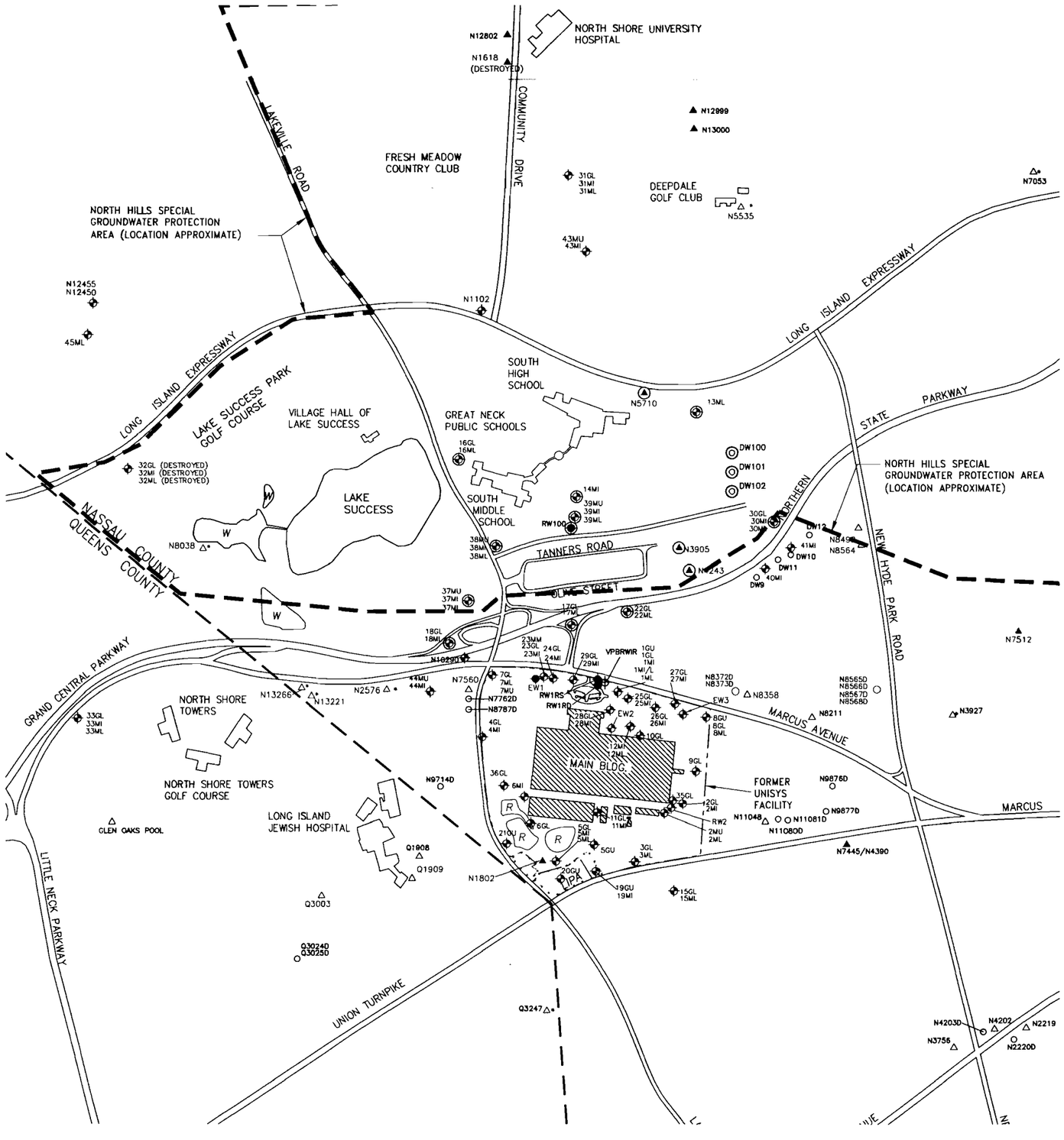
Parameter	ARARs * (µg/L)
Chloromethane	5
Bromomethane	5
Vinyl chloride	2
Chloroethane	5
Methylene chloride	5
Acetone	50
Carbon disulfide	--
1,1-Dichloroethene	5
1,1-Dichloroethane	5
1,2-Dichloroethene (total)	5 (a)
2-Butanone	50
Chloroform	7 or 100 (b)**
1,2-Dichloroethane	0.6
1,1,1-Trichloroethane	5
Carbon tetrachloride	5
Bromodichloromethane	50 or 100 (b)**
1,2-Dichloropropane	1
cis-1,3-Dichloropropene	0.4 (c)
Trichloroethene	5
Benzene	1
Dibromochloromethane	50 or 100 (d)**
trans-1,3-Dichloropropene	0.4 (b)
1,1,2-Trichloroethane	1
Bromoform	50 or 100 (d)**
4-Methyl-2-pentanone	--
2-Hexanone	50
Tetrachloroethene	5
1,1,2,2-Tetrachloroethane	5
Toluene	5
Chlorobenzene	5
Ethylbenzene	5
Styrene	5
Xylene (total)	5 (d)
Freon 113	5

Notes:

µg/L Micrograms per liter.
(a) Represents standard for cis- or trans-1-2-Dichloroethene.
(b) Sum of trihalomethanes.
(c) Applies to sum of cis- and trans-1,3-Dichloropropene.
(d) Represents standard for each of the three isomers.
* Lowest concentration of Applicable or Relevant and Appropriate Requirements (ARARs).
** Use standard that is lowest if sum of trihalomethanes or isomers is greater than 100 µg/L.

Figure

BBL
ENVIRONMENTAL SERVICES, INC.
Remedial Management & Construction



LEGEND:

- W — BODY OF WATER
- R — RETENTION BASIN
- 8GU — LOCATION AND DESIGNATION OF MONITORING WELL/CLUSTER
- EW1 — LOCATION AND DESIGNATION OF SITE EXTRACTION OR RECOVERY WELL
- N7512 ▲ — LOCATION AND DESIGNATION OF MUNICIPAL SUPPLY WELL
- N6073 △ — LOCATION AND DESIGNATION OF NON-MUNICIPAL SUPPLY WELL
- N2576 △• — LOCATION AND DESIGNATION OF NON-MUNICIPAL IRRIGATION WELL
- N8372D ○ — LOCATION AND DESIGNATION OF NON-MUNICIPAL DIFFUSION WELL
- FORMER UNISYS FACILITY PROPERTY BOUNDARY
- WELL IN OFF-SITE IRM MONITORING PROGRAM

NOTES:

BASE MAP SUPPLIED BY ARCADIS IN THE FORM OF ELECTRONIC FILE, ENTITLED "GROUND WATER MONITORING NETWORK FOR THE OFF-SITE INTERIM REMEDIAL MEASURE (IRM)" DATED 11/8/05, AT A SCALE OF 1"=800'.

0 600' 1200'
GRAPHIC SCALE

X: 38031X01.DWG
L: ON=*, OFF=REF
P: PAGESET/SYR-DL
11/17/05 SYR-85-LJP GMS
38031009/38031W02.DWG

FORMER UNISYS FACILITY
OFF-SITE IRM
GREAT NECK, NEW YORK

GROUNDWATER MONITORING NETWORK

BBL®
BLASLAND, BOUCK & LEE, INC.
engineers, scientists, economists

FIGURE
1

Appendix C

Record Drawings
(Under Separate Cover)

BBL
ENVIRONMENTAL SERVICES, INC.
Remedial Management & Construction

Appendix D

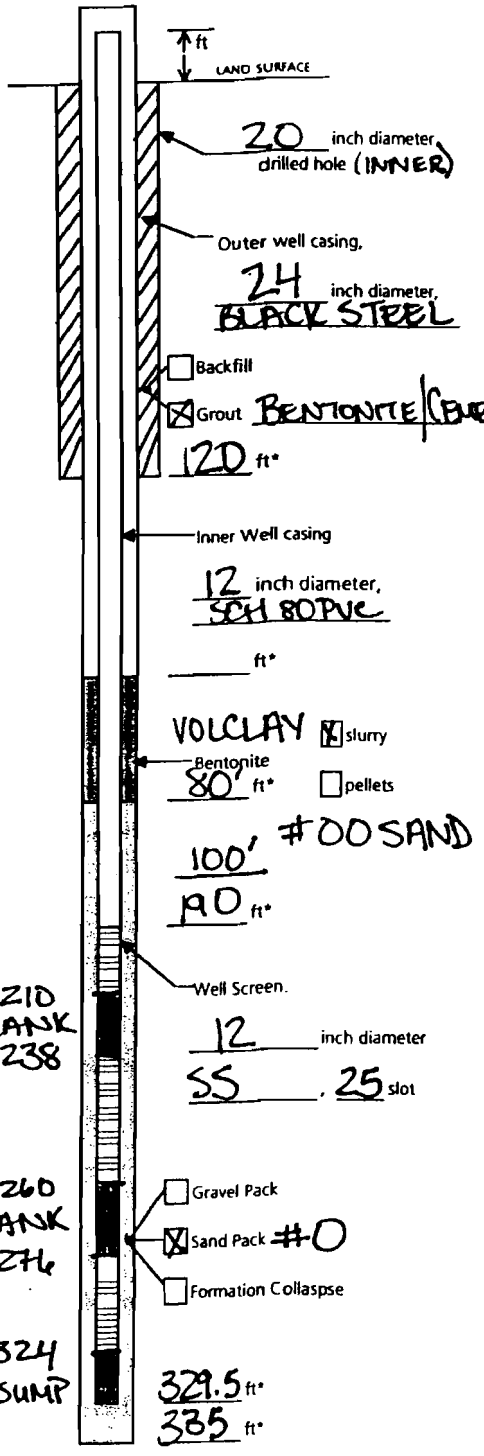
Recovery and Diffusion Well Construction Details

BBL
ENVIRONMENTAL SERVICES, INC.
Remedial Management & Construction

ARCADIS GERAGHTY & MILLER

Well Construction Log

(intermediate)



Measuring Point is Top of Well Casing Unless Otherwise Noted.

• Depth Below Land Surface

Wellintm.xls.xls
10/20/98

Project LMC OU2 South Well RW100

Town/City GREAT NECK

County NASSAU State NY

Permit No. _____

Land-Surface Elevation and Datum:

_____ feet ☐ Surveyed ☐ Estimated

Installation Date(s) 9/16 - 9/18/03

Drilling Method REVERSE ROTARY

Drilling Contractor DELTA

Drilling Fluid WATER

* SCREENS:

190-210

238-260

276-324

Development Technique(s) and Date(s)

9/30 - 10/15/04: AIR LIFTING & SURGING

10/17 - 10/24/04: PUMPING & BACKWASHING

Fluid Loss During Drilling _____ gallons

Water Removed During Development ~1.2 Mil. gallons

Static Depth to Water 121.8 feet below M.P.

Pumping Depth to Water 132.04 feet below M.P.

Pumping Duration 8 hours

Yield 510 gpm Date 10/20/03

Specific Capacity 50 gpm/ft

Well Purpose RECOVERY

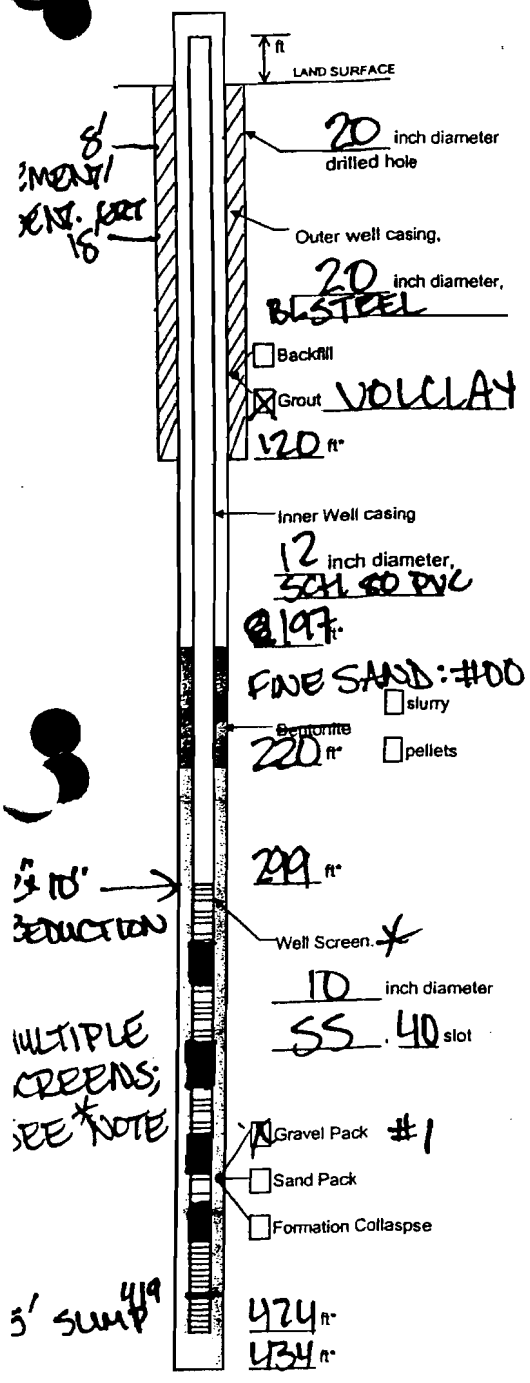
Remarks 170 Ft of Drop Pipe

Prepared by M. SAURBORN

ARCADIS GERAGHTY & MILLER

Well Construction Log

(Intermediate)



Measuring Point is Top of Well Casing Unless Otherwise Noted.

* Depth Below Land Surface

Project LMC 042 Well DW 100

Town/City GREAT NECK

County NASSAU State NY

Permit No. _____

Land-Surface Elevation and Datum:

_____ feet ☐ Surveyed ☐ Estimated

Installation Date(s) 1/12/04 - 1/14/04

Drilling Method REVERSE ROTARY

Drilling Contractor DELTA

Drilling Fluid POTABLE WATER

Development Technique(s) and Date(s)

22 JAN - 18 FEB 2004: AIR LIFTING + SURGING

20 FEB - 25 FEB 2004: PUMPING & BACKWASHING

Fluid Loss During Drilling _____ gallons

Water Removed During Development 4.26 million gallons

Static Depth to Water 95.86 feet below M.P.

Pumping Depth to Water 132.7 feet below M.P.

Pumping Duration 7.5 hours

Yield 840 gpm Date 2/25/04

Specific Capacity 22.6 gpm/ft

Well Purpose DIFFUSION OF TREATED GROUNDWATER

Remarks _____

Prepared by M. SAUERBORN

* SCREENS:

299 - 331

357 - 363

373 - 385

397 - 411

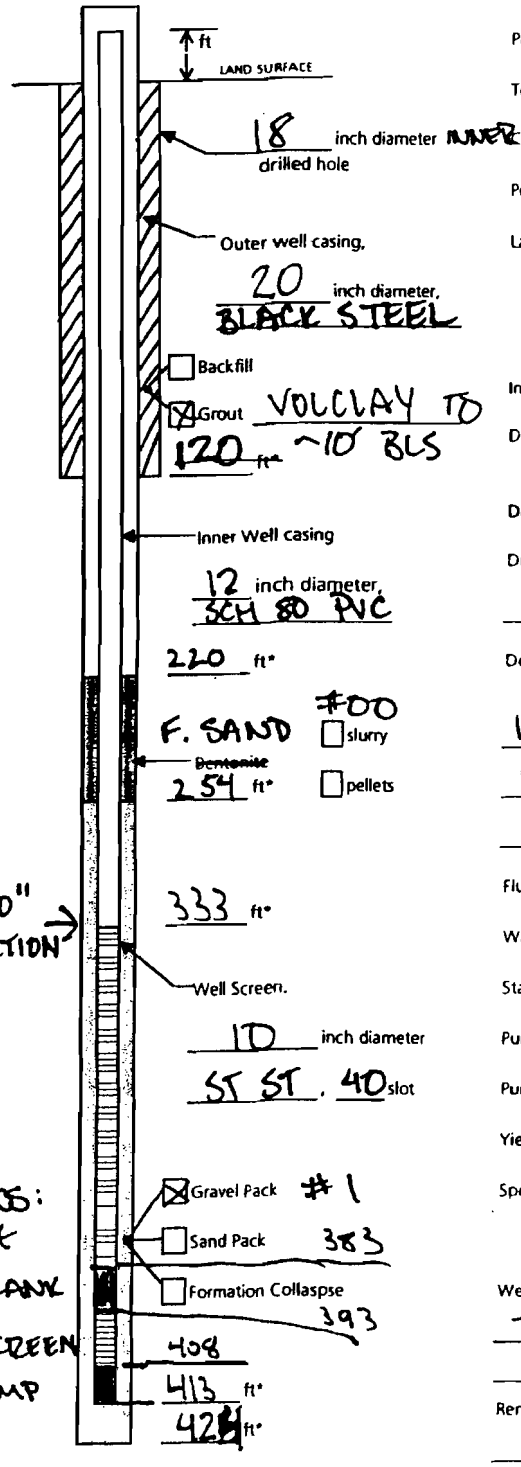
415 - 419

WELLINTM.xls
12/10/2003

ARCADIS GERAGHTY & MILLER

Well Construction Log

(intermediate)



Measuring Point is Top of Well Casing Unless Otherwise Noted.

* Depth Below Land Surface

Project LMC OU2 SOUTH well . DW101

Town/City GREAT NECK, NY

County NASSAU State NY

Permit No.

Land-Surface Elevation and Datum:

_____ feet ☐ Surveyed ☐ Estimated

Installation Date(s) NOV 17-19, 2003

Drilling Method REVERSE ROTARY

Drilling Contractor DELTA

Drilling Fluid WATER

* SCREENS
333-383
393-408

Development Technique(s) and Date(s)

11/24-12/18/04: AIR LIFTING & SURGING
1/6-1/8/04: PUMPING & BACKWASHING

Fluid Loss During Drilling _____ gallons

Water Removed During Development ~924,000 gallons

Static Depth to Water 92.85 feet below M.P.

Pumping Depth to Water 120.70 feet below M.P.

Pumping Duration ~8 hours

Yield 890 gpm Date 1/8/04

Specific Capacity ~32 gpm/ft

Well Purpose DIFFUSION OF TREATED WATER

Remarks

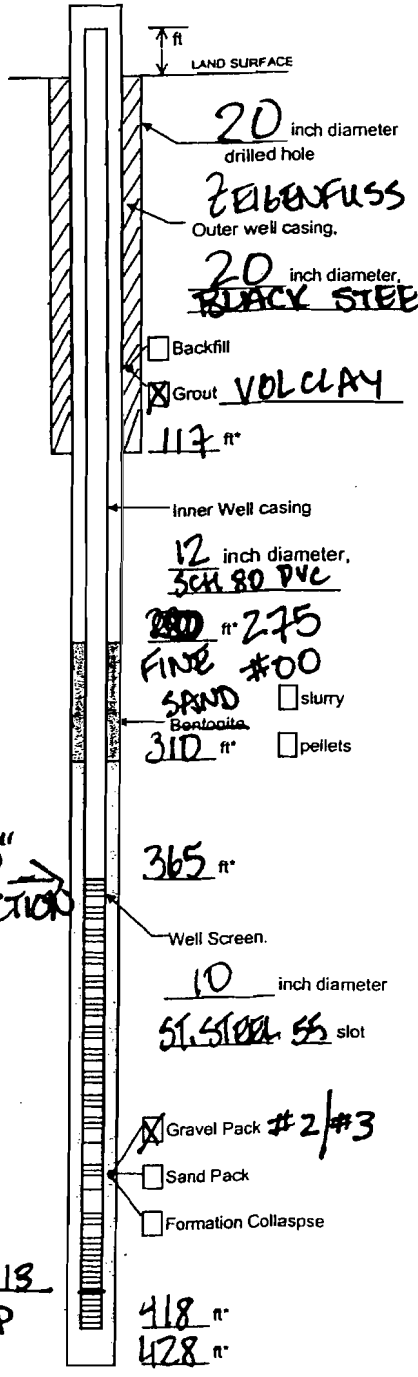
Prepared by M. SAURBORN

Wellintm.xls.xls
10/20/98

ARCADIS GERAGHTY & MILLER

Well Construction Log

(Intermediate)



Measuring Point is Top of Well Casing Unless Otherwise Noted.

* Depth Below Land Surface

Project LMC 0425 Well DW102

Town/City GREAT NECK

County NASSAU State NY

Permit No. _____

Land-Surface Elevation and Datum:

_____ feet ☐ Surveyed ☐ Estimated

Installation Date(s) 2/16 – 2/19/04

Drilling Method REVERSE ROTARY

Drilling Contractor DELTA

Drilling Fluid POTABLE WATER

Development Technique(s) and Date(s)

AIR LIFTING & SURGING: 2/23-3/1/04
PUMPING & BACKWASHING: 3/2-3/3/04

Fluid Loss During Drilling _____ gallons

Water Removed During Development ~700,000 gallons

Static Depth to Water 92.9 feet below M.P.

Pumping Depth to Water 127.6 feet below M.P.

Pumping Duration 8 hours

Yield 850 gpm Date 3/3/04

Specific Capacity ~25 gpm/ft

Well Purpose DIFFUSION OF TREATED GROUNDWATER

Remarks _____

Prepared by M. SAURBORN

WELLINTM.xls
12/10/2003

Appendix E

Manufacturer-Supplied Equipment Information (Under Separate Cover)

BBL
ENVIRONMENTAL SERVICES, INC.
Remedial Management & Construction

Appendix F

OM&M Log Sheet

BBL
ENVIRONMENTAL SERVICES, INC.
Remedial Management & Construction

OM & M LOG S ET (Page 1 of 8)
OFF-SITE INTERIM EDIAL MEASURE
FORMER UNISYS FACILITY - GREAT NECK, NEW YORK

INIT.	DATE	TIME	AIR STRIPPER SCREEN					BAG FILTER SCREEN		STATUS DISPLAY SCREEN		
			Inf. Flow	Air Flow Rate	CW-210 Level	CW-220 Level	Eff. Flow	Inf. Press.	Diff. Press.	AS Eff. Temp.	DH Eff. Temp.	VPGAC Eff. Air Flow
			gpm	scfm	feet	feet	gpm	psi	psi	° F	° F	scfm
			450 - 550	4,000 - 5,000	3.9 - 4.1	3.9 - 4.1	400 - 550	10 - 25	<10	40 - 75	90 -100	4,000-5,000
			<350/>600	<3,500	<3.0/>5.0	<3.0/>5.0	<350	NA	>15	NA	>110	<3,500

See Notes on p. 8 of 8

OM & M LOG SHEET (Page 2 of 8)
OFF-SITE INTERIM REMEDIAL MEASURE
FORMER UNISYS FACILITY - GREAT NECK, NEW YORK

INIT.	DATE	TIME	ENTRANCE VAULT			INSIDE PLANT								
			PI-121	FE/FIQT-131	PI-131	PI-211	FCV-211	CW-210 Level	PI-225	CW-220 Level	PI-401	PI-402	FE/FIQT-401	PI-403
			psi	gpm	psi	psi	%	feet	psi	feet	psi	psi	gpm	psi
			0	450-550	15-20	20-25	50-70	3.9-4.1	15-25	3.9-4.1	5-25	5-25	400-550	2-20
			>5	<350/>650	<10/>25	<15/>35	NA	<3.0/>5.0	>35 psi	<3.0/>5.0	NA	NA	<350/>650	<0/>30

See Notes on p. 8 of 8

OM & M LOG SHEET (Page 3 of 8)
OFF-SITE INTERIM REMEDIAL MEASURE
FORMER UNISYS FACILITY - GREAT NECK, NEW YORK

INIT.	DATE	TIME	AIR STRIPPER SCREEN								BAG FILTER SCREEN		
			Inf. Flow	SOV-211	CW-210 Level	Air Flow Rate	P-225	CW-220 Level	Eff. Flow	Eff. Press.	Inf. Press.	Eff. Press.	Diff. Press.
			gpm	%	feet	scfm	%	feet	gpm	psi	psi	psi	psi
			450 - 550	50 - 70	3.9 - 4.1	4,000 - 5,000	55 - 85	3.9 - 4.1	400 - 550	5 - 20	10 - 25	5 - 20	<10
			<350/>600	NA	<3.0/>5.0	<3,500	NA	<3.0/>5.0	<350	0	NA	NA	>15

See Notes on p. 8 of 8

OM & M LOG SHE(Page 4 of 8)
OFF-SITE INTERIM RE.. DIAL MEASURE
FORMER UNISYS FACILITY - GREAT NECK, NEW YORK

INIT.	DATE	TIME	STATUS DISPLAY SCREEN									SET POINT & PRESS. ALARM SET POINT SCREEN		
			AS Eff. Temp.	DH Eff. Temp.	VPGAC 2 Inf. Temp.	VPGAC 3 Eff. Temp.	AS Eff. RH	VPGAC 2 Inf. RH	VPGAC 3 Eff. RH	AS Eff. Air Flow	AS Eff. Press.	B-310 Speed	B-310 Motor	Inf. Water Press.
			° F	° F	° F	° F	%	%	%	scfm	psi	%	rpm	psi
			40 - 75	90 -100	75 - 100	65 -100	100	20 - 60	15 - 30	4,000 - 5,000	20 - 30	70 - 90	1,300 - 2,000	10 - 20
			NA	>110	NA	NA	NA	NA	NA	<3,500	NA	NA	NA	<4

See Notes on p. 8 of 8

OM & M LOG SHEET (Page 5 of 8)
OFF-SITE INTERIM MEDIAL MEASURE
FORMER UNISYS FACILITY - GREAT NECK, NEW YORK

INIT.	DATE	TIME	ATTIC			BLOWER ROOM		VPGAC No. 1 INFLUENT			VPGAC No. 2 INFLUENT		VPGAC No. 3 INFLUENT	
			FE/FIT-313	PI-313	TI-313	PIT-311	PIT-312	PI-611	TI-611	PID	PI-621	PID	PI-631	PID
			scfm	in. water	° F	in. vac.	in. water	in. water	°F	ppm	in. water	ppm	in. water	ppm
			4,000-5,000	20-30	40-75	1.5-5	20-35	15-30	85-100		15-25		10-15	
			<3,500	NA	NA	NA	<10/>40	NA	NA	NA	NA	NA	NA	NA

See Notes on p. 8 of 8

OM & M LOG SH[illegible]

OFF-SITE INTERIM R[illegible]EDIAL MEASURE

FORMER UNISYS FACILITY - GREAT NECK, NEW YORK

INIT.	DATE	TIME	PPZ No. 1 INFLUENT				PPZ No. 2 INFLUENT			STACK DISCHARGE		
			PI-634	PI-636	TI-635	PID	FIT-641	PI-643	PID	PI-651	TI-651	PID
			in.water	in. water	° F	ppm	scfm	in. water	ppm	in. water	° F	ppm
			5-10	5-10	55-100		4,000-5,000	0.5-5		0-2	45-100	
			NA	NA	NA	NA	<3,500	NA	NA	NA	NA	NA

See Notes on p. 8 of 8

OM & M LOG SHEET (Page 7 of 8)
OFF-SITE INTERIM REMEDIAL MEASURE
FORMER UNISYS FACILITY - GREAT NECK, NEW YORK

INIT.	DATE	TIME	DW-100					DW-101					DW-102				
			Flow	Line P.	P. Drop	Ann. P.	Level	Flow	Line P.	P. Drop	Ann. P.	Level	Flow	Line P.	P. Drop	Ann. P.	Level
			FE/FIQ-711	PI-711	PI-712	PI-713	DTW	FE/FIQ-721	PI-721	PI-722	PI-723	DTW	FE/FIQ-731	PI-731	PI-732	PI-733	DTW
			gpm	psi	psi	psi	ft	gpm	psi	psi	psi	ft	gpm	psi	psi	psi	ft
			+/- 50 Prev	+/-2 Prev	+/-2 Prev	0	+/-2 Prev	+/- 50 Prev	+/-2 Prev	+/-2 Prev	0	+/-2 Prev	+/- 50 Prev	+/-2 Prev	+/-2 Prev	0	+/-2 Prev
			NA	NA	NA	NA	<40	NA	NA	NA	NA	<40	NA	NA	NA	NA	<40

See Notes on p. 8 of 8

OM & M LOG SHEET (Page 8 of 8)
OFF-SITE INTERIM REMEDIAL MEASURE
FORMER UNISYS FACILITY - GREAT NECK, NEW YORK

			RW-100																
			Head	Wye Infl.	Wye Eff.	Water Level	Sump Level												
INIT.	DATE	TIME	PI-101	PI-102	PI-103	DTW	in vault												
			psi	psi	psi	ft	in												
			30-40	30-40	10-15	+/-2 ft Prev	---												
			NA	NA	NA	NA	NA												

Note: For each reading, the typical range is shown on the line below the units and the alarm levels are shown on the line below the typical range.

Appendix G

Instrumentation and Control Record Drawings

BBL
ENVIRONMENTAL SERVICES, INC.
Remedial Management & Construction

LEGEND

ELECTRONIC SIGNAL

PUMP

VALVE (MANUAL)

MAGMETER METER

MOTOR OPERATED VALVE

BLOWER – CENTRIFUGAL (WITH VIV)

ELECTRONICALLY CONTROLLED HYDRAULIC ACTUATOR

MIXER – MOTOR OPERATED

PROCESS FLOW DIRECTION AND CONNECTION

SIGNAL FLOW DIRECTION AND CONNECTION

SPOOL PIECE (SP-Xxx)-OPEN

SPOOL PIECE (SP-xxx)-CLOSED

IDENTIFICATION LETTERS

	FIRST LETTER		SUCCEEDING LETTERS		
	MEASURED OR INITIATING VARIABLE	MODIFIER	READOUT OR PASSIVE FUNCTION	OUTPUT FUNCTION	MODIFIER
A	ANALYSIS		ALARM		ADVISORY
C	USER'S CHOICE	CONTROL			
D	USER'S CHOICE	DIFFERENTIAL			
E	VOLTAGE		SENSOR (PRIMARY ELEMENT)		
F	FLOW RATE	RATIO (FRACTION)			
H	HAND				HIGH
I	CURRENT (ELECTRICAL)		INDICATE		
J	POWER	SCAN			
K	TIME, TIME SCHEDULE	TIME RATE OF CHANGE		CONTROL STATION	
L	LEVEL		LIGHT		LOW
P	PRESSURE (VACUUM)		POINT (TEST) CONNECTION		
Q	QUANTITY	INTEGRATE, TOTALIZE			
S	SPEED, FREQUENCY	SAFETY		SWITCH	
T	TEMPERATURE			TRANSMIT	
V	VIBRATION, MECHANICAL ANALYSIS			VALVE, DAMPER, LOUVER	
W	WEIGHT, FORCE, TORQUE			WELL	
X	USER'S CHOICE			EXTREME	
Y	EVENT, STATE OR PRESENCE	Y AXIS		RELAY, COMPUTE, CONVERT	
Z	POSITION, DIMENSION	Z AXIS		DRIVER, ACTUATOR, UNCLASSIFIED FINAL CONTROL ELEMENT	

ABBREVIATIONS

DCU	DISTRIBUTED CONTROL UNIT	**SP**	SPOOL PIECE
LAN	LOCAL AREA NETWORK	**UTGW**	UNTREATED GROUNDWATER
LCP	LOCAL CONTROL PANEL	**PTGW**	PARTIALLY TREATED GROUNDWATER
MCC	MOTOR CONTROL CENTER	**TGW**	TREATED GROUNDWATER
RIO	REMOTE INPUT / OUTPUT	**UAV**	UNTREATED AIR VAPOR
VFD	VARIABLE FREQUENCY DRIVE	**TA**	TREATED AIR
WAN	WIDE AREA NETWORK		
TH	THERMAL TYPE FLOW METER SWITCH		

GENERAL INSTRUMENT OR FUNCTION SYMBOLS

DISCRETE INSTRUMENTS	PRIMARY LOCATION NORMALLY ACCESSIBLE TO OPERATOR **	FIELD MOUNTED	AUXILIARY LOCATION NORMALLY ACCESSIBLE TO OPERATOR **
DISCRETE INSTRUMENTS	1 IPI *	2	3
SHARED DISPLAY, SHARED CONTROL	4	5	6
COMPUTER FUNCTION	7	8	9
PROGRAMMABLE LOGIC CONTROL	10	11	12

* ABBREVIATIONS OF THE USER'S CHOICE SUCH AS IPI (INSTRUMENT PANEL # 1), IC2 (INSTRUMENT CONSOLE #2) CC3 (COMPUTER CONSOLE #3), ETC. MAY BE USED WHEN IT IS NECESSARY TO SPECIFY INSTRUMENT OR FUNCTION LOCATION.

** NORMALLY INACCESSIBLE OR BEHIND-THE-PANEL DEVICES OR FUNCTIONS MAY BE DEPICTED BY USING THE SAME SYMBOLS BUT WITH DASHED HORIZONTAL BARS, I.E.

*** THE LETTER A BELOW AN ALARM LIGHT MEANS ADVISORY ONLY.

INPUT AND OUTPUT IDENTIFICATION

SUFFIX	STATUS	COMMAND	ANALOG INPUT	ANALOG OUTPUT	DESCRIPTION
A	X				RUNNING; ON; ENERGIZED
AI			X		ANALOG INPUT
AO				X	ANALOG OUTPUT
B	X				AVAILABLE; READY TO RUN
C	X				CLOSED POSITION
D	X				DE-ENERGIZED OR LOCKED-OUT
E	X				EMERGENCY STOP
F	X				FAULT; ALARM (OVERLOAD)
G	X				RUNNING FORWARD; LOW SPEED
H	X				RUNNING REVERSE; LOW SPEED
I		X			STOP MOTOR OR CLOSE VALVE
J		X			START-STOP MOTOR OR OPEN CLOSE VALVES
J1	X				START PUSHBUTTON OR SELECTOR SWITCH POSITION
J2	X				STOP PUSHBUTTON OR SELECTOR SWITCH POSITION
K		X			START (FORWARD OR LOW SPEED OR OPEN VALVE)
K1	X				START (FORWARD OR LOW SPEED OR OPEN)
L		X			START (REVERSE OR HIGH SPEED OR CLOSE)
L1	X				START (REVERSE OR HIGH SPEED OR CLOSE)
M					
N					
O	X				OPEN POSITION
P					
Q					
R					SPEED INDICATOR
S	X				STOPPED
SI					SPEED INDICATOR
SC					SPEED CONTROL
T					
U					
V					
W	X				(HOR) OR (LR) SWITCH IN (R) POSITION OR (HOA) IN (A) POSITION
X					
Y					
Z					

RECORD DRAWINGS
TO THE BEST OF OUR KNOWLEDGE, INFORMATION AND BELIEF, THESE RECORD DRAWINGS SUBSTANTIALLY REPRESENT THE PROJECT AS CONSTRUCTED.
BLASLAND, BOUCK & LEE, INC.
DATE 3/27/06 BY

X: 38031\00.DWG
L: ON=*, OFF=*REF*
P: PAGESET/PLT-COL-36
03/21/06 PISC-125-WJD SYR-85-AMS PRO KLS
38031\004\38031I01.DWG

ORIGINAL SCALE APPLIES TO 24"X36" DRAWING

THIS DRAWING WAS PREPARED AT THE SCALE INDICATED IN THE TITLE BLOCK. INACCURACIES IN THE STATED SCALE MAY BE INTRODUCED WHEN DRAWINGS ARE REPRODUCED. USE THE GRAPHIC SCALE BAR IN THE TITLE BLOCK TO DETERMINE THE ACTUAL SCALE OF THIS DRAWING.

No.	Date	Revisions	Init
2	03/06	GENERAL REVISIONS; ID CHART MOVED FROM DWG. P-2	MEC
1	12/05	DRAFT GENERAL REVISIONS	MEC

NO ALTERATIONS PERMITTED HEREON EXCEPT AS PROVIDED UNDER SECTION 7209 SUBDIVISION 2 OF THE NEW YORK STATE EDUCATION LAW

Professional Engineer's Name: LOWELL W. MCBURNEY
Professional Engineer's No.: 066776
State: NY
Date Signed: 3/27/06
Project Mgr.: DFS
Designed by: BA
Drawn by: MD

BBL BLASLAND, BOUCK & LEE, INC. engineers, scientists, economists

FORMER UNISYS FACILITY • GREAT NECK, NEW YORK
OFF-SITE IRM

PROCESS AND INSTRUMENTATION DIAGRAM NOTES AND LEGEND

INSTRUMENTATION AND CONTROL

BBL Project No. 38031.001
Date MARCH 2006

Blasland, Bouck & Lee, Inc.
Corporate Headquarters
6723 Towpath Road
Syracuse, NY 13214
315-446-9120

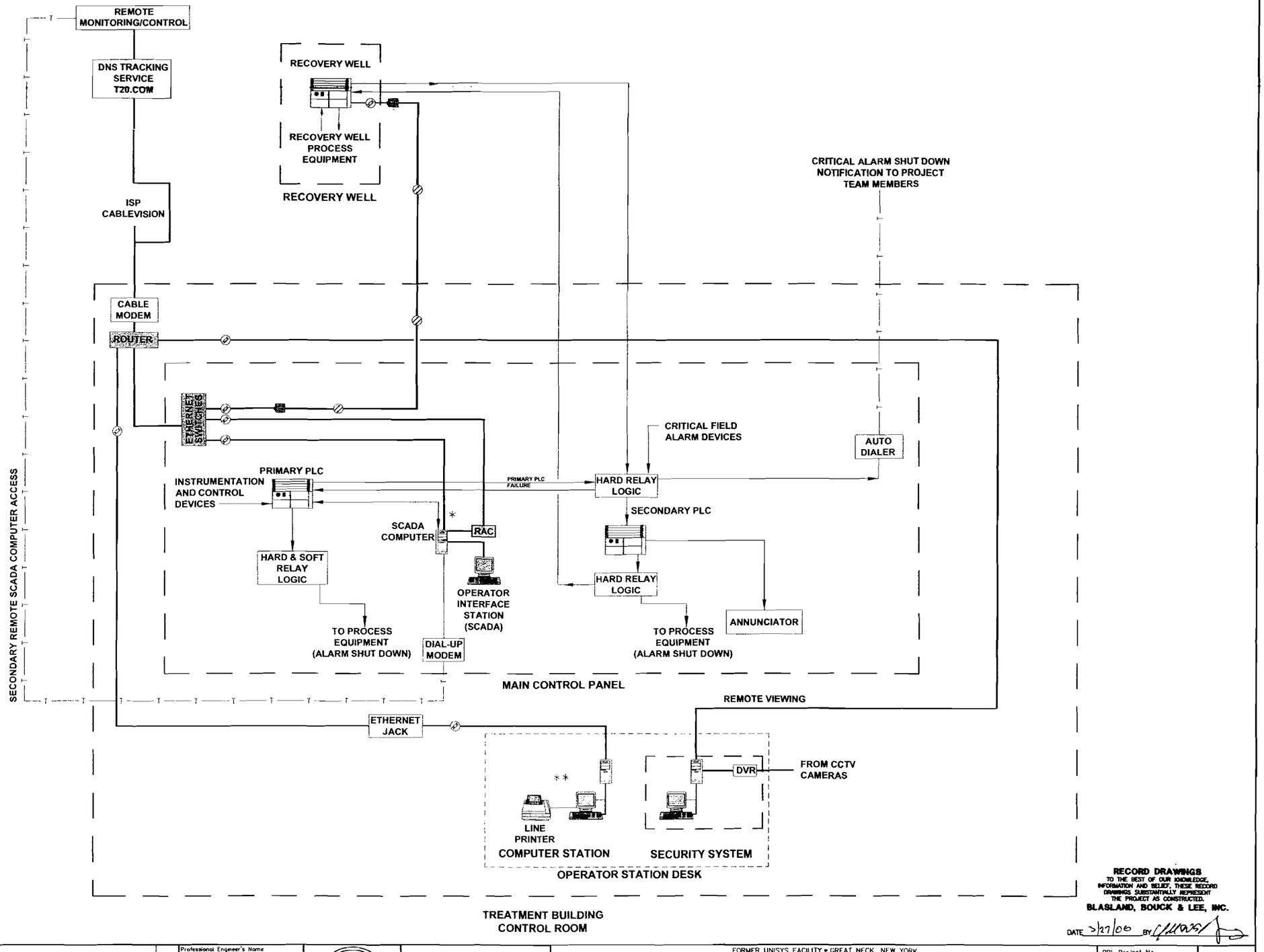
I-1

LEGEND

- PLC
- LINE PRINTER
- COMPUTER TOWER
- MONITOR KEYBOARD
- OPERATOR'S INTERFACE STATION
- SWITCH — ETHERNET SWITCH
- RAC — REMOTE ACCESS CARD
- ROUTER — ROUTER
- MEDIA CONVERTER
- FIBER-OPTIC
- UNSHIELDED TWISTED PAIR CAT 5e
- DATA COMMUNICATION
- HARDWIRED SIGNALS
- T — TELEPHONE COMMUNICATION

* PRIMARY ALARM SHUT DOWN NOTIFICATION VIA CELL PHONE TEXT MESSAGING AND E-MAIL TO PROJECT TEAM MEMBERS. PRIMARY REMOTE SCADA COMPUTER ACCESS

** CAN VIEW "ON-SITE" CCTV CAMERA FEED AND COMMUNICATE WITH "ON-SITE" SCADA COMPUTER



X: 38031X00.DWG
L: ON=*, OFF=*REF*
P: PAGESET/PLT-COL-36
03/24/06 PSC-175-MJD SYR-85-AMS KLS
38031004\38031I02.DWG

RECORD DRAWINGS
TO THE BEST OF OUR KNOWLEDGE, INFORMATION AND BELIEF, THESE RECORD DRAWINGS SUBSTANTIALLY REPRESENT THE PROJECT AS CONSTRUCTED.
BLASLAND, BOUCK & LEE, INC.
DATE 3/27/06 BY

ORIGINAL SCALE APPLIES TO 24"X36" DRAWING

THIS DRAWING WAS PREPARED AT THE SCALE INDICATED IN THE TITLE BLOCK. INACCURACIES IN THE STATED SCALE MAY BE INTRODUCED WHEN DRAWINGS ARE REPRODUCED. USE THE GRAPHIC SCALE BAR IN THE TITLE BLOCK TO DETERMINE THE ACTUAL SCALE OF THIS DRAWING.

No.	Date	Revisions	Init
2	03/06	GENERAL REVISIONS	MEC
1	12/05	DRAFT GENERAL REVISIONS	MEC

NO ALTERATIONS PERMITTED HEREON EXCEPT AS PROVIDED UNDER SECTION 7209 SUBDIVISION 2 OF THE NEW YORK STATE EDUCATION LAW

Professional Engineer's Name: LOWELL W. MCBURNEY
Professional Engineer's No.: 066776
State: NY
Date Signed: 3/27/06
Project Mgr.: DFS
Designed by: BA
Drawn by: MJD

STATE OF NEW YORK — LOWELL W. MCBURNEY — 066776 — LICENSED PROFESSIONAL ENGINEER

BBL BLASLAND, BOUCK & LEE, INC. engineers, scientists, economists

FORMER UNISYS FACILITY • GREAT NECK, NEW YORK
OFF-SITE IRM

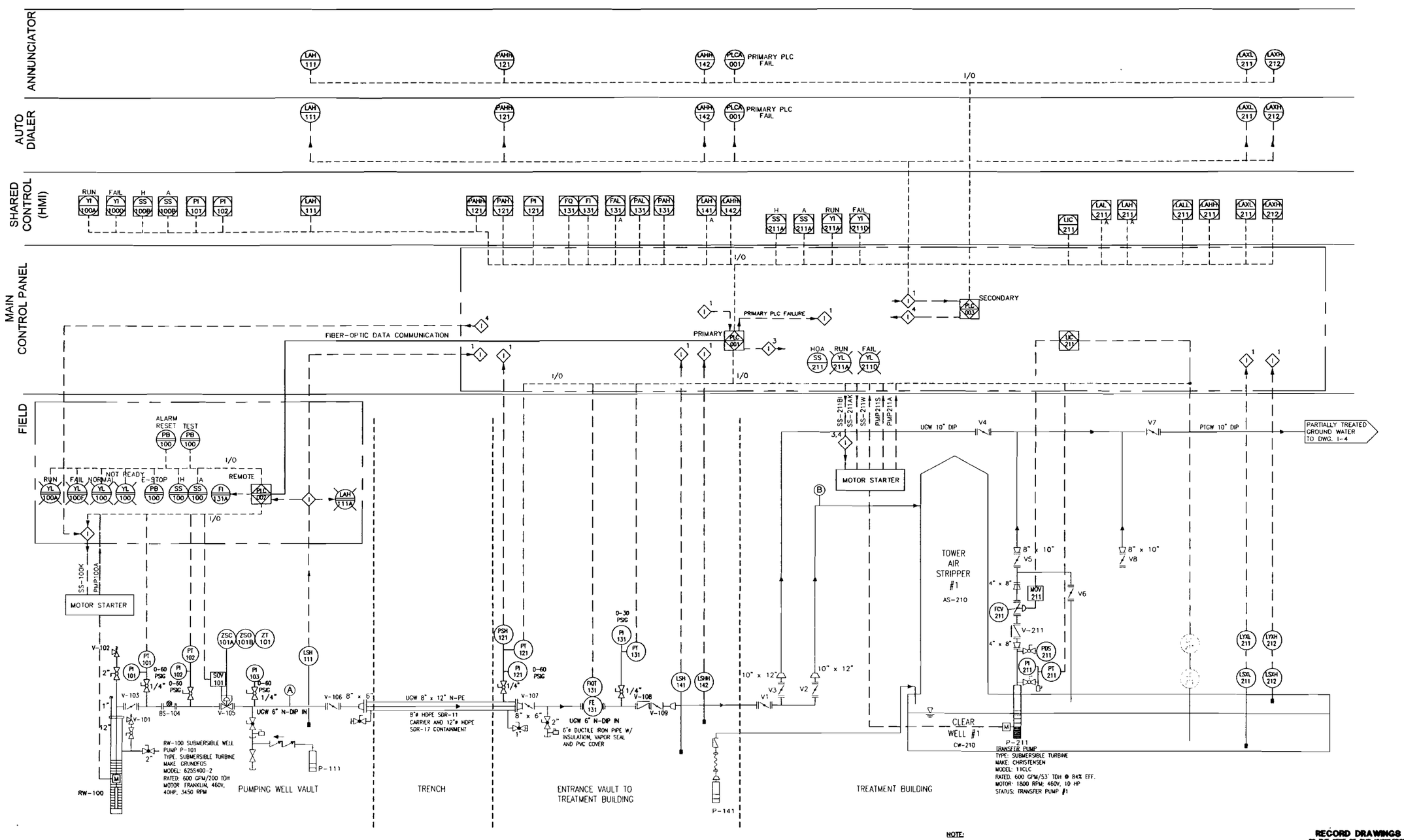
PROCESS AND INSTRUMENTATION DIAGRAM SYSTEM ARCHITECTURE

INSTRUMENTATION AND CONTROL

BBL Project No.: 38031.001
Date: MARCH 2006

Blasland, Bouck & Lee, Inc.
Corporate Headquarters
6723 Towpath Road
Syracuse, NY 13214
315-446-9120

I-2



NOTE:

BASE DRAWING PREPARED FROM RECORD DRAWING INFORMATION FROM ARCADIS DRAWINGS ENTITLED "OFF-SITE INTERIM REMEDIAL MEASURE (IRM) RECORD DRAWINGS, FORMER UNISYS FACILITY, GREAT NECK, NEW YORK, MARCH 2005".

RECORD DRAWINGS
TO THE BEST OF OUR KNOWLEDGE, INFORMATION AND BELIEF, THESE RECORD DRAWINGS SUBSTANTIALLY REPRESENT THE PROJECT AS CONSTRUCTED.
BLASLAND, BOUCK & LEE, INC.
DATE 3/27/06 BY

X: 38031X00.DWG
L: ON=*, OFF=*REF*
P: PAGESET/PLT-CDL-36
03/20/06 PISC-125-MJD SYR-85-AMS PRO
38031004\38031103.DWG

ORIGINAL SCALE APPLIES TO 24"X36" DRAWING

THIS DRAWING WAS PREPARED AT THE SCALE INDICATED IN THE TITLE BLOCK. INACCURACIES IN THE STATED SCALE MAY BE INTRODUCED WHEN DRAWINGS ARE REPRODUCED. USE THE GRAPHIC SCALE BAR IN THE TITLE BLOCK TO DETERMINE THE ACTUAL SCALE OF THIS DRAWING.

No.	Date	Revisions	Init
2	03/06	GENERAL REVISIONS	MEC
1	12/05	DRAFT GENERAL REVISIONS	MEC

NO ALTERATIONS PERMITTED HEREON EXCEPT AS PROVIDED UNDER SECTION 7209 SUBDIVISION 2 OF THE NEW YORK STATE EDUCATION LAW

Professional Engineer's Name: LOWELL W. MCBURNEY
Professional Engineer's No.: 066776
State: NY
Date Signed: 3/27/06
Project Mgr.: DFS
Designed by: BA
Drawn by: MD

BBL BLASLAND, BOUCK & LEE, INC. engineers, scientists, economists

FORMER UNISYS FACILITY • GREAT NECK, NEW YORK
OFF-SITE IRM

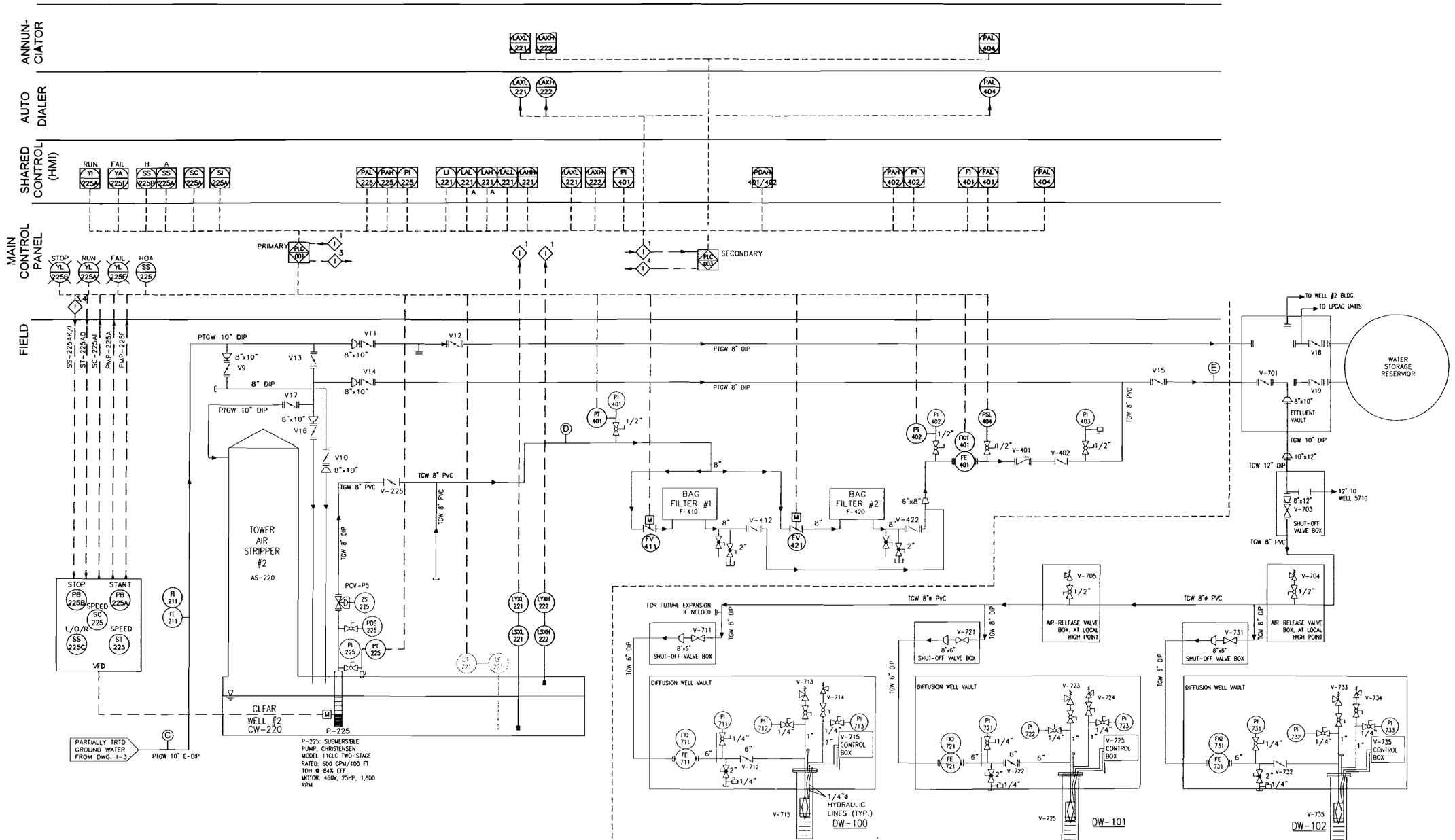
PROCESS AND INSTRUMENTATION DIAGRAM WATER SIDE

INSTRUMENTATION AND CONTROL

BBL Project No. 38031.001
Date MARCH 2006

Blasland, Bouck & Lee, Inc.
Corporate Headquarters
6723 Towpath Road
Syracuse, NY 13214
315-446-9120

I-3



RECORD DRAWINGS
TO THE BEST OF OUR KNOWLEDGE, INFORMATION AND BELIEF, THESE RECORD DRAWINGS SUBSTANTIALLY REPRESENT THE PROJECT AS CONSTRUCTED.
BLASLAND, BOUCK & LEE, INC.
DATE 3/27/06 BY

NOTE:
BASE DRAWING PREPARED FROM RECORD DRAWING INFORMATION FROM ARCADIS DRAWINGS ENTITLED "OFF-SITE INTERIM REMEDIAL MEASURE (IRM) RECORD DRAWINGS, FORMER UNISYS FACILITY, GREAT NECK, NEW YORK, MARCH 2005".

X: 38031X00.DWG
L: ON=*, OFF=*REF*
P: PAGESET/PLT-CDL-36
03/22/06 PSC-125-MJD SYR-85-AMS PRO KLS
38031004\38031I04.DWG

ORIGINAL SCALE APPLIES TO 24"X36" DRAWING

THIS DRAWING WAS PREPARED AT THE SCALE INDICATED IN THE TITLE BLOCK. INACCURACIES IN THE STATED SCALE MAY BE INTRODUCED WHEN DRAWINGS ARE REPRODUCED. USE THE GRAPHIC SCALE BAR IN THE TITLE BLOCK TO DETERMINE THE ACTUAL SCALE OF THIS DRAWING.

No.	Date	Revisions	Init
2	03/06	GENERAL REVISIONS	MEC
1	12/05	DRAFT GENERAL REVISIONS	MEC

NO ALTERATIONS PERMITTED HEREON EXCEPT AS PROVIDED UNDER SECTION 7209 SUBDIVISION 2 OF THE NEW YORK STATE EDUCATION LAW

Professional Engineer's Name: LOWELL W. MCBURNEY
Professional Engineer's No.: 066776
State: NY
Date Signed: 3/27/06
Project Mgr.: DFS
Designed by: BA
Drawn by: MD

BBL BLASLAND, BOUCK & LEE, INC. engineers, scientists, economists

FORMER UNISYS FACILITY • GREAT NECK, NEW YORK
OFF-SITE IRM

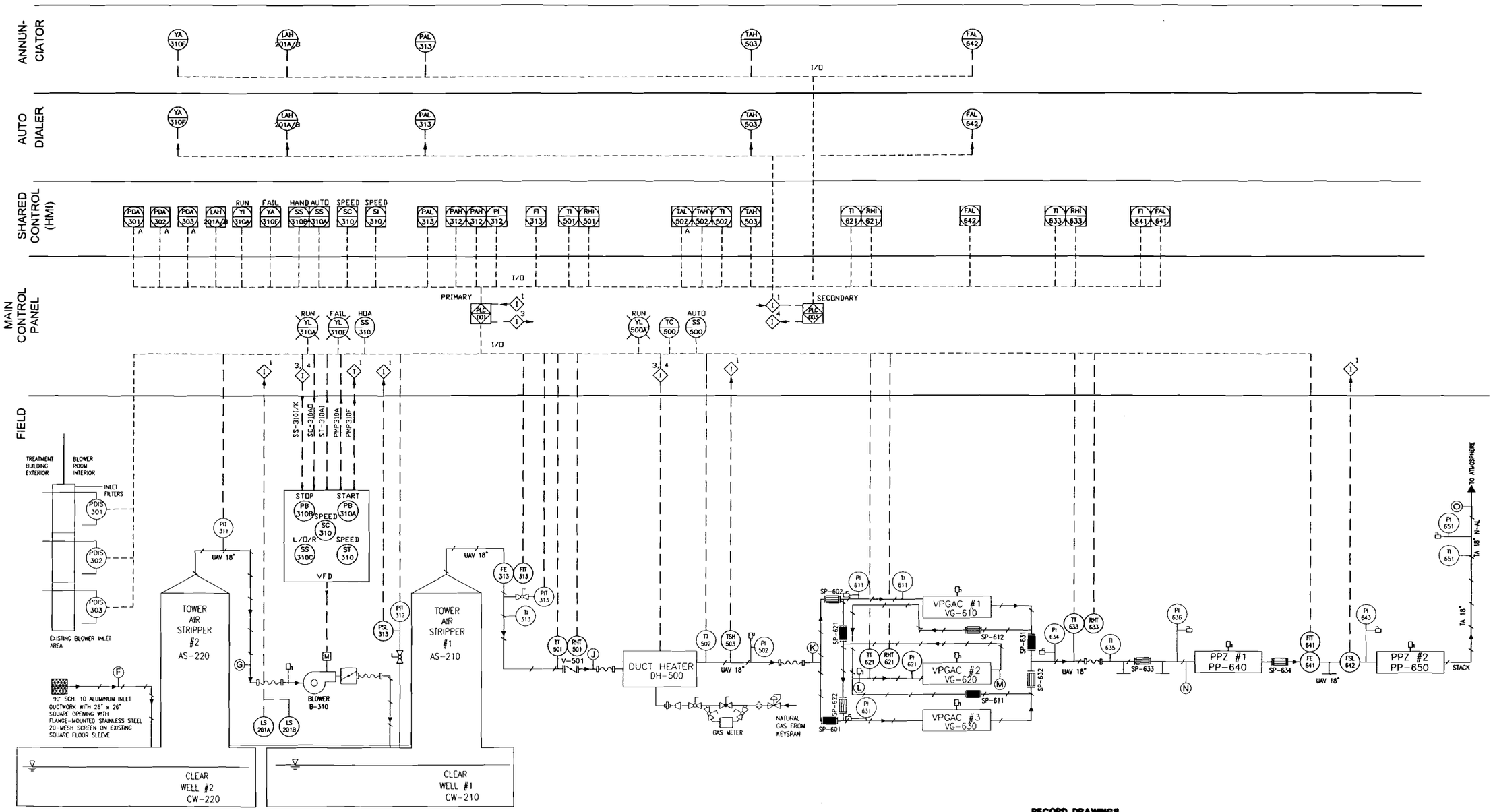
PROCESS AND INSTRUMENTATION DIAGRAM WATER SIDE (CONT.)

INSTRUMENTATION AND CONTROL

BBL Project No. 38031.001
Date MARCH 2006

Blasland, Bouck & Lee, Inc.
Corporate Headquarters
6723 Towpath Road
Syracuse, NY 13214
315-446-9120

I-4



RECORD DRAWINGS
TO THE BEST OF OUR KNOWLEDGE, INFORMATION AND BELIEF, THESE RECORD DRAWINGS SUBSTANTIALLY REPRESENT THE PROJECT AS CONSTRUCTED.
BLASLAND, BOUCK & LEE, INC.
DATE 3/27/00 BY

NOTE:
BASE DRAWING PREPARED FROM RECORD DRAWING INFORMATION FROM ARCADIS DRAWINGS ENTITLED "OFF-SITE INTERIM REMEDIAL MEASURE (IRM) RECORD DRAWINGS, FORMER UNISYS FACILITY, GREAT NECK, NEW YORK, MARCH 2005".

X: 38031X00.DWG
L: ON=*, OFF=*REF*
P: PAGESET/PLT-CDL-36
03/22/06 PSC-125-WD SYR-85-AWS PRO KLS
38031004\38031105.DWG

ORIGINAL SCALE APPLIES TO 24"X36" DRAWING

THIS DRAWING WAS PREPARED AT THE SCALE INDICATED IN THE TITLE BLOCK. INACCURACIES IN THE STATED SCALE MAY BE INTRODUCED WHEN DRAWINGS ARE REPRODUCED. USE THE GRAPHIC SCALE BAR IN THE TITLE BLOCK TO DETERMINE THE ACTUAL SCALE OF THIS DRAWING.

No.	Date	Revisions	init
2	03/06	GENERAL REVISIONS	MEC
1	12/05	DRAFT GENERAL REVISIONS	MEC

NO ALTERATIONS PERMITTED HEREON EXCEPT AS PROVIDED UNDER SECTION 7209 SUBDIVISION 2 OF THE NEW YORK STATE EDUCATION LAW

Professional Engineer's Name: LOWELL W. MCBURNEY
Professional Engineer's No.: 066776
State: NY
Date Signed: 3/27/06
Project Mgr.: DFS
Designed by: BA
Drawn by: MD

BBL BLASLAND, BOUCK & LEE, INC. engineers, scientists, economists

FORMER UNISYS FACILITY • GREAT NECK, NEW YORK
OFF-SITE IRM

PROCESS AND INSTRUMENTATION DIAGRAM AIR SIDE

INSTRUMENTATION AND CONTROL

BBL Project No. 38031.001
Date MARCH 2006

Blasland, Bouck & Lee, Inc.
Corporate Headquarters
6723 Towpath Road
Syracuse, NY 13214
315-446-9120

I-5

Appendix H

Health and Safety Plan (Under Separate Cover)

BBL
ENVIRONMENTAL SERVICES, INC.
Remedial Management & Construction

Appendix I
Contingency Plan

Off-Site Interim Remedial Measure
Former Unisys Facility
Great Neck, New York

NYSDEC Site ID# 130045

March 2006

BBL
ENVIRONMENTAL SERVICES, INC.
Remedial Management & Construction

Table of Contents

Figure

1 Map to Hospital

Attachment

I-1 Amendment to Contingency Plan

1. Introduction

ARCADIS G&M, Inc. (ARCADIS) originally prepared this Contingency Plan (CP) on behalf of Lockheed Martin Corporation (Lockheed Martin) for the Off-Site Interim Remedial Measure (IRM) for Operable Unit 2 (OU-2) associated with the former Unisys Corporation (Unisys) facility located in Great Neck, New York (see Figure 1 of the Operation, Maintenance and Monitoring [OM&M] Manual). This CP was subsequently revised by BBL Environmental Services, Inc. (BBLES), in conjunction with Blasland, Bouck & Lee, Inc. (BBL). The former Unisys site, located at 365 Lakeville Road in Great Neck, New York, is classified by the New York State Department of Environmental Conservation (NYSDEC) as a Class 2 Site in the Registry of Inactive Hazardous Waste Disposal Sites in New York State (Site No. 130045) due to the presence of volatile organic compounds (VOCs) in soil and groundwater. The former Unisys site, which is currently owned by i.park, Lake Success, LLP (i.park), is designated as Operable Unit 1 (OU-1), whereas OU-2 addresses off-site areas.

An OU-2 Remedial Investigation (RI) is in progress and is being conducted under NYSDEC Administrative Order on Consent (AOC) No. W-1-0527-91-02, dated December 13, 1991. Based on the results of the OU-2 RI obtained to date, an IRM (interim remedial measure) is being implemented for the OU-2 area. The NYSDEC-approved Off-Site IRM was installed between the Northern State Parkway and the Long Island Expressway (LIE). The goals of the Off-Site IRM are to help protect public drinking water wells and retard further contaminant migration into the North Hills Special Groundwater Protection Area (SGPA).

The conceptual Off-Site IRM is documented in the NYSDEC-approved OU-2 IRM South System Groundwater Remediation Work Plan (hereinafter called the OU-2 South IRM Work Plan), dated May 29, 2003. This CP was prepared as a component of the OM&M Manual. This CP is to be implemented in the case of emergencies that may require protection of human health or the environment, such as fire, gas leak, recovery well vault or clearwell overflow, or pipeline rupture.

1.1 Key Features of the Off-Site Interim Remedial Measure

The Off-Site IRM consists of the major components described below.

- A groundwater recovery well (RW-100) located and designed to efficiently capture and contain off-site, VOC-impacted groundwater. Well RW-100 is located on the Great Neck Union Free School District (Great Neck UFSD) Property.

- A double-walled, dual containment pipeline used to convey the extracted, groundwater from RW-100 to the groundwater treatment plant. The majority of the dual containment, influent pipeline is located on the Great Neck UFSD Property; the remainder of the pipeline is located on the Manhasset-Lakeville Water District (MLWD) Property.

- A groundwater treatment system designed to reduce the concentration of VOCs in the recovered groundwater to Non-Detect Performance Standards per the Remediation Access and Licensing Agreement between Lockheed Martin and the Great Neck UFSD, dated April 14, 2003 (Access Agreement) prior to reinjection to the Magothy aquifer via the diffusion wells. The groundwater treatment system is located on the MLWD Property and is comprised mainly of two air stripping towers.

- An emission control system designed to reduce the concentration of VOCs in the air stripper off-gas to Non-Detect Performance Standards per the Access Agreement between Lockheed Martin and the Great Neck UFSD prior to atmospheric discharge. The emission control system is located on the MLWD Property and consists of three vapor-phase granular activated carbon (VPGAC) units in series followed by two potassium permanganate-impregnated zeolite (PPZ) units in series.

- A discharge system designed to convey treated groundwater from the treatment plant to three diffusion wells back into the Magothy aquifer. The discharge system consists of: a) a discharge pipeline, portions of which are located on the MLWD, Great Neck UFSD, and New York State Department of Transportation (NYSDOT) Properties; and b) three diffusion wells (DW-100 through DW-102) located on NYSDOT Property.

1.2 Contingency Plan Organization

The remainder of the CP is divided into the sections described below.

- Section 2 (Site Descriptions) provides a brief description of the Former Unisys Site (OU-1) and the three properties (Great Neck UFSD, MLWD, and the NYSDOT) on which portions of the Off-Site IRM are present.

- Section 3 (Content of Contingency Plan) describes the duties of the Emergency Coordinator and outlines emergency procedures.

- Section 4 (Emergency Contacts) provide contact lists for both emergency and non-emergency situations.

- Section 5 (Emergency Response Procedures) provides a description of response procedures, should they become necessary.

- Section 6 (Response Officials/Agencies) lists the response officials to be contacted soon after start-up to brief them about Off-Site IRM activities and potential emergencies.

- Section 7 (Provisions for Amending Contingency Plan) presents the provisions for amending this CP.

2. Site Descriptions

This Section provides a brief description of the former Unisys site (OU-1) and the three properties (Great Neck UFSD, MLWD, and the NYSDOT) on which portions of the Off-Site IRM remediation systems are located.

2.1 The Former Unisys Facility (OU-1)

The former Unisys facility (OU-1) was a former manufacturing facility of mainly electronic components for military and commercial applications. The 94-acre site is listed by the NYSDEC as a Class 2 Inactive Hazardous Waste site (Site No. 130045). The site is located in both the Village of Lake Success and the Town of North Hempstead in Nassau County at 365 Lakeville Road in Great Neck, New York. The site is bounded by Marcus Avenue to the north, Union Turnpike to the south, Lakeville Road to the west and Triad Business Park to the east. A site location map is presented on Figure 1 of the OM&M Manual.

The subject area has been separated into two project areas, which represent portions of the site and/or surrounding areas. The on-site project area consists of the OU-1 Treatment System. This CP addresses the Off-Site IRM. The Off-Site IRM has components on Great Neck UFSD, MLWD, and NYSDOT properties. A site plan is provided on Figure 2 of the OM&M Plan. A summary of the system components on each of the three properties is provided below.

2.2 The Great Neck UFSD Property

Off-Site IRM components on Great Neck UFSD property include recovery well RW-100, the majority of the dual-contained influent pipeline, and a portion of the discharge pipeline. The Great Neck UFSD property includes both the Great Neck South Middle and High Schools.

2.3 The MLWD Property

Off-Site IRM components on MLWD property include the remainder of the dual-contained influent pipeline, the groundwater treatment system, the emission control system, and a portion of the discharge pipeline. The MLWD property also has primary and secondary components of the MLWD public supply system, which are operated and maintained by the MLWD.

2.4 The NYSDOT Property

Off-Site IRM components on NYSDOT property include a portion of the discharge pipeline and the three diffusion wells (DW-100 through DW-102). The NYSDOT property also consists of two stormwater retention ponds operated and maintained by the NYSDOT and an access road.

3. Content of Contingency Plan

This CP describes the actions personnel working at the site must take in response to fires, explosion, or releases that threaten human health or the environment. This plan includes the following:

- The list of names of all persons qualified to act as Emergency Coordinator;
- The arrangements made with local emergency agencies;
- A description of emergency and spill-control equipment located at the site;
- The evacuation plan; and
- Emergency procedures to be followed in the event of an incident which requires use of this plan.

A description of these items is presented below.

3.1 Designation of Emergency Coordinator

At least one employee with primary responsibility for coordinating emergency response measures will be either in the treatment building or on-call at all times. The Emergency Coordinator and his/her designated alternate(s) (designees) will be thoroughly familiar with all aspects of this CP, Off-Site IRM operations and other activities at the facility, the location and characteristics of the untreated groundwater and other wastes handled at the site, the location of records, and the layout of the facility and Off-Site IRM.

The Emergency Coordinator and/or his/her designees is responsible for determining whether this CP needs to be implemented in response to an emergency incident during work activities conducted at the site. These persons have the authority to commit the resources necessary to carry out this CP. The Emergency Coordinator list for work activities conducted at the site is presented in Section 4.1.

3.2 Coordination with Local Authorities

If the Emergency Coordinator determines that any incident at the site threatens the health and safety of site personnel, the community, or the environment, appropriate outside agencies will be notified, as necessary, to assist in emergency response activities. A list of these agencies and their phone numbers, including police, fire departments, and the local hospital, is included in Section 4.1. Also included on this list are the NYSDEC, Great Neck UFSD, and MLWD. This list will be posted near the telephone in the office area of the treatment building. Plans detailing the facility's layout and evacuation routes will also be displayed at the site.

3.3 Emergency and Spill Control Equipment

The following is a list of emergency and spill control equipment that will be available during work activities to be conducted at the site:

- Fire extinguishers (ABC rated) located in the office area of the treatment building and within the treatment building;
- Telephone (located in the office area of the treatment building);
- Absorbents;

- Empty containers (i.e., 55-gallon drums, overpacks, and/or salvage drums);
- Containment booms;
- Nitrile gloves and rubber boots;
- Chemical-resistant overalls (i.e., Tyvek suits);
- Safety goggles, ear plugs, and hard hats;
- Brooms; and
- Shovels.

3.4 Evacuation Plan

MLWD property is surrounded by a chain link fence. There is one access road to the facility with the gate at the end of the Tanners Road Extension. A parking area is located to the west of the treatment building. The treatment building has a double access door by the office on the northeast side of the building, as well as a single access door on the southwest side.

In the event of an emergency incident requiring evacuation of the site, the Gravelpave™ area to the north of the gate at the end of the Tanners Road Extension will serve as the assembly area. The signal for evacuation of the site is three blasts of a horn (e.g., air horn or vehicle horn).

3.5 Copies of Contingency Plan

Copies of this CP will be maintained in the office area of the treatment building, and by the Emergency Coordinator and his/her designees. This CP can be amended as discussed in Section 7.

4. Emergency Contacts

This section provides an emergency contact list and a non-emergency contact list for situations such as troubleshooting system operations.

4.1 Emergency Contact List

BBLES Emergency Coordinators – Great Neck	Phone Numbers
Scott Morris – Primary (Project Manager)	Office: (516) 328-0464 Ext. 16 Cell: (516) 592-9355
Scott DeCesare – Alternate (Site Supervisor/Health & Safety Supervisor)	Office: (516) 328-0464 Ext. 17 Cell: (516) 459-8848
Other BBLES Emergency Contacts – Great Neck	**Phone Numbers**
Greg McDermott – Project Engineer	Office: (516) 328-0464 Ext. 18 Cell: (516) 592-1740
Jerry Mitchell – Project Engineer	Office: (732) 457-0700 Ext. 126 Cell: (908) 705-3061
Michael Currie – Electrical Engineer	Office: (732) 457-0700 Ext. 151 Cell: (908) 568-9170
Lowell McBurney – Project Officer	Office: (315) 671-9439 Cell: (315) 382-2562
Jay Keough – Project Health & Safety Officer	Office: (609) 860-0590 Ext. 101 Cell: (908) 492-5674
Charles Webster – Project Health & Safety Manager	Office: (315) 671-9297 Cell: (315) 247-5971
Arcadis Emergency Contacts – Great Neck	**Phone Numbers**
Nicholas Valkenburg – Vice President	Office: (631) 391-5234 Cell: (516) 903-0142
William Wittek – Project Engineer	Office: (631) 391-5270 Cell: (516) 315-6226
Dennis McClafferty - Operator	Office: (631) 391-5203 Cell: (516) 779-8034
Konrad Kuc – Staff Engineer	Office: (631) 391-5246 Cell: (516) 250-9958

Lockheed Martin Emergency Contacts – Great Neck	Phone Numbers
Tina Armstrong – Project Manager	Office: (301) 214-9971 Cell: (410) 279-8637
Tom Blackman – Director of Remediation	Office: (301) 214-9958 Cell: (240) 460-7508
Lockheed Martin Emergency Contact Number (Gail Rymer)	(800) 449-4486
NYSDEC Emergency Contacts – Great Neck	**Phone Numbers**
Girish Desai – Project Manager	Office: (631) 444-0243
Walter Parish – Manager	Office: (631) 444-0240
Great Neck UFSD Emergency Contacts	**Phone Numbers**
Security	Office: (516) 773-1741
David Kincaid - Consultant	Office: (516) 773-1465
Ronald Friedman - Superintendent	Office: (516) 773-1405
Edwin Groshans – Deputy Superintendent	Office: (516) 773-1413
MLWD Emergency Contacts	**Phone Numbers**
Paul Schrader - Superintendent	Office: (516) 466-4415
Other Emergency Contacts	**Phone Numbers**
Local Police (Nassau County – 3rd Precinct)	911 or (516) 573-6300
Local Police (Village of Lake Success)	911 or (516) 482-4600
State Police	(631) 756-3300
Local Ambulance (Manhasset-Lakeville)	911 or (516) 466-4411
Local Fire Department (Manhasset-Lakeville)	911 or (516) 466-4411
i.Park Lake Success Site Security	(516) 592-4504
Local Hospital (Long Island Jewish Medical Center)	(516) 470-7000
Electric Company	(800) 490-0075
Gas Emergency	(800) 490-0045
Poison Control	(516) 542-2323
Nassau County Health Department (Joseph DeFranco)	(516) 571-3323
New York State Department Of Health (Rebecca Mitchell)	(518) 402-7870
NYSDOT	(516) 625-0297
NYSDEC – Spill Hotline	(800) 457-7362
National Response Center (all spills in reportable quantities)	(800) 424-8802
United States Coast Guard (spills to water)	(800) 424-8802
USEPA – Emergency Response Team	(800) 424-8802

Other Emergency Contacts	Phone Numbers
USEPA – Regional Office	(212) 637-3000
Spill Contractor – RGM Liquid Waste Division - Lina Saglembeni	Emergency: (631) 586-0002 Cell: (516) 250-1251

4.2 Non-Emergency Contact List

In addition to the emergency contacts listed in Section 4.1, the following non-emergency contacts are provided in the event assistance is required for troubleshooting system operations.

Non-Emergency Contacts		
Company (Role)	**Contact Name**	**Address/Telephone No.**
Delta Well and Pump Co. (Wells)	Chris Okon	97 Union Avenue, Ronkonkoma, NY 11779 Office: (631) 981-2255 Cell: (631) 926-9745
United Fence and Guard Rail Co. (Fences)	Allan Oakland	25 Mill Road, Ronkonkoma, NY 11779 Office: (631) 467-6677
Exquisite Products (Security/Monitoring Systems)	Steve Szoke	523 Cedar Street, West Hempstead, NY 11552 Office: (516) 538-6344 Cell: (516) 236-0794
Morehouse Engineering (Computer Programming)	C. Schuyler Morehouse	83 Princeton Avenue, Suite 1D, Hopewell, NJ 08525 Office: (609) 466-4955 Cell: (609) 731-8408
James McCullagh Co. (Mechanical)	John Clukies	73 East Bethpage Avenue, Plainview, NY 11803 Office: (516) 293-8800 Cell: (516) 779-5180
JK Electric Co. (Electrical)	Jim Kilcullen	374 Neptune Avenue, W. Babylon, NY 11703 Office: (516) 807-1125

5. Emergency Response Procedures

This section lists the identified potential emergencies associated with the Off-Site IRM and provides a description of emergency response procedures, should they become necessary. Specifics concerning procedures to be followed are presented below. All emergency efforts should also be addressed in accordance with the Health ands Safety Plan (HASP), which is included as Appendix H of the OM&M Plan.

Any time local public response agencies such as police, fire and/or ambulance are called, i.Park Lake Success Site Security and Great Neck UFSD Security must be called and provided pertinent information so that the site security personnel can direct the local response agencies to where they are required.

Lockheed Martin representatives must be notified by their authorized agent in the unlikely event that emergency response procedures must be implemented. Notification of Lockheed Martin by its authorized agents shall not preclude the authorized agent from first responding to the emergency situation and reporting it to the appropriate State authorities.

5.1 Emergency Procedures

In the unlikely event there is an imminent or actual emergency situation, the first action of an individual who discovers the emergency will be to immediately contact the Emergency Coordinator or his/her designated alternate(s) listed in Section 4. All emergency procedures will be initiated by the Emergency Coordinator or his/her designee in the manner outlined below.

5.1.1 Notification and Documentation

The Emergency Coordinator or his/her designee will record the time, date and details of any incident that requires the implementation of this CP. Within 15 business days after the incident, Lockheed Martin's Project Manager will submit a written report on the incident to NYSDEC, which will include the following:

- Date, time and type of incident;
- Type and quantity of material(s) involved;
- The extent of injuries, if any;
- An assessment of actual or potential hazards to human health or the environment, where applicable; and
- Estimated quantity and disposition of recovered material(s) and a description of subsequent cleanup activities.

5.1.2 Medical Emergencies

Medical emergencies may not require implementation of this CP. Nevertheless, directions to the local hospital are provided on Figure 1. If needed, ambulance service can be arranged by contacting (516) 466-4411 or 911.

5.2 Emergency Coordinator Response

Upon the occurrence of an emergency situation, the Emergency Coordinator or his/her designees will inform any personnel at the facility of the emergency. In addition, the appropriate local agencies (see Section 4.1) having response roles will be notified by telephone if their assistance is required or if there is any threat to the surrounding community.

5.3 Identification of Incidents

Upon a fire, explosion, or release, the Emergency Coordinator or his/her designees must immediately identify the character, source, amount, and extent of any released materials. This will be accomplished by observation, analysis, or any practical means necessary. These initial observations will be forwarded to the proper emergency response teams with suggested precautions.

5.4 Assessment of Possible Hazards

The Emergency Coordinator or his/her designees and other appropriate individuals (if necessary) will assess possible hazards to human health or the environment that may result from the incident. The assessment will consider both direct and indirect effects of fire, explosion, or release of toxic, irritating, or asphyxiating gases and surface water runoff from water used to control fires.

5.5 Response Procedures

Immediately after assessing the hazards of the fire, explosion, or release, the Emergency Coordinator or his/her designees will take all reasonable measures necessary to ensure that the fire, explosion, and/or release do not recur or spread. Necessary actions may include overseeing the operations of collecting and containing the released materials, removing and isolating containers, inspecting the structural integrity of the facility, and stopping processes and/or operations. If the facility stops operations in response to a fire, explosion, or release, the Emergency Coordinator or his/her designees will monitor for leaks, pressure build-up, or ruptures in valves, pipes, or other appurtenances.

If the Emergency Coordinator or his/her designees determine that the facility has had a release, fire, or explosion that could threaten human health and/or the environment outside the facility, they should take the following actions:

- If the assessment indicates that evacuation of local areas may be advisable, the appropriate local agencies (see Section 4.1) must be notified immediately; and
- Record the (a) time and type of incident (e.g., fire, explosion, or release) (b) name and quantity of material(s) involved, to the extent known, and (c) potential hazards to human health and/or the environment outside of the facility.

After the emergency has passed, the Emergency Coordinator or his/her designees will provide for treating, storing, or disposing of any recovered materials and/or contaminated soil or surface water generated during response to the emergency incident. Prior to resuming operations, the Emergency Coordinator or his/her designees will ensure that cleanup procedures and decontamination activities, if necessary, are complete, and

that all emergency equipment is cleaned and restored to pre-accident conditions. The Emergency Coordinator or his/her designees will notify the necessary agencies (see Section 4.1) to declare the facility safe for continued operations. The treatment system will not be restarted without prior NYSDEC approval.

5.5.1 Fire

In the event of a fire, the following procedures should be followed:

- Call 911, notify fire and police departments;
- Notify the Emergency Coordinator or his/her designee;
- Call i.Park Lake Success Site Security and Great Neck UFSD Security to provide location of fire;
- If fire is small, try to use fire extinguisher located in the Treatment Plant to extinguish it; and
- Evacuate area, if necessary.

5.5.2 Gas Leak

In the event of a gas leak, the following procedures should be followed:

- Evacuate area;
- Shut off all vehicle engines and electronic equipment;
- Call 911, notify fire and police departments;
- Notify the Emergency Coordinator or his/her designee.
- Call i.Park Lake Success Site Security and Great Neck UFSD Security to provide location of gas leak; and
- Notify gas company.

5.5.3 Extraction Well Vault Overflow

In the event of a pipe leak, the drop in line pressure will activate a low pressure switch that will automatically and immediately shut down the Off-Site IRM system. The well vault is also equipped with a level switch that will automatically and immediately shut down the Off-Site IRM system if the water level rises to the set point. In the event untreated groundwater is released into the extraction well vault, the following steps should be immediately performed:

- Notify the Emergency Coordinator or his/her designee; and
- Any water released in the vault should be drained back into the well, pumped into the discharge pipeline via the sump pump or removed by vacuum truck for proper off-site disposal.

Should any water be released from the extraction well vault, notify NYSDEC and Great Neck UFSD representatives immediately. In the event of leakage or spillage of water on Great Neck UFSD property, Lockheed Martin or their authorized agent will take actions necessary to correct and cure the condition with 10 days in accordance with a corrective action plan approved by the NYSDEC. However, based on the nature of the leak or spill and the details of the corrective action plan, a longer time frame may be specified in the corrective action plan.

5.5.4 Influent Pipeline Leak on Great Neck UFSD Property

The system influent line is a dual-containment pipeline system, where the inner pipeline is the "main" line and the outer pipeline is the sealed "containment" line. In the event the main pipeline fails, water will flow into the sealed containment pipeline, triggering a pressure transmitter that will automatically and immediately shut down the Off-Site IRM system. If there is a simultaneous failure of both the inner and outer pipe sections and water is released from the system, then a pressure transmitter located on the main line will sense the loss of flow, which will automatically and immediately shut down the Off-Site IRM system.

Corrective action for main pipeline leaks is outlined below.

- Immediately notify the Emergency Coordinator or his/her designee.
- Immediately notify RGM Liquid Waste Division (RGM) for 24 hour, 7 day (24/7) response.
- Immediately notify NYSDEC and Great Neck USFD representatives.
- Pump remaining water out of the pipeline to containers or a vacuum truck (procedures for surface flooding are summarized below).
- Determine the location of pipe failure from available information.
- Coordinate corrective action with NYSDEC and Great Neck UFSD representative.
- Corrective action for leak in main line only will include the following:
  - Excavate the non-impacted soils down to the pipeline and replace or repair the section of failed line; and
  - Once repaired, pressure test the line and bring back into service.
- Corrective action for containment system failure will include the following:
  - If leak is evident on the surface, set up temporary fencing around the area; otherwise, determine the location of the leak by other means;
  - Collect appropriate soil and standing water samples, and submit samples for analysis of VOCs with 24-hours turnaround on data results;
  - Remove standing water and affected soil and properly dispose off-site. Non-impacted soil will be stockpiled for reuse as trench backfill;
  - Excavate the non-impacted soils down to the pipeline and replace or repair the section of failed line; and
  - Once repaired, pressure test the line and bring back into service.

In the event of leakage or spillage of water on Great Neck UFSD property, Lockheed Martin or their authorized agent will take actions necessary to correct and cure the condition with 10 days in accordance with a corrective action plan approved by the NYSDEC. However, based on the nature of the leak or spill and the details of the corrective action plan, a longer time frame may be specified in the corrective action plan.

5.5.5 Influent Pipeline Leak on Manhasset-Lakeville Water District Property

In the event of a below grade influent pipeline leak on the MLWD property, a similar procedure as the one outlined above in Section 5.5.4 will be followed, except that MLWD representatives will be notified.

5.5.6 Effluent Pipeline Leak

In the event of a below grade discharge pipeline leak, a pressure switch will automatically and immediately shut down the Off-Site IRM system. In the event that the leak is on Great Neck UFSD property, the same response protocol as noted above in Section 5.5.4 concerning the influent pipeline leak will be implemented. If the leak occurs on one of the other properties, the appropriate property owner will be notified.

5.5.7 Clearwell Overflow

Both clearwells are equipped with redundant high-high level switches which will automatically and immediately shut down the Off-Site IRM system. However, in case of clearwell overflow, the following procedure will be immediately followed:

- Shut down the entire Off-Site IRM system ;
- Notify the Emergency Coordinator or his/her designee;
- Notify NYSDEC, Great Neck UFSD and MLWD representatives;
- Recover untreated water released; and
- Assess system with regards to reason for overflow, and appropriate corrective measures will be implemented and tested before the plant is brought back on-line.

5.5.8 Major Spill

In the event of a major spill (e.g., more than 5 gallons), immediately notify RGM for 24/7 response. The NYSDEC's 24-hour oil and hazardous material spill hotline [(800) 457-7362] and the National Response Center [(800) 424-8802] must also be immediately notified, in addition to those individuals noted previously.

6. Response Officials/Agencies

Officials of the agencies listed below will be contacted and briefed about Off-Site IRM activities and potential emergencies during a site walkthrough soon after start-up.

Name: _____

Agency: Police (Village of Lake Success)

Date: _____

Name: _____

Agency: Fire Department (Village of Lake Success)

Date: _____

Name: _____

Agency: Ambulance (Manhasset-Lakeville)

Date: _____

Name: David Kincaid

Agency: Great Neck UFSD

Date: _____

Name: Paul Schrader

Agency: Manhasset-Lakeville Water District

Date: _____

Name: _____

Agency: New York State Department of Transportation

Date: _____

7. Provisions for Amending Contingency Plan

The Amendment to Contingency Plan Form (Attachment I-1) should be used to document any changes required to this CP. Amendments or revisions to this CP will be made whenever:

- The facility changes in a way that increases the potential for fires, explosions, or releases of hazardous waste or hazardous waste constituents, or changes the response necessary in the event of an emergency;
- The list of Emergency Coordinators change;
- The list or location of emergency and/or spill-control equipment changes significantly; or
- The plan fails during an emergency incident.

The Amendment to Contingency Plan Form will be completed prior to the next work day once the changes have been identified. The modifications will be reviewed with all site staff and appropriate Response Officials\Agencies will be updated. A copy of the amendment will be attached to all copies of the CP, including the site copy.

Figure

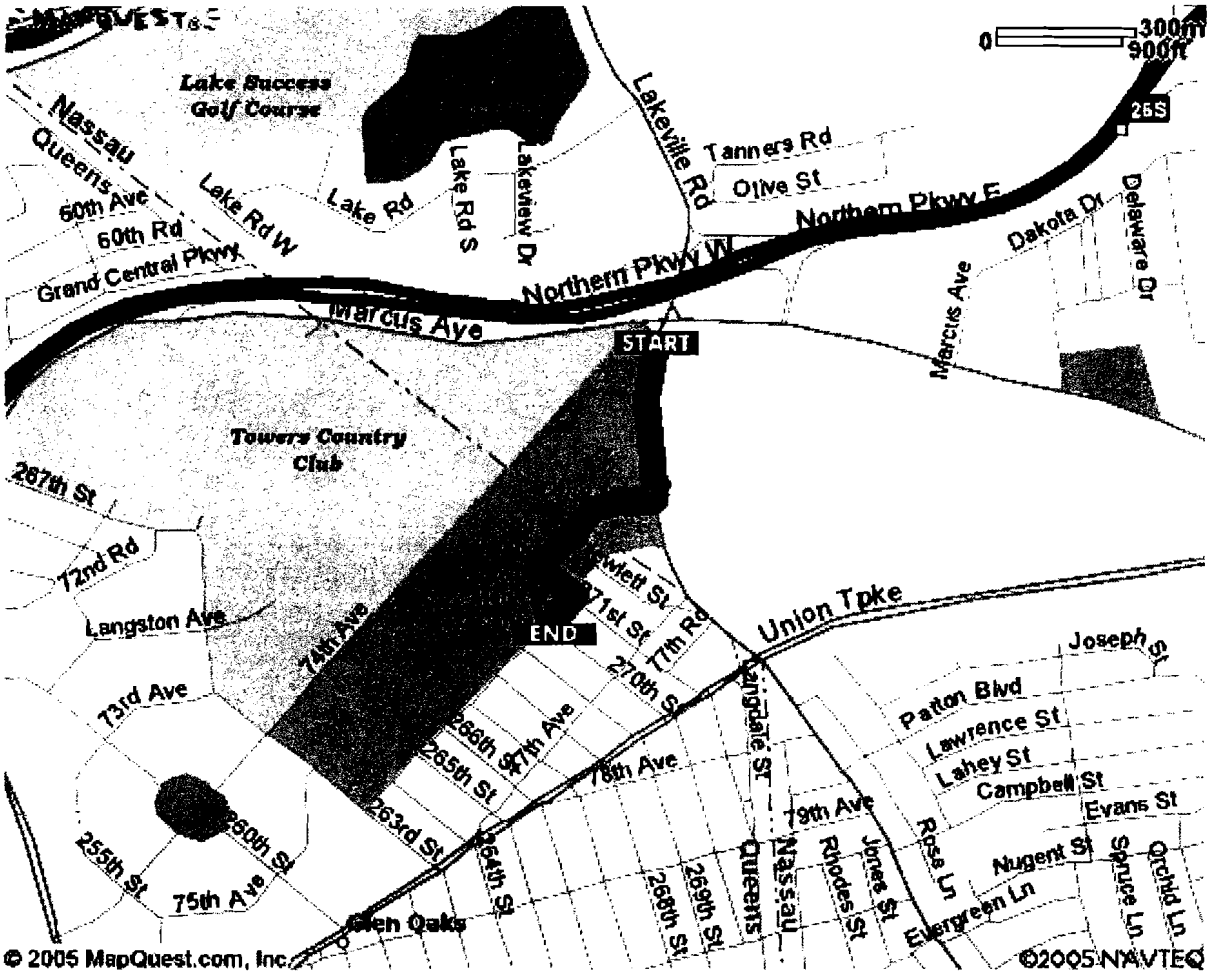
BBL
ENVIRONMENTAL SERVICES, INC.
Remedial Management & Construction

FIGURE 1
MAP TO HOSPITAL

Long Island Jewish Medical Center
27005 76th Avenue
#1120
New Hyde Park, NY 11040
Phone: (516) 470-7000

Directions

- Start out going SOUTH on LAKEVILLE ROAD.
- Turn RIGHT.
- Turn LEFT.
- Turn RIGHT onto 76th Avenue.



Attachment I-1

Amendment to Contingency Plan

BBL
ENVIRONMENTAL SERVICES, INC.
Remedial Management & Construction

ATTACHMENT I-1
AMENDMENT TO CONTINGENCY PLAN

Amendment Number:_____ Date of Amendment:_____

Description of Change that Results in Modifications to CP:

Describe in Detail the Changes Required to the CP:

Signed:_____
Project Manager

Appendix J

Non-Detect Performance Standards

BBL
ENVIRONMENTAL SERVICES, INC.
Remedial Management & Construction

Table 1 Analyte List for Analysis of Aqueous Samples, Quality Assurance Project Plan, OU-2 IRM South Groundwater Treatment System, Former Unisys Facility, Great Neck, New York.

Monitoring Program:	Operational Monitoring	Performance/Compliance Monitoring [3]
Method:	NYSDEC ASP 95-1	NYSDEC ASP 95-1
Matrix/Sample Type:	Aqueous/Groundwater	Aqueous/Water
Constituent [1]	Contract-Required Quantitation Limits (ug/L)	Required Method Detection Limits (ug/L)
Chloromethane	10	1
Bromomethane	10	1
Vinyl Chonde	10	1
Chloroethane	10	1
Methylene chloride	10	1
Acetone	10	5
Carbon disulfide	10	1
1,1-Dichloroethene	10	1
1,1-Dichloroethane	10	1
1,2-Dichloroethene (total) [2]	--	--
cis-1,2-Dichloroethene	10	1
trans-1,2-Dichforoethene	10	1
2-Butanone	10	2
Chloroform	10	1
1,2-Dichloroethane	10	1
1,1,1-Trichloroethane	10	1
Carbon tetrachloride	10	1
Bromodichloromethane	10	1
1,2-Dichloropropane	10	1
cis-1,3-Dichloropropene	10	1
Trichloroethene	10	1
Benzene	10	1
Dibromochloromethane	10	1
trans-1,3-Dichloropropene	10	1
1,1,2-Trichloroethane	10	1
Bromoform	10	1
4-Methyl-2-pentanone	10	1
2-Hexanone	10	1
Tetrachloroethene	10	1
1,1,2,2-Tetrachloroethane	10	1
Toluene	10	1
Chlorobenzene	10	1
Ethylbenzene	10	1
Styrene	10	1
Xylene (total)	10	1
Freon 113	10	1

Notes and Abbreviations:

(1) Listed constituents represent Target Compound List (TCL), volatile organic compounds (VOCs), plus Freon 113 (trichlorotrifluoromethane).

(2) 1,2-Dichloroethane (total) represents the sum of the analyses for the cis-and trans-isomers.

(3) The detection limit is the minimum detection limit (MDL) for the analyte by the approved method. However, the MDL is only achievable in samples with little or no analytes present.

ASP Analytical Services Protocol

ug/L micrograms per liter

Table 2 Analyte List for Analysis of Air Samples, Quality Assurance Project Plan, OU-2 IRM South Groundwater Treatment System, Former Unisys Facility, Great Neck, New York.

Monitoring Program:	Performance/Compliance Monitoring
Method:	EPA Method TO-14A
Matrix:	Air
Constituent [1]	Required Method Detection Limits (2,3) (ug/m3)
Chloromethane	1.0
Bromomethane	1.9
Vinyl Choride	1.3
Chloroethane	1.3
Methylene chloride	1.7
1,1-Dichloroethene	2.0
1,1-Dichloroethane	2.0
1,2-Dichloroethene (total) [4]	2.0
Chloroform	2.4
1,2-Dichloroethane	2.0
1,1,1-Trichloroethane	2.7
Carbon tetrachloride	3.2
1,2-Dichloropropane	2.3
cis-1,3-Dichloropropene	2.3
Trichloroethene	2.7
Benzene	1.6
trans-1,3-Dichloropropene	2.3
1,1,2-Trichloroethane	2.7
Tetrachloroethene	3.4
1,1,2,2-Tetrachloroethane	3.4
Toluene	1.9
Chlorobenzene	2.3
Ethylbenzene	2.2
Styrene	2.1
o-Xylene	2.2
m&p-Xylene	4.3
Freon 113	3.8

Notes and Abbreviations:

(1) Listed constituents based on Target Compound List (TCL) volatile organic compounds (VOCs), plus Freon 113 (trichlorotrifluoromethane). Specific compounds to be analyzed will include, but not be limited to, this list.

(2) Required method detection limits (and/or laboratory reporting limits) will be equal to or less than compound-specific Air Guide 1 requirements.

(3) The detection limit is the minimum detection limit (MDL) for the analyte by the approved method. However, the MDL is only achievable in samples with little or no analytes present.

(4) 1,2-Dichloroethane (total) may be determined by the sum of the analyses for the cis-and trans-isomers.

ug/m3 Micrograms per cubic meter