

**WORK PLANS:**  
**PART 1 - SITE INVESTIGATION PLAN**  
**PART 2 – STANDARD OPERATION PROCEDURES**  
**PART 3 – QUALITY ASSURANCE PROJECT PLAN**

**For the**  
**1318 Niagara Street Site**  
**Buffalo, New York**  
**NYSDEC ID# E915213**

**PREPARED FOR:**  
City of Buffalo

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## **LIST OF ACRONYMS AND ABBREVIATIONS**

AST	above-ground storage tank
AOC	Area of Concern
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CWM	Chemical Waste Management
CRA	Conestoga-Rovers and Associates
CSM	Conceptual Site Model
cy	cubic yard
DUSR	Data Usability Summary Report
ECIDA	Erie County Industrial Development Agency
ERP	Environmental Restoration Program
GAC	Granular Activated Carbon
HASP	Health and Safety Plan
HSA	hollow stem auger
I.D.	inside diameter
LiRo	LiRo Engineers, Inc.
ND	non-detect
NYSDEC	New York State Department of Environmental Conservation
OSHA	Occupational Safety and Health Administration
OU	Operable Unit
PID	photoionization detector
ppb	parts per billion
ppm	parts per million
ppt	parts per trillion
QAPP	Quality Assurance Project Plan
RCRA	Resource Conservation and Recovery Act
RFA	RCRA Facility Audit
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
SCGs	Standards, Criteria, and Guidance
SIP	Site Investigation Plan
SI/RAR	Site Investigation and Remedial Alternatives Report
SOP	Standard Operation Procedures
SPDES	State Pollutant Discharge Elimination System
SWMU	Solid Waste Management Unit
TAGM	Technical and Administrative Guidance Memorandum
TAL	Target Analyte List
TCL	Target Compound List
UST	underground storage tank

## **PART 1 SITE INVESTIGATION PLAN**

### **1.0 INTRODUCTION**

LiRo Engineers, Inc. (LiRo) is in contract agreement with the City of Buffalo, Office of Strategic Planning to provide a Site Investigation and Remedial Alternatives Report (SI/RAR) for the 1318 Niagara Street Site in Buffalo, New York. The Site location is shown on Figure 1. General Site and nearby/adjacent property features are shown on Figure 2. The property is bounded by Niagara Street to the East, a rail corridor to the West and commercial properties to the north and south.

In support of the SI/RAR, LiRo has developed a site remedial investigation plan which includes soil sampling and groundwater sampling. The purpose of the Site Investigation is to characterize site physical and chemical conditions in order to evaluate appropriate remedial alternatives for site remediation.

These Work Plans were developed following the NYSDEC Environmental Restoration Program (ERP) requirements and the DER-10 Guidance Document. This site Work Plan is a three-part document which describes the entire scope, rationale and methods that will be used for the investigation. Part 1 - Site Investigation Plan (SIP) identifies the site background including a summary of the historical document review, previous investigations, previous Interim Remedial Measures (IRMs), project objectives and specific work elements that will be completed for the investigation. Part 2 – Standard Operation Procedures (SOP) specifies the standard field investigation, drilling and sampling protocols to be used during this investigation. Part 3 – Quality Assurance Project Plan (QAPP) describes the procedures, methods and means that will be employed to assure the quality and defensibility of data generated during the investigation.

A project Health and Safety Plan (HASP) prepared for the investigation was submitted by LiRo under separate cover on August 10, 2009. The HASP details procedures and protocols that will be implemented to protect site workers and the surrounding community during the investigation including levels of personal protective equipment for

planned site activities, air monitoring requirements, action levels, and emergency response procedures.

Upon completion of site investigation activities, analytical results, physical data, and interpretations will be documented in a summary report.

## **1.1 Project Goals and Scope**

The purpose of the Investigation Plan is to fully characterize the Site chemical and physical conditions in order to support an evaluation of remedial alternatives and select a preferred alternative for site remediation. Planned Site Investigation activities include document review (already completed), monitoring well installation, and sampling and analysis of soil and groundwater. The site is zoned for commercial use and the future intended use is likely commercial. Therefore, the site remedial goals will be based on 6NYCRR Part 375 Restricted Commercial Track 2 Soil Cleanup Objectives (SCOs). If additional data needs (e.g., aquifer testing, etc.) are identified during the course of the investigation, LiRo will prepare Work Plan Addenda to describe the scope and rationale for any required additional investigations prior to initiating the work.

The document review included review of NYSDEC spills division records for the Site and City of Buffalo building demolition records. No previous Phase I Environmental Site Assessment was evident in the records. LiRo also reviewed NYSDEC reports for the nearby Chem Core site located approximately 650 feet north of the site as that site may potentially impact the 1318 Niagara Street Site and the hydrogeological information developed for the Chem Core project is considered relevant to the 1318 Niagara Street site. The document review information has been incorporated into the Site history and relevant sections of this Work Plan. There is no stand-alone deliverable required for the document review.

## **1.2 Project Organization**

The 1318 Niagara Street SI/RAR is being conducted under a NYSDEC ERP State Assistance Contract with the City of Buffalo (the City), Office of Strategic Planning.

LiRo is under contract with the City to plan and implement the SI/RAR and NYSDEC is responsible for oversight of the investigation as well as review and approval of project deliverables.

The NYSDEC project manager is Mr. Anthony Lopes and Mr. Dennis Sutton directs the project for the City. LiRo's key project personnel are Mr. Robert Kreuzer, project manager and Mr. Stephen Frank, project coordinator.

### **1.3 Site Setting**

The Site is located at 1318 Niagara Street in the City of Buffalo, New York (Figure 1) on approximately 0.77 acres of land. The Site elevation along Niagara Street (eastern side of the Site) is approximately 600 feet above sea level, and the Site slopes to the west. The site was previously developed with a brewery; however, these structures were demolished in 2006 - 2007. Some foundation structures remain at the Site, which are represented on Figure 2 through Figure 5.

The Site is located in an urban setting, with commercial properties along Niagara Street north and south of the site, and residential/commercial properties across Niagara Street to the southeast, east, and northeast. The site is bordered to the west by the Penn Central Railroad and beyond that by the New York State I-190 and the Black Rock Canal.

### **1.4 Site Background**

The Site was formerly operated as a brewery from approximately 1909 until approximately 1987. The site was held by private owners from 1987 until November 2004, at which time the City of Buffalo obtained the property through the tax foreclosure process. It is not known what the property was utilized for during the period from 1987 until 2004.

Demolition of the site buildings began in May of 2006. During demolition, two 20,000 gallon fuel oil USTs were discovered. A laboratory report from January 2007 indicated that the residual oil in the tanks contained hazardous levels PCBs (Aroclor 1242 at



concentrations of 90 mg/kg and 124.5 mg/kg). The samples also contained tetrachloroethene (150 mg/kg and 200 mg/kg), trichloroethene (78 mg/kg and 270 mg/kg), 1,2-dichlorobenzene (44 mg/kg) and lead (4,100 mg/kg and 2,100 mg/kg). The residual oil was reportedly removed using a Vac-truck in February 2007. The two tanks were excavated in February 2007, staged along the southern margin of the site, and covered with polyethylene tarps. Upon UST excavation, it was found that one of the USTs had leaked into the subsurface, impacting the surrounding soil. Piping from the USTs was also discovered and removed. The site records indicate that one soil sample described as “tank soil” was collected on February 12, 2007. The soil sample was analyzed for PCBs and TCLP organics/metals. The PCB concentration was 0.866 mg/kg in soil and the TCLP results showed non-hazardous levels of barium and lead. A NYSDEC Spill Number, 0651726, was assigned to the site.

In addition to contamination associated with the USTs, a former furnace was uncovered in January 2007. The furnace contained sludge that was tested for PCBs and TCLP organics/metals. The PCB concentration in sludge was 23,700 mg/kg and the TCLP results showed detectable (but non-hazardous) levels of VOCs, SVOCs and barium.

In addition, 55-gallon drums reportedly containing PCBs in waste oil/sludge, and used personal protective equipment (PPE) were staged along the northern margin of the Site and covered with polyethylene tarps.

LiRo visited the site on June 25, 2009 with representatives from the City. Mr. Larry Schiavone, who directed the site demolition project for the City in 2006, indicated the northeast portion of the Site where the USTs had been removed. He recalled that soil from the tank excavation was used for backfilling and that a polyethylene tarp (the edge of which was visible) had been placed to mark the excavation limit. Mr. Schiavone also recalled that imported fill had been used to level the Site and that an existing mound of fill material was imported. The furnace excavation was open and it appeared that the former bottom of the structure had been covered by recent sedimentation.

## **1.5 Preliminary Site Investigations**

LiRo developed a Preliminary Site Investigation Plan (dated July 13, 2009) to generate screening level data to support the IRM planning. The preliminary investigation included soil sampling, surface water sampling, sludge and residual water sampling from each of the former USTs, and composite sampling of soil and of sludge from the 55-gallon drums staged on-site. The results of the Preliminary Site Investigation are discussed further in the sections below.

### **1.5.1 Soil and Surface Water Investigation**

LiRo conducted a preliminary site investigation and documented the results in a letter report dated October 14, 2009. The purpose of the preliminary surface soil investigation was to determine if surface soils pose a significant health risk due to PCB contamination. Surface soil samples were collected from a depth interval of 0 to 2 inches or 0 to 6 inches at 14 locations including the furnace pit, the area of the UST excavation, the area near the staged USTs and general site locations (see Figure 3). LiRo collected a sample of surface water and sediment present in the furnace pit for PCB analysis, also.

Aroclor-1260 was detected in all of the surface soil and sediment samples ranging in concentrations from 0.043 parts per million (ppm) to 51 ppm. Surface soil samples SS-1 through SS-5, SS-12 and SS-15 all exceeded the NYSDEC Part 375 Soil Clean-up Objective (SCO) of 1 ppm. Sample locations where the SCO was exceeded are shown on Figure 3.

The pit water sample showed Aroclor 1260 at a concentration of 0.29 parts per billion (ppb). The pit water concentration exceeded the NYSDEC Class GA groundwater standard which is 0.09 ppb for PCB.

### **1.5.2 Drum and Tank Investigation Results**

The nineteen (19) onsite drums contained sludge, oil, polyethylene sheeting, and personal protective equipment (PPE). LiRo opened each drum and classified the contents (to the extent possible). A composite sample of drum sludge and a composite sample of the

residual oil/water were analyzed for PCBs and VOCs (total), and hazardous waste characteristics (full TCLP, sludge composite only). Sludge and residual oil/water samples were also collected from each of the former USTs.

Both tank oil samples contained relatively low concentrations of Aroclor 1260. Also detected were trichloroethene (in both samples) and toluene (in the West Tank). The companion sludge samples showed PCB concentrations up to 7.9 ppm (in the west tank), as well as chlorinated solvents and fuel-related compounds.

Compared to the UST samples, the drum samples showed significantly higher levels of PCBs, chlorinated solvents and fuel related compounds. The PCB concentration in the drum sludge composite sample was 59 ppm for Aroclor 1242. Both drum sludge samples exceeded the TCLP limit for lead.

## **1.6 IRM Results**

### **1.6.1 Introduction**

Based on preliminary results LiRo developed an IRM Work Plan, dated March 11, 2010. The IRM work was conducted by Empire GeoServices, Inc., a subsidiary of SJB Services, Inc., with oversight conducted by LiRo. The IRM was implemented in September - October 2010. The two 20,000-gallon UST's that had been previously excavated and staged in the southeast corner of the Site were cleaned and removed from the Site. The UST's were disposed of off-site at a metal recycling facility. The staged 55-gallon drums containing PCB sludge waste and used PPE that were remaining on-site since the excavation activities were removed and disposed of off-site at a permitted treatment, storage, and disposal facility. Impacted soils from four discrete areas of the Site were excavated and also disposed of at a permitted treatment, storage, and disposal facilities. The following section contains a summary of the IRM activities. The full IRM details will be documented in an IRM construction completion report, which is currently being developed by LiRo.

### **1.6.2 UST Excavation**

The UST excavation is located in the northeastern portion of the subject property where PCBs in fill materials were detected in excess of the NYSDEC Part 375 commercial soil cleanup objectives (SCO's). Remedial excavation work on the UST area consisted of excavation and disposal of contaminated soils, and was initiated on September 16-17, 2010 with the excavation and disposal of contaminated soil. The initial excavation was advanced to the top of the underlying native silty clay soil which was encountered at a depth of approximately 12 feet below the pre-excavation ground surface. The sidewalls of the excavation were initially extended to the limits of the blue tarps that reportedly had been placed in 2007 to mark the original UST excavation limit. The initial excavation area was approximately 1,100 square feet. Due to cave-ins of the eastern sidewall along the fence, the limits were reduced along the length of eastern sidewall.

10 sidewall and three bottom confirmation soil samples were collected from the UST excavation area on September 24-27, 2010 and analyzed for PCBs. Three confirmation soil samples (W-1 at 10', W-5 at 5', and B-3 at 12'), from the eastern sidewall, western sidewall, and the southern bottom of the excavation exceeded the NYSDEC SCO's for PCBs.

Based upon confirmation sample exceedances, additional soil excavation was conducted on October 7, 2010. A three foot wide by 12 foot deep excavation was performed along the northwestern sidewall. An additional confirmation soil sample (W-10A at 10') from the northwestern sidewall was collected on October 7, 2010 and the sample result showed compliance with the NYSDEC SCO's.

Final confirmation sample PCB results are summarized in Table 1-4 and shown on Figure 4. At completion of the IRM, exceedances of the PCB SCO were evident in the northern portion of the east wall (locations W-1 and W-8), south bottom (location B-3) and central portion of the west wall (location W-5). The final excavation was approximately 1,287 sq. ft. The excavation was backfilled with select fill (virgin quarry stone) on September

29, October 4-5, October 14-15, and October 25, 2010 and graded level with the surrounding area.

### **1.6.3 Area Immediately North and West of UST Excavation Area**

The area immediately north and west of the UST excavation is located in the northeastern area of the property where PCBs in shallow fill soil were detected in excess of the NYSDEC SCO's. Remedial excavation work in this area was initiated on September 29, 2010. The excavation was initially advanced to a depth of approximately one foot below the pre-excavation ground surface. The initial excavation area was approximately 1,200 square feet in size.

Six sidewall and two bottom confirmation soil samples were collected on September 29, 2010 and analyzed for PCBs. Two bottom (BT-1 at 1' and BT-2 at 1') and five sidewall confirmation soil samples (WS-1 at 1', WS-3 at 1', WS-4 at 1', WS-5 at 1', and WS-6 at 1') exceeded the NYSDEC SCO's for PCBs. An additional excavation was conducted on October 7, 2010. An additional one foot of soil material was removed from the bottom of the excavation along with an additional three feet of material along the western sidewall, to a depth of two feet. The excavation along the western sidewall was approximately 75 feet in length. Five sidewall and two bottom confirmation soil samples were collected on October 7, 2010 and analyzed for PCBs. At completion of the IRM, exceedances of the PCB SCO were evident in a southern bottom sample (BT-1A at 1'), a western sidewall sample (WS-1A at 1') and a northern sidewall sample (WS-4A at 1'). The results are presented in Table 1-4 and shown on Figure 4. The excavation was backfilled with soil from the on-site approved stockpile on October 18, 2010 and graded level with the surrounding area.

### **1.6.4 Discrete Area SS-12**

Discrete Area SS-12 is located in the southwestern portion of the property where PCBs in shallow fill soil were detected in excess of NYSDEC SCO's. Remedial excavation work at Discrete Area SS-12 was initiated on September 23, 2010 with the excavation and disposal of contaminated soil. The excavation was initially advanced to a depth of

approximately one foot below the pre-excavation ground surface. The initial excavation area was approximately 100 sq. ft. in size.

Four sidewall and one bottom confirmation soil samples were collected on September 23, 2010, and analyzed for PCBs. Three of the four sidewall confirmation soil samples (SS-12 North at 1', SS-12 South at 1', and SS-12 West at 1'), from the sidewalls slightly exceeded the NYSDEC SCO's for PCBs and therefore, additional soil excavation was performed from the northern, western and southern sidewalls on October 8, 2010. An approximate one and a half foot wide and one foot deep excavation was performed along these sidewalls. Additional sidewall confirmation soil samples (SS-12A North at 1', SS-12A West at 1', and SS-12A South at 1') were collected on October 8, 2010 and the western and southern wall sample results exceeded NYSDEC SCO's for PCBs. Following the second set of sample exceedances (SS-12B West at 1' and SS-12B South at 1'), an approximate one and a half foot wide by one foot deep of additional soil was removed from the western and southern sidewalls on October 19, 2010. Additional sidewall confirmation soil samples were collected on October 19, 2010 and analytical results indicated that the western and southern sidewall samples still slightly exceeded the NYSDEC SCO's for PCBs. The final excavation was 160 square feet in size. The excavation was backfilled with soil from the on-site approved stockpile on October 19, 2010 and graded level with the surrounding area.

#### **1.6.5 Discrete Area SS-5**

Discrete Area SS-5 is located in the southeastern area of property where PCBs in shallow fill soil were detected in excess of the NYSDEC SCO's. Remedial excavation work was initiated on September 18, 2010 with the excavation and disposal of contaminated soil. The excavation was advanced to a depth of approximately one foot below the pre-excavation ground surface. The initial excavation area was approximately 100 sq. ft. in size.

Four sidewall and one bottom confirmation soil samples were collected on September 23, 2010 and analyzed for PCBs. All of the confirmation samples complied with NYSDEC

SCO's. The final excavation was 100 sq. ft. in size. The excavation was backfilled with select fill and graded level with the surrounding area.

#### **1.6.6 Furnace Pit Area**

The Furnace Pit Area is located in the northwestern portion of the property where PCBs in the sediment and fill material were detected in excess of the SCOs. Remedial excavation work at the furnace pit area was initiated on September 21, 2010 with the excavation and disposal of contaminated soil from the bottom and sidewalls of the existing pit. The bottom of the excavation was initially advanced to depths of one to two ft. below the pre-excavation pit bottom. Existing sidewalls were excavated approximately one ft. to the north, east, south, and west. The initial excavation area was approximately 1,600 square feet in size.

Six sidewall (FPS-1 at 2', FPS-2 at 2', FPS-3 at 3', FPS-4 at 2', FPS-5 at 3' and FPS-6 at 2') and two bottom confirmation soil samples (FPB-1 and FPB-2) were collected on September 23, 2010 and analyzed for PCBs. All of the confirmatory soil sample results exceeded the NYSDEC SCO's for PCBs.

Based on these and subsequent PCB exceedances in endpoint samples, additional excavation work was conducted on September 30, 2010, October 8, 2010, October 20, 2010, October 22, 2010, and October 25, 2010.

Final confirmation sample PCB results are summarized in Table 1-4 and the locations of the samples showing residual soil contamination are shown on Figure 4. At completion of the IRM, exceedances of the PCB SCO were evident in two of the bottom samples (FPB-2A and FPB-MID12), west sidewall sample (FPS-3A) and a southwest sidewall sample (FPS-4C). The excavation was backfilled to approximately one ft. below grade with soil from the on-site approved stockpile on October 27, 2010.

### **1.6.7 IRM Target Compound List Sample Results**

To support the ongoing ERP investigation of the Site for other contaminants, three of the endpoint samples were analyzed for the full Target Compound List (TCL) criteria. The full TCL includes VOCs, SVOCs, pesticides, PCBs and Target Analyte List (TAL) metals. The full TCL samples were collected from the Furnace Pit Excavation Area (FPS-7), UST Excavation Area (W-11), and Discrete Area SS-12 (S-12-B-A) which are shown on Figure 4. The analytical results are presented in Tables 1-5 through 1-8 and summarized below.

- TCL Metals were analyzed for all three samples. Although detections were observed, no exceedances of SCOs were reported.
- TCL Pesticides/Herbicides were analyzed for all three samples. Although detections were observed, no exceedances were reported.
- TCL VOC's were analyzed for all three samples. No detections were reported.
- TCL SVOC's were analyzed for all three samples. Although detections were observed, no exceedances were reported. Most of the detections were identified as polycyclic aromatic hydrocarbons (PAH's), which are commonly detected in urban fill soils.

### **1.7 Site Hydrogeology**

Subsurface information obtained from the IRM activities conducted at the Site is described below. Generally, the fill material found at the Site consisted of a clayey-silt soil with gravel, concrete, bricks, plastic, and wood. The fill material was encountered at depths ranging from the pre-excavation ground surface to an approximate depth of 12 feet in the UST excavation. Fill around the perimeter of the furnace pit excavation was approximately four to six feet in thickness. Re-graded or native silty clay soil was encountered beneath the fill.

Water was observed within the Furnace Pit excavation at a depth of approximately 13 feet. Since the Site slopes to the west, the Furnace Pit Area is approximately five feet lower than the eastern side of the Site.



Subsurface information was also reviewed from a nearby NYSDEC Superfund remediation site (Chem-Core) located just north of the site, and generally was consistent with the findings at the 1318 Niagara Site. Because a comprehensive hydrogeological characterization was conducted at the Chem-Core site, the information is included herein as a baseline for evaluating 1318 Niagara Street Site conditions. Based on Chem-Core observations, the thickness of the native material in the nearby site ranged from 12 feet to 20 feet. Beneath the overburden deposits, the bedrock consists of the Silurian age Akron Dolostone.

The stratigraphic sequence at the Chem-Core property includes, from the surface down: fill; stratified clayey silt/silty clay; and bedrock. The overburden at the Chem-Core site was determined to be approximately 13 to 30 feet thick based upon drilling information. The fill that was encountered at most drilling locations was described as a heterogeneous mixture of sand, gravel, concrete, bricks, cinders and slag. Bedrock was encountered beneath the silts and clays. The bedrock surface appeared to slope to the west at the Chem-Core site.

An area-wide water table aquifer was identified in bedrock at a typical depth of 20 feet to 25 feet below grade at the Chem-Core site. Flow in this aquifer is to the west at a gentle horizontal gradient. Perched water was also identified in portions of the Chem-Core site overburden.

## **1.8 Conceptual Site Model**

Based on historical testing of the UST residuals conducted in January 2007 by Upper New York State Environmental, the UST's stored fuel oil contaminated with chlorinated solvents, metals and PCBs prior to their excavation in 2007. The UST's appear to have been connected to the furnace pit via piping which was removed in 2007. Ground observations suggest that the location of the former piping was along the northern margin of the Site, but the location was not documented is not known with certainty. When the UST's were removed it was observed that one of the UST's had leaked into the subsurface. The excavated soils around the tanks were used as backfill for the

excavation. It is possible that the downward migration of contamination may have further impacted the soils in the UST excavation and potentially impacted the groundwater at the Site as well.

The UST's were staged in the southeast corner of the Site. The UST's were not properly cleaned prior to their placement. Sludge mixed with rain water was observed in the open ends of the UST's while they were staged at the Site. There is the potential that the contaminated rain water leaked out from the UST's and impacted the soils beneath and around the staging area. The downward migration of contamination may have also impacted the groundwater at the Site.

Another source for potential contamination at the Site is the UST piping. The piping has since been excavated from the Site. However, the potential for leakage from the piping exists. Since the original location of the piping is not known, potentially impacted soils in the subsurface may still exist.

The furnace was used to burn the contaminated oil at the Site. Based on the IRM work, contamination migrated from the furnace pit and affected surrounding soils beneath the furnace pit and to the south of the furnace. It is possible that the contaminants have impacted groundwater at the Site.

With the demolition of the Site structures, excavation of the UST's, furnace, and associated tank piping, it is possible that contaminated soils may have been inadvertently spread around the Site by heavy machinery operating at the Site, thus contributing to other areas of PCB contamination.

The primary uncertainties associated with the conceptual Site model are the extents of impacted soils and the impacts to groundwater. The areas of known or suspected contamination were utilized along with the results of the Preliminary Site Investigation and IRM activities at the Site, in the identification of proposed Site investigation activities presented in the following sections.

## **2.0 PROPOSED INVESTIGATION PROGRAM**

The purpose of the SI is to develop a database sufficient to identify all sources of site contamination, evaluate the mobility and transport mechanisms of the contamination, perform an exposure assessment, evaluate the extent to which site contaminants pose an unacceptable risk to human health or the environment, and evaluate remedial alternatives to mitigate such risks and return the site to productive use. The following sections detail the scope, approach and rationale for the remaining work elements that will be conducted during the SI. Details for the specific sampling methods and protocols that will be implemented during the investigation are detailed in the Standard Operation Procedures portion (Part 2) of this Work Plan.

Soil Borings and surface soil locations will be sampled at the Site to determine the nature and extent of soil contamination. Monitoring wells will be installed at the Site to characterize the groundwater conditions at known or suspected contaminant source locations and also to evaluate hydraulic conditions at the Site.

Locations of the proposed samples are biased toward contaminant source areas or to delineate the extent of PCB contamination in areas where IRM confirmation samples exceeded SCOs. Proposed sampling locations are shown on Figure 5. Table 1-9 summarizes the proposed soil and groundwater sampling for each location.

### **2.1 Soil Borings**

Thirteen soil borings are proposed to be installed at the Site using a Geoprobe. Proposed locations for the soil borings are shown on Figure 5. Each soil boring will be advanced to target depths (see Table 1-9) as directed by LiRo's supervising geologist. LiRo's supervising geologist will screen soil from each core for the presence of organic vapors using a photoionization detector (PID) and will record field descriptions of the soil as well as PID readings. The sample intervals (for chemical analysis) are indicated on Table 1-9. Soil samples will be collected and analyzed for VOCs using USEPA Method 8260, SVOCs using Method 8270, PCBs using Method 8082, pesticides using Method 8081,

TAL metals using Method 6010, mercury using Method 7471, and cyanide using Method 9012.

## **2.2 Monitoring Well Installation and Groundwater Sampling**

Five new monitoring wells are proposed to be installed at the site. The proposed locations of these new monitoring wells are located within the furnace pit, within the UST excavation, the previous drum storage area, in the southwest corner (presumed downgradient) of the Site, and also within the staging area of the excavated USTs. Proposed locations for the new monitoring wells are shown on Figure 5. The monitoring wells will be constructed using 2-inch (inside diameter), Schedule 40 PVC screens (10-feet in length) and riser and finished with a watertight cap and protective steel casing. Based on IRM excavation observations, it appears that overburden water will be present at the Site. The anticipated target for well completion will be in overburden approximately 25 to 28 feet below ground surface (bgs). Drillers will be prepared for bedrock drilling if groundwater is not encountered in overburden.

Newly-installed monitoring wells will be developed a minimum of 24-hours after installation and sampled a minimum of 2-weeks after development. Prior to sampling, the wells will be purged to remove water held in casing storage. If the well productivity is sufficient, the wells will be purged of at least three casing volumes prior to sampling. If the wells purge to dryness, the groundwater sample will be collected after the water level has returned to within 85 percent of the static condition. Groundwater samples will be analyzed for volatile organic compounds (VOCs) using USEPA Method 8260, semi-volatile organic compounds (SVOCs) using Method 8270, PCBs using Method 8082, pesticides using Method 8081, TAL metals using Method 6010, mercury using Method 7471, and cyanide using Method 9012. Monitoring wells will also be used to measure groundwater levels for the determination of the direction of groundwater flow.

### **2.2.1 Well Development**

Following installation, each monitoring well will be developed by surging, pumping, bailing, or a combination thereof until the discharged water is relatively sediment free. Development water will be containerized within 55-gallon drums, and disposed of as per NYSDEC guidelines. The effectiveness of the development process will be monitored by recording measurements of temperature, pH, specific conductance, and turbidity using a portable water quality analyzer. Due to the low permeability soil, the wells may pump to dryness.

### **2.2.2 Water Level Measurement**

Water levels in the new site monitoring wells will be measured using an electronic water level indicator. At least two sets of synoptic water level measurements will be recorded including a set of measurements prior to sampling. One of the key investigation objectives will be to determine the hydraulic relationship between groundwater and the surrounding soil.

## **2.3 Shallow Surface Soil Delineation**

Four shallow surface soil samples (0-1') are proposed to be collected adjacent to excavation area SS-12 to delineate the extent of PCB contamination to the south and west of the excavation area. Proposed locations for the soil borings are shown on Figure 5. Each shallow sample will be advanced to approximately one foot bgs, by hand, using dedicated or pre-cleaned reusable equipment and one soil sample will be collected and sent for PCB analysis.

## **2.4 Equipment Decontamination Procedures**

### **2.4.1 Hand Sampling Equipment**

Reusable equipment used to collect samples, such as sample trowels and mixing bowls will be hand cleaned using a sequence of analconox/water wash and distilled water rinse between each use. Dedicated (i.e., disposable) sampling equipment is for one-time use and will not require decontamination. Field instruments (i.e., PID, water quality meters)

will be decontaminated by wiping with a damp cloth or in accordance with the manufacturer's recommendations.

#### **2.4.2 Drilling Equipment**

All reusable sampling equipment (i.e., split-spoons, core samplers, and augers/drilling rods) will be decontaminated between uses with standard techniques (i.e., alconox-water wash and distilled water rinse or steam clean). The drilling Contractor will use the existing decontamination pad to conduct large equipment decontamination at the Site.

#### **2.5 Sample Handling and Analysis**

Soil and groundwater samples will be collected into laboratory supplied, pre-cleaned sample jars. The jars will be labeled with a unique sample identification code, packed in a cooler with ice, and shipped under chain-of-custody control to ChemTech Consulting Group, Inc. (ChemTech) of Mountainside, New Jersey, a New York State Certified Laboratory (ELAP Certification # 11376). Sample bottle requirements and holding times as well as details regarding laboratory QC procedures and field QA sampling are detailed in the QAPP portion of this Work Plan and are summarized in Tables 3-1 through 3-8. Soil samples will be collected and analyzed for chemical parameters as outlined in Table 1-9.

#### **2.6 Surveying and Mapping**

Soil boring, surface soil, and monitoring well locations will be surveyed for horizontal and vertical coordinates by a licensed New York State surveyor. The surveyor will also locate existing excavation limit markers and IRM confirmation sample markers.

#### **2.7 Investigation Derived Waste**

Auger cuttings, development water, purge water and equipment decontamination water will be containerized, characterized and disposed of at an off-site facility. Used personal protective equipment will be placed in contractor grade trash bags for off-site disposal.

## **3.0 REPORTING**

### **3.1 Initial Site Characterization**

Upon completion of the field investigation, LiRo will develop Standards, Criteria, and Guidance (SCGs) in concert with the City and NYSDEC. LiRo anticipates that the SCGs will be based primarily on 6 NYCRR Part 375 Soil Cleanup Objectives. Analytical data from groundwater monitoring will be compared with TOGS 1.1.1 Ambient Water Quality Standards for Groundwater (Class GA). In cases where a comparison value does not exist for TOGS 1.1.1 or the standard is lower, the analytical results will be compared to NYSDOH Part 5 Drinking Water Standards. The SCGs will be used throughout the SI/RAR process. LiRo will evaluate raw site data, determine the need for additional site investigations, and document the results/additional needs in an Initial Site Characterization Report.

### **3.2 Exposure Assessment**

The objective of the Exposure Assessment is to evaluate the presence of completed or potential exposure pathways in order to determine if the site contamination poses an existing or potential hazard to current or future site users. The results of the Exposure Assessment will be incorporated into the Site Investigation Report.

### **3.3 Site Investigation Report**

The results of all site investigations will be summarized in a comprehensive Site Investigation Report. The SI Report will present a detailed summary of site physical conditions, chemical conditions and potential risks to human health or the environment. The report will be structured in accordance with NYSDEC DER-10 guidance and will contain all required elements to support the RAR. The report will contain a detailed evaluation of contaminant levels with respect to SCGs.

### **3.4 Remedial Alternatives Report**

A remedial alternatives report (RAR) will be prepared in accordance with DER-10. The RAR will contain a detailed analysis of several remedial alternatives which will be selected in consultation with NYSDEC and the City. A detailed analysis of each selected alternative will be completed in accordance with the requirements of 6NYCRR Part 375-1.10. Each selected alternative will be evaluated against the following criteria:

- Protection of human health and environment;
- Compliance with SCGs;
- Implementability;
- Reduction of toxicity, mobility or volume;
- Long-term effectiveness; and
- Cost.

The RAR will summarize the findings of the remedial alternatives evaluation and recommend a preferred alternative, or if warranted, a combination of selected alternatives for the site.

### **3.5 Schedule**

Key milestones of the SIP schedule are detailed below:

- Complete Final Work Plans – March 2011
- Mobilization/Field Investigation – May-June 2011
- Evaluate Raw Data/Initial Site Characterization – July 2011
- Draft SI Report and RAR (Assumes no Additional Investigation) – August 2011



**TABLE 1-1**  
**Preliminary Investigation Sampling Results**  
**Summary of PCBs Detected in Surface Soil**

Boring Number	Depth of Sample	Lab Sample ID	Date Collected	Commercial Soil Clean-up Objective	PCB (mg/kg)													
					Aroclor-1016		Aroclor-1221		Aroclor-1232		Aroclor-1242		Aroclor-1248		Aroclor-1254		Aroclor-1260	
SS-1	0-2"	A4464-01	9/24/2009	1 mg/kg	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	<u>48</u>	D
SS-2	0-6"	A4464-02	9/24/2009	1 mg/kg	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	3.1	D
SS-3	0-2"	A4464-03	9/24/2009	1 mg/kg	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	1.8	D
SS-4	0-6"	A4464-04	9/24/2009	1 mg/kg	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	<u>35</u>	D
SS-5	0-2"	A4464-05	9/24/2009	1 mg/kg	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	<u>2.4</u>	D
SS-6	0-2"	A4464-06	9/24/2009	1 mg/kg	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	0.96	D
SS-7	0-2"	A4464-07	9/24/2009	1 mg/kg	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	0.21	
SS-8	0-6"	A4464-10	9/24/2009	1 mg/kg	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	0.043	
SS-9	0-6"	A4464-11	9/24/2009	1 mg/kg	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	0.071	
SS-10	0-2"	A4464-12	9/24/2009	1 mg/kg	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	0.31	
SS-11	0-2"	A4464-13	9/24/2009	1 mg/kg	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	0.054	
SS-12	0-2"	A4464-14	9/24/2009	1 mg/kg	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	3	D
SS-13	0-6"	A4464-15	9/24/2009	1 mg/kg	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	0.23	
SS-14-SED	0-3"	A4464-16	9/24/2009	1 mg/kg	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	0.096	
SS-15	0-6"	A4464-17	9/24/2009	1 mg/kg	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	<u>51</u>	D

Notes:

All concentrations are reported in parts per million (ppm or mg/kg)

ND or U = Compound not detected above method detection limit (see attached lab report for mdl's)

D = Sample diluted

Underline = Result exceeds 6 NYCRR Part 375 Restricted Commercial Soil Cleanup Objective

**Table 1-2. Preliminary Investigation Sampling Results - Summary of VOCs and PCBs Detected in Tank and Drum Contents**

Sample Identification	Tank-E-AQ		Tank-E-S		Tank-W-AQ		Tank-W-S		Drum-Comp-AQ		Drum-Comp-S	
Lab Sample ID	A4465-01		A4465-02		A4465-03		A4465-04		A4465-06		A4465-07	
Date Sampled	9/24/2009		9/24/2009		9/24/2009		9/24/2009		9/24/2009		9/24/2009	
Matrix	oil		sludge		oil		sludge		oil		sludge	
Compound												
VOCs	Concentration in mg/Kg											
Dichlorodifluoromethane	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Chloromethane	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Vinyl Chloride	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Bromomethane	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Chloroethane	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Trichlorofluoromethane	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Freon 113 (1,1,2-Trichlorotrifluoroethane)	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
1,1-Dichloroethene	ND	U	ND	U	ND	U	ND	U	ND	U	0.44	J
Acetone	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Carbon disulfide	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Methyl ter-butyl Ether	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Methyl Acetate	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Methylene Chloride	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
trans-1,2-Dichloroethene	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
1,1-Dichloroethane	ND	U	ND	U	ND	U	ND	U	ND	U	0.79	
Cyclohexane	ND	U	ND	U	ND	U	7.2		ND	U	9.6	
2-Butanone	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Carbon Tetrachloride	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
cis-1,2-Dichloroethene	ND	U	ND	U	ND	U	ND	U	ND	U	52	D
Chloroform	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
1,1,1-Trichloroethane	ND	U	ND	U	ND	U	ND	U	ND	U	17	JD
Methylcyclohexane	ND	U	1.6		ND	U	26		34		42	D
Benzene	ND	U	ND	U	ND	U	ND	U	ND	U	5.8	
1,2-Dichloroethane	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Trichloroethene	2.8	J	1.4		9.2		50		11	J	180	D
1,2-Dichloropropane	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Bromodichloromethane	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
4-Methyl-2-pentanone	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Toluene	ND	U	0.59		3.5	J	36		51		280	D
t-1,3-Dichloropropene	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
cis-1,3-Dichloropropene	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
1,1,2-Trichloroethane	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
2-Hexanone	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Dibromochloromethane	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
1,2-Dibromoethane	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Tetrachloroethene	ND	U	2.3		ND	U	48		16	J	82	D
Chlorobenzene	ND	U	ND	U	ND	U	ND	U	ND	U	0.93	
Ethylbenzene	ND	U	0.26	J	ND	U	27		23	J	110	D
Xylene (para & meta)	ND	U	0.92	J	ND	U	130		180		490	D
Xylene (Ortho)	ND	U	1.3		ND	U	60		73		200	D
Styrene	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Bromoform	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Isopropylbenzene	ND	U	ND	U	ND	U	8.8		9.5	J	28	D
1,1,1,2-Tetrachloroethane	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
1,3-Dichlorobenzene	ND	U	ND	U	ND	U	ND	U	ND	U	1.2	
1,4-Dichlorobenzene	ND	U	ND	U	ND	U	ND	U	ND	U	2.9	
1,2-Dichlorobenzene	ND	U	0.35	J	ND	U	11		14	J	27	D
1,2-Dibromo-3-Chloropropane	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
1,2,4-Trichlorobenzene	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
PCBs	Concentration in mg/kg											
Aroclor-1016	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Aroclor-1221	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Aroclor-1232	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Aroclor-1242	ND	U	ND	U	ND	U	ND	U	59	D	ND	U
Aroclor-1248	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Aroclor-1254	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Aroclor-1260	5.9	P	5.1	D	2.1	P	7.9	D	ND	U	10	D

**Notes:**

ND = Not Detected

D = Compound reported from laboratory dilution

J = Compound detected below laboratory MDL

P = >25% difference for detected concentrations between the two GC columns

**Bold** = Result exceeds TSCA 50 ppm threshold

**Table 1-3. Preliminary Investigation Sampling Results - Summary of Sludge Hazardous Waste Testing**

Sample Identification		NYSDEC	Tank-Comp-S		Drum-Comp-S	
Lab Sample ID		Haz Waste	A4465-05		A4465-07	
Date Sampled		Limits	9/24/2009		9/24/2009	
Compound	Unit					
Corrosivity (as pH)	Std Unit	2-12	6.9		7	
Ignitability	°F	<140	NO		NO	
Reactive Cyanide	mg/kg	250	ND	U	ND	U
Reactive Sulfide	mg/kg	500	ND	U	ND	U
TCLP BNA						
Pyridine	ug/L	5,000	ND	U	ND	U
1,4-Dichlorobenzene	ug/L	7,500	ND	U	ND	U
2-Methylphenol	ug/L	200,000	120		1,500	D
3+4-Methylphenols	ug/L	200,000	440		7,000	D
Hexachloroethane	ug/L	3,000	ND	U	ND	U
Nitrobenzene	ug/L	2,000	ND	U	ND	U
Hexachlorobutadiene	ug/L	500	ND	U	ND	U
2,4,6-Trichlorophenol	ug/L	2,000	ND	U	ND	U
2,4,5-Trichlorophenol	ug/L	400,000	ND	U	ND	U
2,4-Dinitrotoluene	ug/L	130	ND	U	ND	U
Hexachlorobenzene	ug/L	130	ND	U	ND	U
Pentachlorophenol	ug/L	100,000	ND	U	ND	U
TCLP Herbicide						
2,4-D	ug/L	10,000	ND	U	ND	U
2,4,5-TP (SILVEX)	ug/L	1,000	ND	U	ND	U
TCLP Metals						
Arsenic	ug/L	5,000	ND	U	ND	U
Barium	ug/L	100,000	2,840		6,240	
Cadmium	ug/L	1,000	18.7	J	9.5	J
Chromium	ug/L	5,000	ND	U	ND	U
Lead	ug/L	5,000	<b>15,500</b>		<b>11,800</b>	
Selenium	ug/L	1,000	ND	U	58	J
Silver	ug/L	5,000	ND	U	ND	U
TCLP Mercury						
Mercury	ug/L	200	1	J	2	J
TCLP Pesticide						
gamma-BHC (Lindane)	ug/L	400	ND	U	ND	U
Heptachlor	ug/L	8	ND	U	ND	U
Heptachlor epoxide	ug/L	8	ND	U	ND	U
Endrin	ug/L	20	ND	U	ND	U
Methoxyclor	ug/L	10,000	ND	U	ND	U
Toxaphene	ug/L	500	ND	U	ND	U
Chlordane	ug/L	30	ND	U	ND	U
TCLP VOA						
Vinyl Chloride	ug/L	200	ND	U	ND	U
1,1-Dichloroethene	ug/L	700	ND	U	ND	U
2-Butanone (MEK)	ug/L	200,000	ND	U	ND	U
Carbon Tetrachloride	ug/L	500	ND	U	ND	U
Chloroform	ug/L	6,000	ND	U	ND	U
Benzene	ug/L	500	ND	U	31	
1,2-Dichloroethane	ug/L	500	ND	U	ND	U
Trichloroethene	ug/L	500	40		280	
Tetrachloroethene	ug/L	700	ND	U	26	
Chlorobenzene	ug/L	100,000	ND	U	ND	U

Notes:

NO - Not ignitable waste

ND/U = Not Detected

J = Estimated value

**Bold** = Result exceeds NYSDEC Part 371 hazardous waste limit

**TABLE 1-4**  
**IRM Final Confirmation Sample PCB Results**

Sample ID	Date	Depth	Total PCBs Concentration in mg/kg
<b>Discrete Area SS-5</b>			
Discrete SS-5-North	9/23/2010	0'-1'	0.39
Discrete SS-5-South	9/23/2010	0'-1'	0.22
Discrete SS-5-East	9/23/2010	0'-1'	0.24
Discrete SS-5-West	9/23/2010	0'-1'	ND
Discrete SS-5-Floor	9/23/2010	1'	0.29
<b>Discrete Area SS-12</b>			
Discrete SS-12-East	9/23/2010	0'-1'	0.50
Discrete SS-12 Bottom	9/23/2010	1'	1.0
Discrete SS-12A-North	10/8/2010	0'-1'	ND
Discrete SS-12B West	10/19/2010	0'-1'	<b>1.4</b>
Discrete SS-12B-South	10/19/2010	0'-1'	<b>1.4</b>
<b>North &amp; West of UST</b>			
BT-1A	10/7/2010	2'	<b>2.3</b>
WS-2	9/29/2010	1'	0.89
BT-2A	10/7/2010	2'	ND
WS-3A	10/7/2010	1'	0.21
WS-4A	10/7/2010	1'	<b>2.3</b>
WS-5A	10/7/2010	1'	0.92
WS-6A	10/7/2010	1'	0.56
WS-1A	10/7/2010	1'	<b>3.1</b>
<b>UST Excavation Area</b>			
B-1	9/24/2010	12'	ND
B-2	9/27/2010	12'	ND
B-3	9/29/2010	12'	<b>3.6</b>
W-1	9/24/2010	10'	<b>1.2</b>
W-2	9/27/2010	8'	ND
W-3	9/27/2010	3'	ND
W-4	9/24/2010	5'	0.64
W-5	9/29/2010	5'	<b>5.6</b>
W-6	9/29/2010	3'	0.39
W-7	9/30/2010	9'	ND
W-8	9/24/2010	4'	<b>6.9</b>
W-10A	10/7/2010	10'	ND
<b>Furnace Pit Area</b>			
FPB-2A	9/30/2010	2'*	<b>1.6</b>
FPS-1A	9/30/2010	2'*	ND
FPS-2A	9/30/2010	2'*	ND
FPS-3A	9/30/2010	3'*	<b>3.1</b>
FPS-4C	10/21/2010	3'*	<b>1.33</b>
FPS-5B	10/8/2010	2'*	ND
FPS-6B	10/8/2010	3'*	ND
FPB-West	10/20/2010	3'*	ND
FPB-9 East	10/20/2010	8'*	0.90
FPB-Mid 12	10/25/2010	8'*	<b>2.25</b>

Notes:

ND=Not Detect.

Results reported in Milligrams per kilograms- mg/kg

PCB soil cleanup objective is 1 mg/kg

Bold results indicate sample result exceeds soil cleanup objective - to be addressed further

\*Furnace Pit Area depths are referenced pre-existing pit bottom

**TABLE 1-5**  
**IRM**  
**TCL Metals Sampling Results**

Sample Location	NYSDEC Part 375 Commercial Use SCOs	NYSDEC Part 375 Unrestricted Use SCOs	FPS-7	W-11	S-12-B-A
Date Sampled			10/13/2010	10/12/2010	10/13/2010
Compound			Soil	Soil	Soil
Units	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Metals					
Aluminum	N/A	N/A	13,000	15,000	14,000
Iron	N/A	N/A	19,000	23,000	20,000
Lead	1,000	63	19	12	<b>66</b>
Magnesium	N/A	N/A	21,000	12,000	11,000
Manganese	10,000	1,600	440	340	490
Nickel	310	30	20	26	20
Potassium	N/A	N/A	4,200	2,600	2,200
Sodium	N/A	N/A	220	160	130
Barium	400	350	110	110	120
Beryllium	590	7.2	1	1	1
Cadmium	9.3	2.5	<.61	1	1
Chromium	400	1	<b>17</b>	<b>21</b>	<b>23</b>
Cobalt	N/A	N/A	9	12	9
Copper	270	50	18	21	20
Vanadium	N/A	N/A	20	30	30
Zinc	10000	109	60	57	80
Calcium	N/A	N/A	72,000	32,000	31,000

**Note:**

- 1) Metals analyzed for Target Analyte List by USEPA method SW6010.
- 2) Mercury analyzed by USEPA method SW7471.
- 3) Bolded areas indicate that the concentration exceeds the NYSDEC Part 375 Unrestricted Use Soil Cleanup Objectives.
- 4) < = not detected - below the laboratory's method detection limit (MDL).
- 5) mg/kg = micrograms per kilogram.
- 6) N/A = No Available SCO.

**TABLE 1-6**  
**IRM**  
**TCL Pesticides Sampling Results**

Sample Location	NYSDEC Part 375 Commercial Use SCOs	NYSDEC Part 375 Unrestricted Use SCOs	FPS-7		W-11		S-12-B-A		
Date Sampled			10/13/2010		10/12/2010		10/13/2010		
Compound			Soil		Soil		Soil		
Units			ug/kg		ug/kg		ug/kg		
Pesticides									
Endosulfan II	200,000	2,400	<4.0	Q	<4.1	Q	54	Q	
4,4'-DDT	47,000	3.3	54	Q	<4.1	Q	65	Q	

**Note:**

- 1) Pesticides analyzed by USEPA method SW8082.
- 2) Bolded areas indicate that the concentration exceeds the NYSDEC Part 375 Unrestricted Use Soil Cleanup Objectives.
- 3) < = not detected - below the laboratory's method detection limit (MDL).
- 4) ug/kg = micrograms per kilogram.
- 5) Q = Outlying QC recoveries associated with parameter

**TABLE 1-7**  
**IRM**  
**TCL VOC's Sampling Results**

Sample Location	NYSDEC Part 375 Commercial Use SCOs	NYSDEC Part 375 Unrestricted Use SCOs	FPS-7		W-11		S-12-B-A	
Date Sampled			10/13/2010		10/12/2010		10/13/2010	
Depth			Soil		Soil		Soil	
Units			ug/kg		ug/kg		ug/kg	
VOCs								
Total VOCs	N/A	N/A	0		0		0	

**Note:**

- 1) VOCs analyzed for Target Compound List (TCL) by USEPA method SW8260.
- 2) ug/kg = micrograms per kilogram.
- 3) N/A = No Available SCO.

**TABLE 1-8**  
**IRM**  
**TCL SVOCs Sampling Results**

Sample Location	NYSDEC Part 375 Commercial Use SCOs	NYSDEC Part 375 Unrestricted Use SCOs	FPS-7		W-11		S-12-B-A	
Date Sampled			10/13/2010		10/12/2010		10/13/2010	
Depth			Soil		Soil		Soil	
Units			ug/kg		ug/kg		ug/kg	
SVOCs								
Bis(2-ethylhexyl)phthalate	N/A	N/A	300	J	300	J	<4,100	
Anthracene	500,000	100,000	<400		<410		1,000	J
Pyrene	500,000	100,000	<400		<410		2,000	J
Dibenzofuran	N/A	N/A	<400		<410		800	J
Benzo(g,h,i)perylene	500,000	100,000	<400		<410		500	J
Indeno(1,2,3-cd)pyrene	5,600	500	<400		<410		<b>600</b>	J
Benzo(b)fluoranthene	5,600	1,000	<400		<410		1,000	J
Fluoranthene	500,000	100,000	<400		<410		3,000	J
Chrysene	56,000	1,000	<400		<410		1,000	J
Benzo(a)pyrene	1,000	1,000	<400		<410		1,000	J
Benzo(a)anthracene	5,600	1,000	<400		<410		1,000	J
Di-n-butyl phthalate	N/A	N/A	<400		50	J	<4,100	
Fluorene	500,000	30,000	<400		<410		1,000	J
Naphthalene	500,000	12,000	<400		<410		700	J
2-Methylnaphthalene	N/A	N/A	<400		<410		1,000	J
Total SVOCs	N/A	N/A	300		350		19,300	

**Note:**

- 1) SVOCs analyzed for Target Compound List (TCL) by USEPA method SW8270.
- 2) Bolded areas indicate that the concentration exceeds the NYSDEC Part 375 Unrestricted Use Soil Cleanup Objectives.
- 3) < = not detected - below the laboratory's method detection limit (MDL).
- 4) ug/kg = micrograms per kilogram.
- 5) J = Detected below the Reporting Limit (RL) but greater than or equal to the Method Detection Limit (MDL); therefore the result is an estimated concentration.
- 6) N/A = No Available SCO.



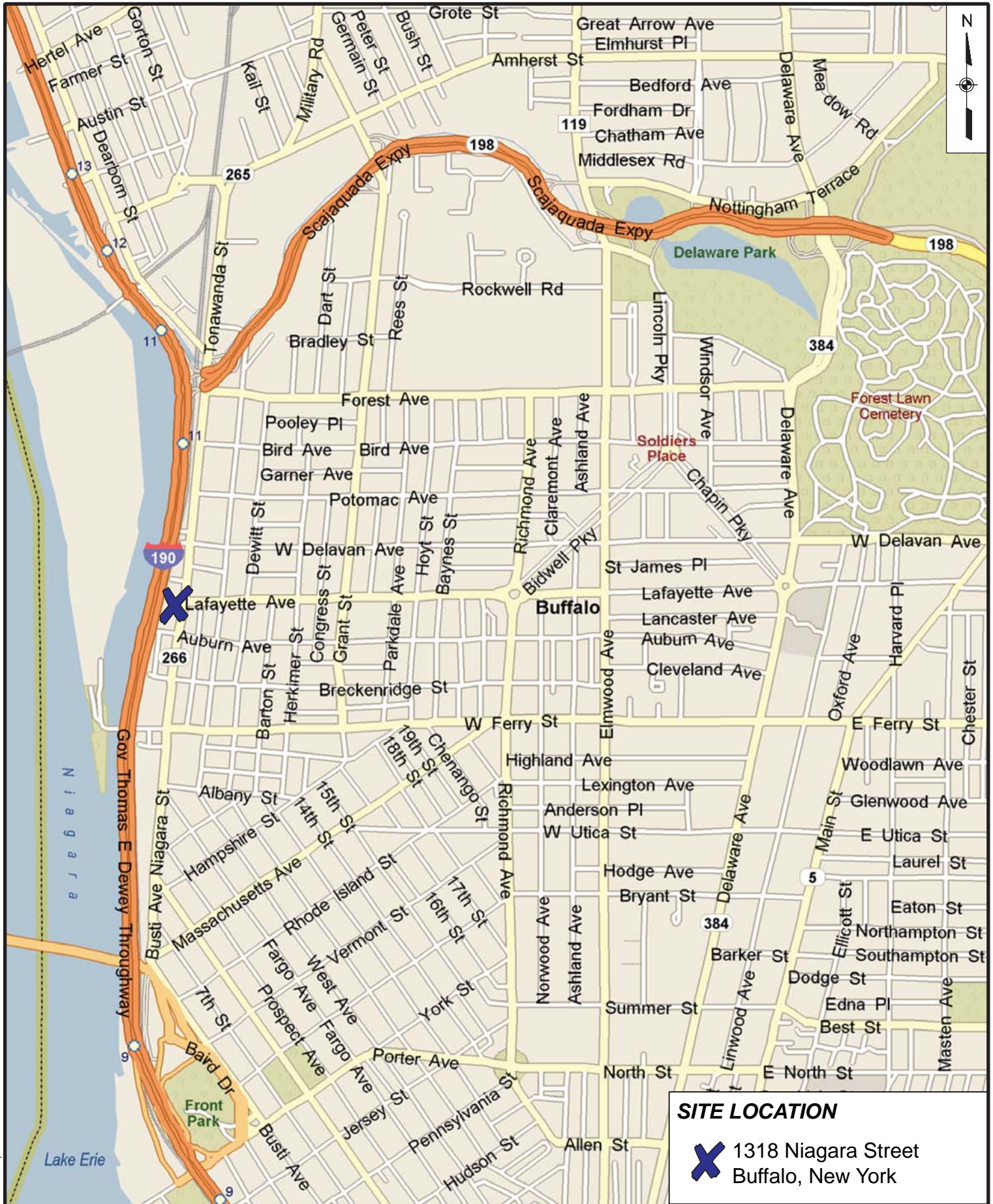
**TABLE 1-9**  
**Proposed Soil Sampling - Site Investigation**

Proposed Sample Location	Proposed Sampling Method	Proposed Boring Depth	Rationale/Target	Proposed Sample Depth	Proposed Analytical Parameters
SB-01	Geoprobe	12'	Investigate off-site soil contamination	2' and Screening*	PCB
SB-02	Geoprobe	12'	Investigate off-site soil contamination	2' and Screening*	VOC, SVOC, Metals, PCB
SB-03	Geoprobe	12'	Investigate off-site soil contamination	2' and Screening*	VOC, SVOC, Metals, PCB
SB-04	Geoprobe	15'	Delineate vertical extent of contamination at UST area B-3	13', 14', and 15'	PCB**
SB-05	Geoprobe	4'	Delineate vertical extent of contamination at BT-1A	3' and 4'	PCB**
SB-06	Geoprobe	4'	Delineate northern extent of contamination at BT-1A	3' and 4'	PCB**
SB-07	Geoprobe	3'	Delineate western extent of contamination at WS-4A and characterize shallow soil	0"-4"	VOC, SVOC, Metals, Pesticides, PCB
				1' - 2'	PCB
SB-08	Geoprobe	3'	Delineate northern extent of contamination at WS-1A	0.5' - 1' and 1' - 2'	PCB
SB-09	Geoprobe	15'	Delineate vertical extent of contamination at FPB-MID12	1', 2' and 3' below demarcation layer	PCB**
SB-10	Geoprobe	5'	Delineate western extent of contamination at FPS-3A	0" - 4", 3' and Screening*	PCB
SB-11	Geoprobe	5'	Delineate extent of contamination at FPS-4C and characterize shallow soil	0" - 4"	VOC, SVOC, Metals, Pesticides, PCB
				3' and Screening*	PCB
SB-12	Geoprobe	10'	Delineate vertical extent of contamination at FPB-2A	1', 2' and 3' below demarcation layer	PCB**
				0" - 4"	VOC, SVOC, Metals, Pesticides, PCB
SB-13	Geoprobe	5'	Characterize soil in UST staging area	2' and Screening*	PCB
				0-2' and Screening*	VOC, SVOC, Metals, Pesticides, PCB
MW-01	Auger/ Splitspoon	28'	Drum Storage Area	Screening*	VOC, SVOC, Metals, Pesticides, PCB
MW-02	Auger/ Splitspoon	28'	UST Area	Screening*	VOC, SVOC, Metals, Pesticides, PCB
MW-03	Auger/ Splitspoon	25'	Furnace Pit Area	Screening*	VOC, SVOC, Metals, Pesticides, PCB
MW-04	Auger/ Splitspoon	25'	Downgradient of Excavation Area SS-12 and characterize shallow soil	0" - 4" and Screening*	VOC, SVOC, Metals, Pesticides, PCB
MW-05	Auger/ Splitspoon	25'	South-central portion of Site and characterize shallow soil	0" - 4" and Screening*	VOC, SVOC, Metals, Pesticides, PCB
SS-13 thru SS-16	Hand tool	1'	Delineate southern and western extent of contamination at SS-12	0' - 1'	PCB

\* Screening sample to be collected from interval showing elevated PID readings or visual/olfactory evidence of contamination

\*\* Deeper vertical delineation samples will be collected and held for analysis only if shallower sample exceeds SCO

If location is in IRM excavation area, screening sample will be collected below demarcation barrier.



# SITE LOCATION

**X** 1318 Niagara Street  
Buffalo, New York



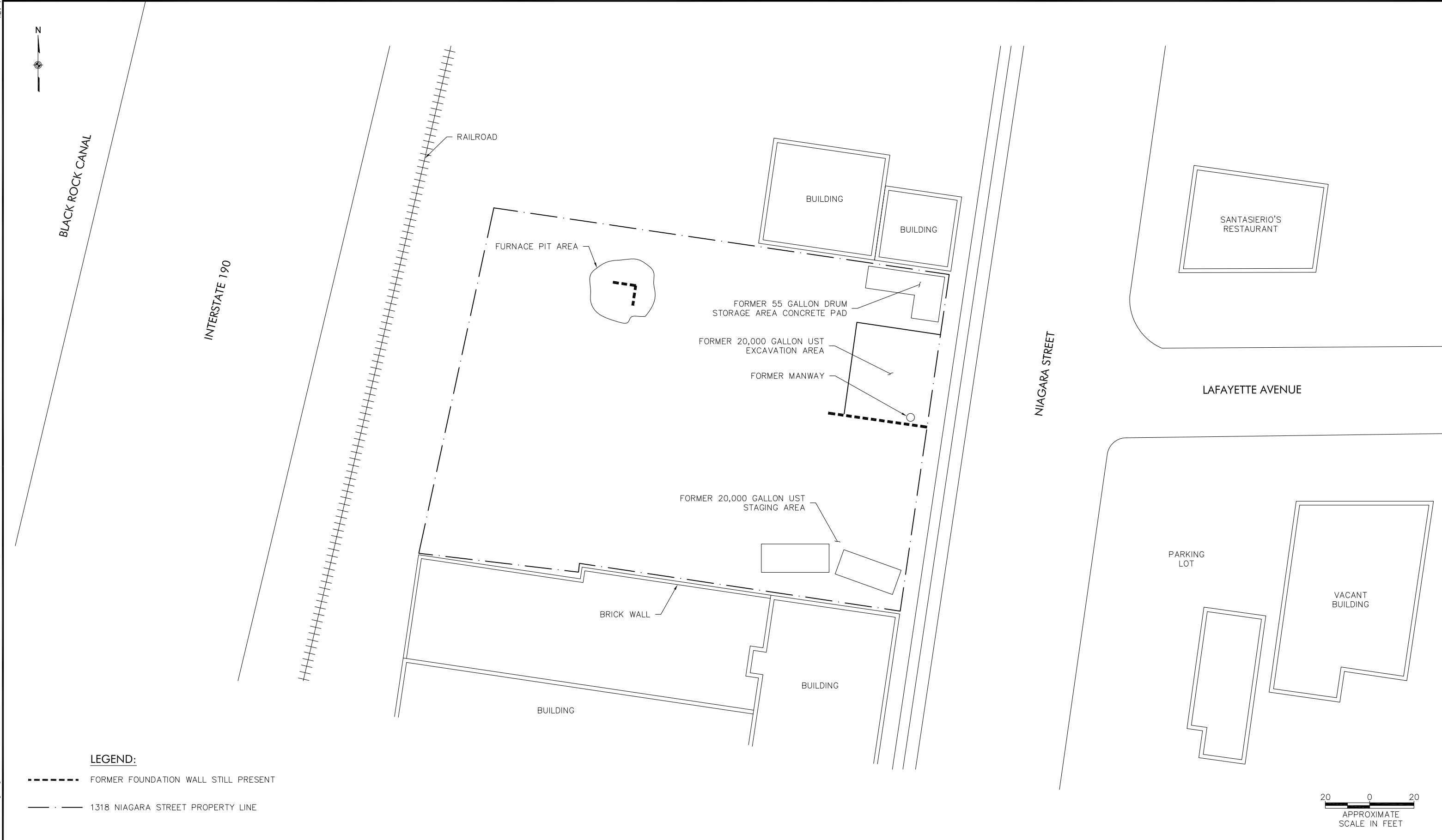
LiRo Engineers, Inc.  
690 Delaware Ave.  
Buffalo, New York


## 1318 NIAGARA STREET SITE LOCATION MAP

FIGURE NO.

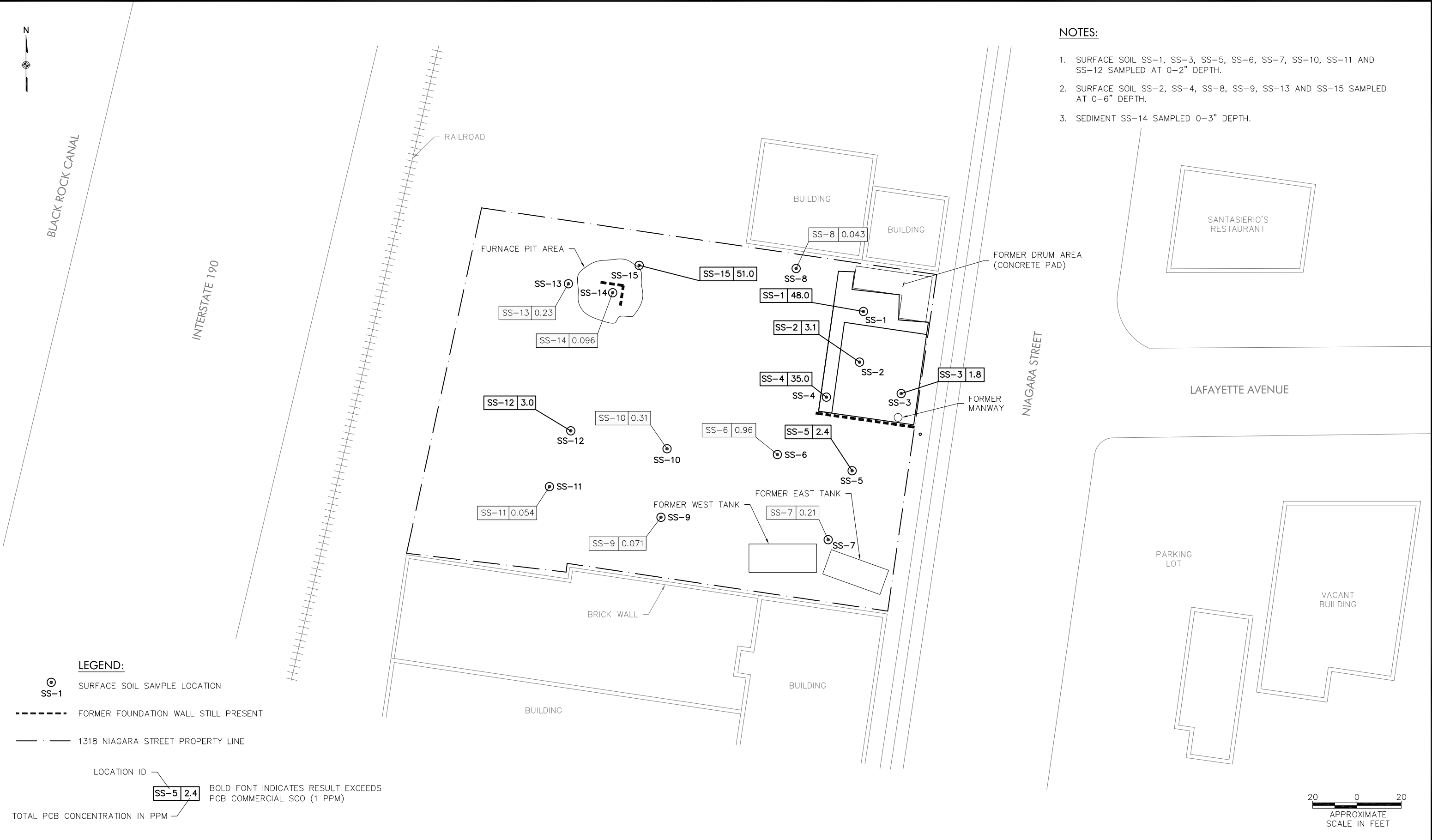
1

REV-1  
1318 NB 09-29-2009 C:\D\1318 NIAGARA STREET SITE 09 2.dwg 4/1/2011 11:12:04 AM ES



<p>WARNING</p> <p>IT IS A VIOLATION OF SECTION 7209, SUBDIVISION 2, OF THE NEW YORK STATE EDUCATION LAW FOR ANY PERSON, OTHER THAN THOSE WHOSE SEAL APPEARS ON THIS DRAWING, TO ALTER IN ANY WAY AN ITEM ON THIS DRAWING. IF AN ITEM IS ALTERED, THE ALTERING ENGINEER SHALL AFFIX TO THE ITEM HIS SEAL AND THE NOTATION "ALTERED BY" FOLLOWED BY HIS SIGNATURE AND THE DATE OF SUCH ALTERATION, AND A SPECIFIC DESCRIPTION OF THE ALTERATION.</p>				 <i>LiRo Engineers, Inc.</i> 690 Delaware Ave Buffalo, New York	PROJ. ENG.:	CLIENT:		JOB TITLE AND LOCATION:  CITY OF BUFFALO - ERP INVESTIGATION OF 1318 NIAGARA STREET		LIRO JOB NO.: 09-29-426		
					DESIGNED BY:					SHEET OF		
					CHECKED BY:					FIGURE NO.		
					DRAWN BY:	DATE: APRIL 2011	SCALE: NONE	DRAWING TITLE:  GENERAL SITE LAYOUT		2		

REV-1  
1318 NB 09-29-2010 1318 NIAGARA STREET EXCAVATION.dwg 3.5mg 4/4/2011 8:49:37 AM ES



WARNING

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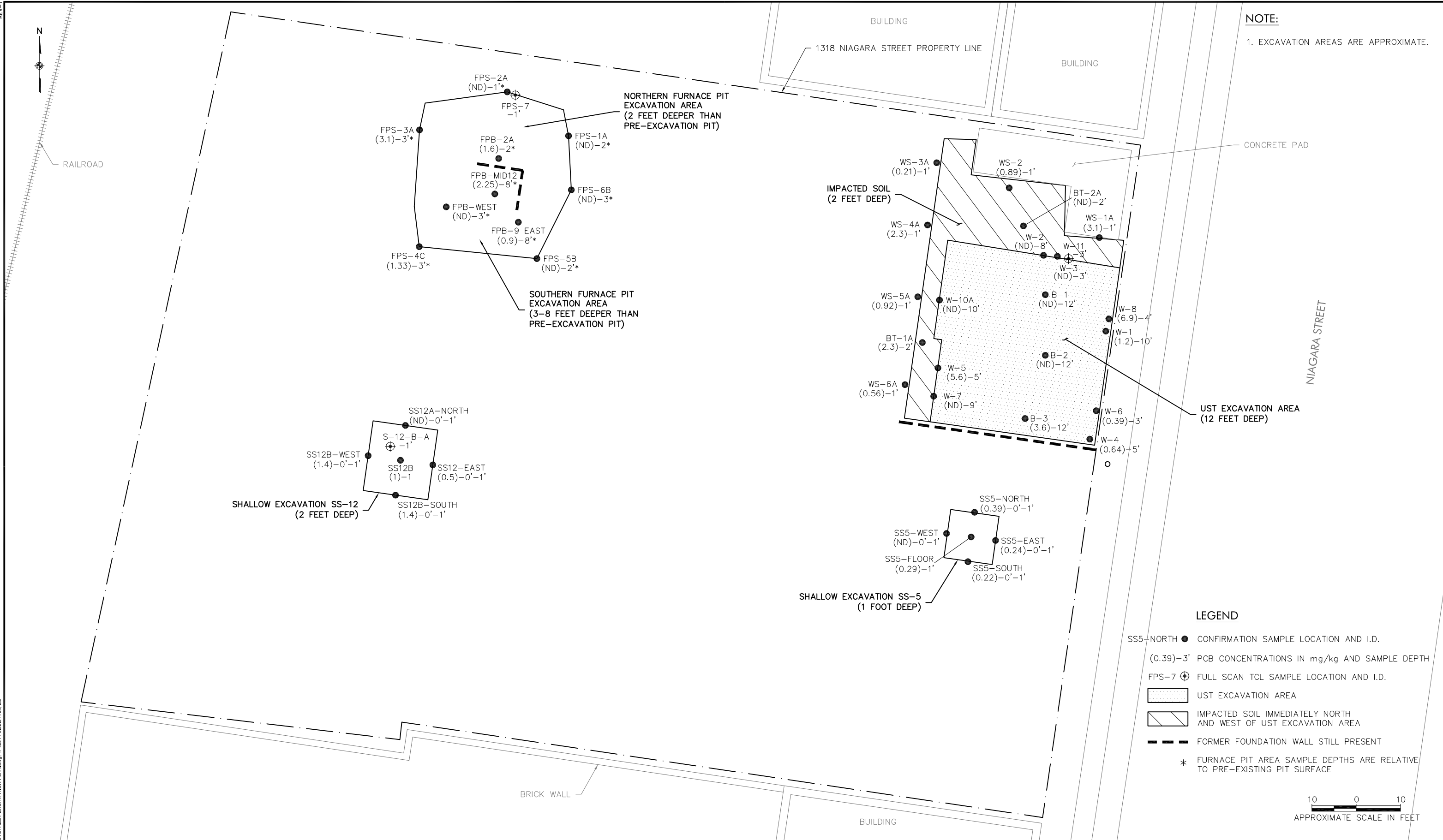
NO.	DATE	DESCRIPTION
REVISIONS		




LiRo Engineers, Inc.  
690 Delaware Ave.  
Buffalo, New York

PROJ. ENG.:	CLIENT:	CITY OF BUFFALO - ERP INVESTIGATION OF 1318 NIAGARA STREET		LIRO JOB NO.:
DESIGNED BY:				09-29-426
CHECKED BY:				SHEET OF
DRAWN BY:	DATE:	SCALE:	PRELIMINARY INVESTIGATION SAMPLE LOCATIONS AND PCB SCO EXCEEDANCES	
	APRIL 2011	NONE		
			FIGURE NO.	3





<b>WARNING</b> IT IS A VIOLATION OF SECTION 7209, SUBDIVISION 2, OF THE NEW YORK STATE EDUCATION LAW FOR ANY PERSON, OTHER THAN THOSE WHOSE SEAL APPEARS ON THIS DRAWING, TO ALTER IN ANY WAY AN ITEM ON THIS DRAWING. IF AN ITEM IS ALTERED, THE ALTERING ENGINEER SHALL AFFIX TO THE ITEM HIS SEAL AND THE NOTATION "ALTERED BY" FOLLOWED BY HIS SIGNATURE AND THE DATE OF SUCH ALTERATION, AND A SPECIFIC DESCRIPTION OF THE ALTERATION.									 LiRo Engineers, Inc. 690 Delaware Ave. Buffalo, New York		PROJ. ENG.: DESIGNED BY: CHECKED BY: DRAWN BY:	CLIENT:	JOB TITLE AND LOCATION: CITY OF BUFFALO - ERP INVESTIGATION OF 1318 NIAGARA STREET		LIRO JOB NO.: 09-29-426 SHEET OF
NO.	DATE	DESCRIPTION	REVISIONS								DATE: APRIL 2011	SCALE: AS SHOWN	DRAWING TITLE: IRM EXCAVATION AREAS AND ENDPOINT PCB RESULTS		FIGURE NO. 4



## **PART 2 STANDARD OPERATION PROCEDURES**

### **4.0 SOP INTRODUCTION**

This section contains standard methods and procedures that will be used for the investigation activities in the Work Plan for the 1318 Niagara Street site in the City of Buffalo, New York. Field sampling procedures described in these sections are consistent with the requirements and procedures described in the New York State Department of Environmental Conservation (NYSDEC) and United States Environmental Protection Agency (USEPA) field investigation guidance documents. This SOP follows NYSDEC Environmental Restoration Program (ERP) requirements and the DER-10 Guidance Document.

## **5.0 DRILLING AND EXCAVATION**

### **5.1 General**

Drilling and excavation activities will be performed by qualified well drillers, under the supervision of a qualified and experienced geologist(s). Prior to any intrusive work, underground structures such as storage tanks and the like, utilities, such as gas, electric, oil pipelines, telephone, and sewer and water lines will be identified and the locations of boreholes and test pits will be adjusted, as necessary. The clearance procedure will utilize the resources of the New York “Call Center” as well as the information previously provided to LiRo. During ground intrusive activities such as drilling and excavation, the community air monitoring program (CAMP) will be in place. The CAMP will follow the guidelines as set forth within the generic New York State Department Of Health (NYSDOH) CAMP

The drilling rig, hammer drill, and excavating equipment will be set up and operated in accordance with standard earthwork practice, and in a manner that will allow for safe and efficient operation of the equipment. Overhead power lines, buried utilities, or underground storage tanks will be avoided. Intrusive operations at each monitoring well and test pit location will include monitoring for potential organic and explosive vapors to protect the workers.

### **5.2 Test Pit Excavation**

Test trenches are a common method of subsurface exploration which enables characterization of subsurface materials and recovery of samples for identification and laboratory analysis. The results of the test pits will be incorporated into the Site Investigation Report. The procedure for performing test pit excavations is as follows:

1. The backhoe used for test pit excavation will be safely and securely positioned at the test pit location.
2. Proceed with excavation in two foot lifts. Excavation will continue until native soil is encountered or at the discretion of the supervising geologist. Screen soil



for the presence of organic vapors using a PID. The geologist will also monitor ambient and air within the test pit for the presence of methane.

3. Characterize excavated material in accordance with Section 6.2. Record field descriptions, observations and air monitoring results in a field log book as described in Section 8.5 and on Field Activity Form Test Pit Log.
4. Select soil samples for chemical analysis from the test pit. Soil samples will be selected in accordance with Section 2.3 of the Site Investigation Plan.
5. Backfill the excavation using the excavated soil from that test pit location.

### **5.3 Geoprobe Sampling**

The Geoprobe sampling system employs direct-push technology, which involves a truck-mounted hydraulic probe that is used to advance interconnected small-diameter steel pipe to the required sampling depth. Samples of soil vapor, soil, and groundwater may be collected using the Geoprobe system. Sample locations situated in paved areas will require the creation of a pilot hole prior to probe use. The Geoprobe soil sampling procedures are as follows:

1. Advance a pilot hole through any surface paving materials.
2. Push the Geoprobe Macro-Core Sampler at 4-foot intervals to prescribed depth or refusal.
3. Retract sampler from the probe hole.
4. Split inner plastic sleeve of the sample, screen sample with photoionization detector (PID) and record readings.
5. Transfer the soil sample from the inner plastic sleeve of the sampler to appropriate sample containers (if samples are required) and label.
6. Examine and describe soil in accordance with Section 6.2. Note and record soil type and any obvious signs of contamination (discoloration, sheen, and odor).

Environmental samples will be collected directly from the Geoprobe sampler with a pre-cleaned or dedicated polyethylene or stainless steel sample trowel and placed in laboratory-provided bottles.

#### **5.4 Hollow-Stem Augering**

Drilling performed for monitoring well installation will use a conventional drill rig with hollow stem augers (HSA) and 2-inch or 3-inch split spoon samplers. Field descriptions, observations and air monitoring results will be recorded in a field log book as described in Section 8.5 and on Field Activity Form Geologic Boring Log. The hollow-stem augers will be advanced using a mobile rotary drilling rig as follows:

1. Advance the boring by rotating and advancing the augers to the desired depth below ground surface using ASTM practice D1452. The borings must be advanced incrementally to permit recovery of soil samples for geologic profiling at specified intervals. Samples will be collected using a split-spoon sampler or other appropriate sampling device. Collect drill cuttings for disposal. Do not allow cuttings to form a large pile around the augers.
2. Remove center plug from augers and collect sample.
3. Withdraw sampling device.
4. Lower center plug into augers and advance auger to next sampling depth. The auger will be advanced to a depth in such a manner that minimum disturbance is caused to the ground below the depth designated for sample collection.

The borehole will be advanced, with appropriate soil sampling equipment, until the proper termination depth is reached, as specified in the Site Investigation Plan. The only exception to this will be if “refusal” occurs during split-spoon sampling. Refusal may occur if the borehole encounters bedrock, rubble, or a boulder. If refusal occurs while sampling, the obstruction will first be attempted to be cleared by rotating the HSA bit through the obstruction. If the HSA cannot penetrate the obstruction, the borehole will be offset and re-drilled.

### 5.4.1 Split-spoon Sampling

Split-spoon samples will be collected using ASTM Method D1586-84 (replaced D1586-67), “Standard Method for Penetration Test and Split-Barrel Sampling Procedures” described below.

1. Once the boring is advanced to the desired sampling depth using hollow-stem augering procedures, attach split-spoon sampler to the drill rods and lower into borehole. Do not allow sampler to drop onto the soil to be sampled.
2. Position the hammer and anvil above and attach to the drill rods.
3. Rest the weight of the sampler, drill rods, and hammer on the bottom of the boring and apply a seating blow. If excess cuttings are encountered (not expected since center plug is to be used), remove sampler from the borehole and spin augers until the excess cuttings are removed.
4. Mark the drill rods in four successive 6-inch increments so that the advance of the sampler under the impact of the hammer may easily be observed for each 6-inch increment.
5. Drive the sampler with blows from a 140-pound hammer raised 30 inches and allowed to strike the anvil. Count the number of blows applied in each 6-inch increment until one of the following occurs:
  - A total of 50 blows have been applied during any one of the four 6-inch increments.
  - A total of 100 blows have been applied.
  - There is no observed advancement of the sampler during the application of 10 successive blows. If any of the above three circumstances occur, “refusal” will be declared for this depth and recorded as such.
  - The sampler is advanced the complete length (18 or 24 inches).
6. Record the number of blows required for each 6-inch penetration or fraction thereof. The first 6 inches is considered the seating drive. The sum of the second and third 6 inches of penetration is considered the “Standard Penetration Resistance” or the “N” value. If the sampler is driven less than 18 inches, the number of blows per completed 6 inches will be recorded on the boring log. If

the sampler penetrates the full length under the static weight of the drill rods, this information will be recorded on the boring log.

7. Bring the spoon to the surface and open. Record the percent recovery or the length of soil sample recovered. Describe the soil samples recovered as composition, color, stratification, condition and other pertinent information, as outlined in Section 6.2.
8. Obtain an aliquot of sample for chemical analysis from the prescribed intervals of the boring if required.
9. The remainder of the sample may then be disposed of in the test pit or borehole, unless a sample is required for laboratory testing of soil properties, such as grain size distribution or Atterberg limits. If a sample is to be submitted for physical testing, place the remainder of the sample into a soil sample jar without distorting the original stratification. Seal container to minimize evaporation and affix label identifying site, boring number, sample depth, the number of blows per six inches, and the testing to be done on the sample.

The ASTM procedure may be modified during the field investigation by driving the sampler the entire length of the split-spoon (24 inches), and/or using a 3-inch diameter sampler (mainly if sample recovery in coarser materials is poor).

## **5.5 Rock Drilling**

Rock drilling will be used if bedrock wells are required. Rock drilling may be performed using a 3-7/8-inch roller type bit or by using a coring device resulting in a 4-inch rock hole. Rock drilling will be conducted in a manner that prevents any downward migration of contaminants into the bedrock strata. Record field descriptions, observations and air monitoring results in a field log book as described in Section 8.5 and on Field Activity Form Geologic Boring Log. Drilling will be performed following the procedures outlined below.

1. Advance boring using hollow stem augers to refusal.

2. Determine the need for casing off overburden. In contaminated areas, prepare a rock socket and grout permanent 4-inch casing into the rock socket.
3. Prepare for rock drilling by setting up a water circulation system.
4. Assemble and lower the rock bit and drill pipe into the augers or casing.
5. Perform drilling until the desired length of the rock hole is completed.
6. If coring is required, use 5-foot core runs and record rock observations as described in Section 6.3.

## **5.6 Monitoring Well Installation**

Monitoring wells will be installed at locations identified in the Site Investigation Plan. It is anticipated that only shallow overburden wells will be installed; however, in the event that bedrock monitoring wells are required these procedures are included. Monitoring wells will be constructed and developed in accordance with the following procedures:

### **5.6.1 Overburden Monitoring Wells**

1. Advance subsurface boring to the desired depth by means of hollow-stem auger drilling.
2. Remove center plug from augers and verify borehole depth using weighted measuring tape.
3. Add washed and graded medium sand as needed to base of borehole.
4. Insert 20-slot PVC well screen and riser pipe into borehole through the hollow-stem augers. Cap the riser to prevent well construction materials from entering the well.
5. Add a number 2 graded sand to the screen section of the well while slowly removing augers. Sand pack should extend from 1 to 2 feet above the screen section within the borehole. Measure with a weighted tape.
6. Slowly add bentonite pellet seal to borehole as augers are slowly removed. The bentonite seal should extend at least 2 feet above the top of the sand pack section. Measure with tape.

7. If bentonite seal is placed above the groundwater level within the borehole, add water to the borehole to hydrate the bentonite pellets. Allow pellets to hydrate at least 2 hours.

8. Mix cement/bentonite grout with the general mixture ratios as follows:

Grout Slurry Composition (% Weight)

1.5 to 3.0%	Bentonite (quick gel)
40 to 60%	Cement (Portland Type I)
40 to 60%	Water

9. Add grout to borehole through tremie pipe or hose from the top of the bentonite seal to the ground surface.

10. Remove remaining augers from borehole.

11. Top off grout in borehole. Grout should extend to approximately 2 feet below ground surface.

12. Cut well riser pipe to about 2 feet above ground surface for stick-up type wells. Flush-mount well risers should be cut off just below surface grade.

13. Backfill remaining two feet of borehole with concrete.

14. Install protective casing over well riser pipe and set into concrete backfill.

15. Lock protective casing cap.

16. Document well construction on Field Activity Form Monitoring Well Construction Detail.

### **5.6.2 Bedrock Well Construction**

1. Advance 6-1/4 inch I.D. hollow-stem augers to the top of bedrock.

2. Switch to wash rotary drilling and NX core 5 feet into bedrock.

3. Ream 5-inch diameter socket five feet into bedrock.

4. Pressure grout 4-inch stainless steel casing into rock socket.

5. Remove hollow-stem augers and grout annular space between casing and borehole wall. Let grout cure a minimum of 24 hours before continuing with the boring.
6. Insert 3-inch NX corer into 4" steel casing and core 15 feet into bedrock or to intersection of sufficient fractures in bedrock to allow adequate water flow.
7. Verify borehole depth using weighted measuring tape.
8. Add washed and graded medium sand as needed to base of borehole.
9. Insert 20-slot PVC well screen and riser pipe into borehole through 4" steel casing. Cap the riser to prevent well construction materials from entering the well.
10. Add a number 2 graded sand to the screen section of the well. Sand pack should extend from 1 to 2 feet above the screen section within the borehole. Measure with a weighted tape.
11. Slowly add bentonite pellet seal to borehole. The bentonite seal should extend at least 2 feet above the top of the sand pack section. Measure with weighted tape.
12. If bentonite seal is placed above the groundwater level within the borehole, add water to the borehole to hydrate the bentonite pellets. Allow pellets to hydrate at least 2 hours.
13. Mix cement/bentonite grout with the general mixture ratios as follows:  

<u>Grout Slurry Composition (% Weight)</u>	
1.5 to 3.0%	Bentonite (quick gel)
40 to 60%	Cement (Portland Type I)
40 to 60%	Water
14. Add grout to borehole through tremie pipe or hose from the top of the bentonite seal to approximately 2 feet below ground surface.
15. Cut well riser pipe to about 2 feet above ground surface for stick-up type wells. Flush-mount well risers should be cut off just below surface grade.
16. Backfill remaining two feet of borehole with concrete.

17. Install protective casing over well riser pipe and set into concrete backfill.
18. Lock protective cap.
19. Document well construction details on Field Activity Form Monitoring Well Construction Detail.



## **6.0 VISUAL IDENTIFICATION/GEOLOGICAL DESCRIPTION**

### **6.1 Field Equipment Requirements**

The geologist will prepare geologic descriptions of the in-place subsurface soils, residue, and native materials, and collect representative samples from the prescribed intervals for chemical analysis. Prior to the start of drilling or test pit excavation operations, care will be taken that, as a minimum, the following documents, equipment and supplies are available and in good working order:

- Copies of Work Plan
- List of appropriate contacts, with phone numbers
- Field logbook and paper
- Site topographic map
- Waterproof marking pens (for sample boxes and containers)
- Sample jars and chemical analysis vials and bottles
- Health and Safety equipment, per HASP
- Field monitoring instruments, per HASP
- Other specialized equipment per site-specific work activities.

### **6.2 Soil Classification**

Soils will be classified using the Unified Soil Classification System (USCS) as described in ASTM Method D2488-84, "Practice for Description and Identification of Soil visual-Manual Procedure", and ASTM D2487-85, "Test Method for Classification of Soils for Engineering Purposes". According to the USCS system, soils are divided into three major groups: coarse-grained, fine-grained, and highly organic (peaty). The boundary between coarse-grained and fine-grained soils is the 200-mesh sieve (0.074 mm). In the field the distinction is based on whether the individual particles can be seen with the unaided eye. If more than 50% of the soil by weight is judged to consist of grains that can be distinguished separately, the soil is described to be coarse-grained. The coarse-grained soils are divided into gravelly (G) or sandy (S) soils, depending on whether more or less than 50% of the visible grains are larger than the No.4 sieve (3/16 inch). They are each divided further into four subgroups:

- W: Well graded; fairly clean (<5% finer than 0.074 mm)  
P: Poorly graded (gap-graded); fairly clean (<5% finer than 0.074 mm)  
C: Dirty (>12% finer than 0.074 mm); plastic (clayey) fines  
M: Dirty (>12% finer than 0.074 mm); non-plastic or silty fines

The soils are represented by symbols such as GW or SP. Borderline materials are represented by a double symbol, such as GW-GP.

The fine-grained soils are divided into three groups: inorganic silts (M), inorganic clays (C), and organic silts and clays (O). The soils are further subdivided into those having liquid limits lower than 50% (ML, CL, OL), or higher (MH, CH, OH).

The distinction between inorganic clays and silts, or organic silts and clays, is made on the basis of plasticity. Organic soils, O, are distinguished from inorganic soils by their characteristic odor and dark color.

In the field, the fine-grained soils may be differentiated by their dry strength, their reaction to the shaking test, or their toughness near the plastic limit. Borderline materials are represented by a double symbol, such as CL-ML. Like all procedures based on grain size or remolded properties of soil, the classification cannot fully represent the engineering response of the in-situ soil mass.

Soil properties required to define the USCS designation and provide a geologic description are the primary features considered in field identification. These properties and other observed characteristics normally identified in a soil description are defined in this section and include:

- a. Color (using Munsell color chart)
- b. Moisture condition
- c. Grain size
  - (1) Estimated maximum grain size
  - (2) Estimated percent by weight of fines (material passing No. 200 sieve)
- d. Gradation (well graded, poorly graded)

- e. Grain shape (angular, subangular, and rounded)
- f. Plasticity
- g. Predominant soil type
- h. Secondary components of soil
- i. Classification symbol
- j. Other features such as:
  - Organic, chemical, or metallic content
  - Compactness
  - Consistency Cohesiveness near plastic limit
  - Dry strength
  - Source: residual, or transported (aeolian, waterborne, glacial deposit, etc.).

### **6.3 Rock Description**

It is not anticipated that bedrock will be encountered during test pit excavation or monitoring well installation. However; if bedrock is encountered, the following procedures will be followed.

Rock core descriptions should include, at a minimum, rock type, color, relative hardness, brokenness, core recovery, and rock quality designation (RQD). In addition, pertinent drilling observations such as coring rate, loss of drilling water, and presence of voids should be recorded in the field logbook and boring logs.

In describing the rock core, naturally occurring breaks or discontinuities should be described in detail. The discontinuity description should include spacing and orientation (dip) of fractures as well as distinction between bedding plane, joint or foliation features and evidence of water-bearing zones (solution features or stained fracture surfaces) within the rock core.

## **7.0 SURVEY OF SAMPLE LOCATIONS**

Test pit and monitoring well locations will be surveyed for horizontal and vertical coordinates by a licensed New York State surveyor and referenced to the existing site survey. Basement boring locations or interior room locations that are inaccessible to survey equipment will be located by tape measuring from at least two adjacent building exterior wall corners.

## **8.0 SAMPLE COLLECTION PROCEDURES FOR CHEMICAL ANALYSIS**

### **8.1 Soils**

Soil samples will be collected for chemical analysis as described in the Site Investigation Plan. This section discusses the procedures for collecting an aliquot of sample for chemical analysis at the intervals specified in the work plan. All chemical analysis for soils must be performed by a New York State Department of Health certified laboratory.

The detailed procedure for soil sample collection is outlined below:

1. Screen soil with PID. Record any physical characteristics (e.g., obvious contamination, or discoloration) in the field logbook.
2. Using a pre-cleaned trowel or spoon, collect a sample for volatile organic analysis from soil showing the highest PID reading or other evidence of contamination
3. If additional chemical analysis is required (i.e., semi-volatile organics, metals, PCBs), use a pre-cleaned trowel or spoon to place three aliquots of soil in a decontaminated mixing bowl and thoroughly mix soil using cone & quarter method until a consistent physical appearance is achieved.
4. Transfer sample to laboratory-cleaned (I-Chem Series 300 or equivalent) sample containers.
5. Record field sampling information in the field logbook as outlined in Section 6.
6. Label each sample container with the appropriate sample identification data and place sample in a cooler for shipment to the laboratory.
7. Initiate chain-of-custody procedures.

### **8.2 Groundwater**

Groundwater samples will be collected for chemical analysis as described in the Site Investigation Plan. This section discusses the procedures for collecting a sample of groundwater for chemical analysis from a monitoring well. To collect representative groundwater samples, groundwater wells must be adequately developed and purged prior to

sampling. Development and purging field information will be recorded on Field Activity Forms Well Development Log and Well Purge Log. Purging will require the removal of three to five volumes of standing water in rapidly recharging wells and at least one volume from wells with slow recharge rates. Shallow wells in which the screen intersects the water table should require a minimum amount of purging since the groundwater would flow through the screen and not be entrapped in the casing. Deeper wells should be purged more thoroughly since they may be located in confined aquifers and water may rise up into the casing. A thorough purging would require the removal of several volumes of this trapped water to ensure that representative groundwater is brought into the casing for sampling. Sampling should commence as soon as adequate recharge has occurred.

All chemical analysis for groundwater must be performed by a New York State Department of Health certified laboratory. Groundwater samples will be labeled and shipped following procedures outlined in Section 8.3 and 8.4 and analyzed according the program outlined in Section 2.2 of the Site Investigation Plan.

### **8.2.1 Well Purging Procedures**

1. The well cover will be unlocked and carefully removed to avoid having any foreign material enter the well. The interior of the riser pipe will be monitored for organic vapors using a PID. If a reading of greater than 5 ppm is recorded, the well will be vented until levels are below 5 ppm before purging starts.
2. Using an electronic water level detector, the water level below top of casing will be measured. Knowing the total depth of well, it will be possible to determine the volume of water in the well. The end of the probe will be soap and water washed and de-ionized water-rinsed between wells.
3. On wells with water levels that remain 25 feet or less below the top of casing, a suction-lift pump will be used to remove three to five times the well volume, measured into a calibrated pail. (A well volume will be defined as the volume of water standing inside the casing measured prior to evacuation.) Dedicated new polyethylene discharge and intake tubing (3/8" inner-diameter (I.D.) low-density polyethylene) will be used for each well.

During this evacuation of the well, the intake opening of the pump tubing will be positioned just below the surface of the well water. If the water level drops, then the tubing will be lowered as needed to maintain flow. Pumping from the top of the water column will ensure proper flushing of the well. Pumping will continue until required volumes are removed.

If the well purges to dryness and recharges rapidly (within 15 minutes), water will continue to be removed as it recharges until the required volumes are removed. If the well purges to dryness and is slow to recharge (greater than 15 minutes), evacuation will be terminated.

4. If the water level of a well is initially below 25 feet, or draws down to this level because of a slow recharge rate, then a 1-1/2 inch bailer, 5 to 10 feet in length, will be used to evacuate the well. The line for this bailer will be dedicated new 1/4-inch nylon. It will be discarded after use. Prior to use in the field, the dedicated purging bailer will be cleaned per Section 8.6 procedures.
5. Purging will continue until three volumes of water have been removed. Well volume will be calculated as detailed on the Well Purge Log. Measurements for pH, turbidity, and conductivity will be recorded during purging. The stability of these measurements with time will be used to guide the decision to discontinue purging.
6. All well purge water will be discharged to the ground surface unless there is evidence of contamination (historical data indicates limited groundwater contamination) or as directed by the NYSDEC representative in which case it will be containerized for off-site disposal.
7. Well field data are to be recorded in the field notebook and Field Activity Forms Well Development Log and Well Purge Log.

### **8.2.2 Groundwater Sampling Procedures**

1. Groundwater samples will be collected on the same day as well purging at any time after the well has recovered sufficiently to sample, or within 24 hours after evacuation, if the well recharges slowly. If a well does not contain or yield

- sufficient volume for all required laboratory analytical testing (including quality control), then a decision will be made to prioritize analyses. If a well takes longer than 24 hours to recharge, then a decision will be made after consultation with the NYSDEC representative whether or not the groundwater sample will be considered valid.
2. After well purging is completed and the well has recharged sufficiently per the previous item, a sample will be collected into appropriate containers using a dedicated HDPE bailer. The bailer will have a 5-foot monofilament polypropylene or stainless steel “leader” which will be attached to a clean, dedicated ¼-inch nylon line. The bailer will be lowered below the surface of the water so as to allow the water to touch only the “leader” and not the nylon rope.
  3. All sample bottles will be labeled in the field using a waterproof permanent marker. Procedures outlined for Sample Labeling (Section 8.3) and Sample Shipping (Section 8.4) will be followed.
  4. Samples will be collected into verifiably clean sample bottles (containing required preservatives) and placed on ice in coolers prior to shipment to the analytical laboratory. Chain of custody will be initiated by completing Field Activity Form Chain of Custody. The analytical laboratory will certify that the sample bottles are analyte-free.
  5. A separate sample of approximately 200 mls will be collected into a 60-ounce plastic bottle to measure pH, conductivity, turbidity, and temperature of the well in the field.
  6. Well sampling data are to be recorded in the field notebook and on Field Activity Form Well Purge Log.

### **8.3 Sample Labeling**

In order to prevent misidentification and to aid in the handling of environmental samples collected during the field investigation, the following procedures will be followed:



1. Affixed to each sample will be a non-removable (when wet) label. The sample bottle will be wrapped with 2-inch cellophane tape. Apply label and wrap with tape to cover label.
2. The following information will be written with permanent marker:
  - Site name
  - Sample identification
  - Project number
  - Date/time
  - Sampler's initials
  - Sample preservation
  - Analysis required.
3. Each sample of each matrix will be assigned a unique identification alpha-numeric code utilizing the following abbreviations:
  - MW = monitoring well
  - S = shallow
  - D = deep
  - GW = groundwater sample
  - LW = leachate sample
  - TB = trip blank
  - RB = rinse blank
  - MS = matrix spike
  - MSD = matrix spike duplicate.

#### **8.4 Sample Shipping**

Proper documentation of sample collection and the methods used to control these documents are referred to as chain-of-custody procedures. Chain-of-custody procedures are essential for presentation of sample analytical chemistry results as evidence in litigation or at administrative hearings held by regulatory agencies. Chain-of-custody procedures also serve to minimize loss or misidentification of samples and to ensure that unauthorized persons do not tamper with collected samples.

1. The chain-of-custody should be completed with relevant information and placed inside the sample cooler.
2. Cushion the bottom, sides and top of the cooler with bubble pack material.
3. Place bottles in cooler in such a way that they do not touch using bubble pack.
4. Pack coolers with ice in ziplock plastic bags.
5. Secure the cooler lid.
6. Place lab address on top of cooler and ship samples via overnight carrier the same day that they are collected to the laboratory.

## **8.5 Field Log Book**

Field activities including drilling and sampling will be documented daily in bound logbooks with pre-numbered pages. These books are to accompany the samplers to each sample location. Maintenance and legibility of the field logbooks is the responsibility of each sampler. Logbook entries will be made in indelible ink. All changes to field notes will be initialed in ink. Information to be recorded during environmental sampling activities shall include such items as:

- name of site and type of sample
- purpose of sampling (i.e., monitoring, sample collection)
- sample number, volume, and description
- procedure performed during sampling
- sampling location, including sketch with measurements to physical features
- date and time of each sampling event
- sampler name(s)
- field instrument calibration information
- field measurements such as PID and methane readings
- weather conditions
- sample distribution and shipping.

Information to be recorded during drilling activities shall include such items as:

- names of field investigators and drilling personnel

- start and completion times of each drilling event
- measurements and quantities of materials used during drilling
- depth and identification number of soil samples collected for chemical analysis
- monitoring well completion data
- water level measurements and grout levels (borehole sealing information)
- record of site visitors
- PID measurements.

## **8.6 General Documentation Requirements**

The results of all field activities will be documented in the field log book and appropriate field activity forms. The field activity forms anticipated for this project include: Geologic Boring Log, Test Pit Log, Monitoring Well Construction Detail, Well Development Log, Well Purging Log, and Chain of Custody Form.

## **8.7 Equipment Decontamination and Investigation-Derived Soil and Water**

Reusable equipment used to collect samples, such as macro-core tubes and stainless steel mixing bowls will be hand cleaned using a sequence of: an alconox/water wash, tap water rinse and de-ionized water rinse between each use. Dedicated (i.e., disposable) sampling equipment is for one-time use and will not require decontamination. All IDW will be managed in accordance with DER-10.

Auger cuttings, development water, purge water and equipment decontamination water will be containerized, characterized and disposed of at an off-site facility. Used personal protective equipment will be placed in contractor grade trash bags for off-site disposal.

## **PART 3 – QUALITY ASSURANCE PROJECT PLAN (QAPP)**

### **9.0 QAPP INTRODUCTION**

This QAPP provides an overview of quality assurance/quality control (QA/QC) programs which will be adhered to during the Site Investigation activities described in the Site Investigation Plan (SIP). This QAPP gives specific methods and QA/QC procedures for chemical testing of environmental samples obtained from the site, which will ensure the quality and ultimate defensibility of data produced during the Site Investigation.

This QAPP was prepared using elements from the following guidance documents below:

1. Sampling Guidelines and Protocols, New York State Department of Environmental Conservation, September 1992;
2. Guidance for the Data Quality Objective Process, EPA QA/G-4(EPA/600/R-96/055), dated August 2000;
3. Test Methods for Evaluating Solid Waste – Physical/Chemical Methods, SW-846, Third Edition, November 1986; Update III, December 1996;
4. EPA Region II Contract Lab Program Organics Data Review and Preliminary Review, Standard Operating Procedures #HW-6, Revision 12, and;
5. Evaluation of Metals Data for the Contract Laboratory Program, Standard Operating Procedure #HW-2, Revision 11;

### **9.1 Data Quality Objectives (DQO)**

The USEPA DQO Guidance document specifies that sampling programs be designed in order to meet the requirements of the investigation and achieve the DQOs. Part of this process is to determine what data is being collected and how it will be used in assessing Site conditions. For the purposes of this project, two types of data will be produced. Definitive data will be collected from samples that are submitted to an approved laboratory for analysis. Screening data will be produced using field measurement instruments in order to refine the sampling program so as to provide a complete set of definitive data.

These objectives will be attained by strict adherence to the SIP, the Standard Investigative Procedures Plan, and the QAPP as well as by utilizing trained and experienced personnel to perform all tasks required to collect the data. Specific QA/QC objectives of the various program elements are discussed in the following sections.

Laboratory QA procedures regarding personnel, management structure, analytical equipment, and data management are contained in the laboratory's Quality Assurance Plan (LQAP). A copy of the LQAP will be provided under separate cover if requested.

## **9.2 QA/QC for Environmental Samples**

The project QA/QC goals will be attained for the collection of environmental samples by strict compliance with the sampling methods and procedures outlined in the SIP. Only trained personnel, after consultation with the Project Manager as listed in the SIP, will carry out these sampling procedures. QA/QC will also be assured by the use of appropriate containers and preservation methods. In addition, the holding times and sample preservation listed in Tables 3-6 and 3-7 will be followed to ensure integrity of all environmental samples. All samples will be held under proper chains of custody and be controlled by appropriate labels/paperwork as outlined in this QAPP. The laboratory will be required to analyze the samples in accordance with the methods, laboratory precision and recovery limits specified in Tables 3-1 through 3-4, and provide data deliverables in compliance with NYSDEC Analytical Services Protocol (ASP).

## **9.3 Analytical Methods**

To achieve the QA/QC goals, the chemical analysis indicated in Tables 3-1 and 3-3 will be performed in accordance with the referenced USEPA test methods which are cited in NYSDEC ASP. The investigation requires very strict QA/QC procedures which will be followed on all samples for the parameters listed below.

- Target Compound List (TCL) Volatile Organics
- TCL Semi Volatile Organics
- TCL Pesticides/PCBs

- Target Analyte List (TAL) Metals
- TAL Cyanide

Tables 3-6 and 3-7 also summarize the sample bottle and holding time requirements for the site investigation. The environmental samples will not be diluted to remove chemical interferences. Dilutions are permitted only to bring TCL/TAL analytes within instrument calibration range. If analytical cleanups are necessary, then the laboratory must make best efforts to remove interferences through the cleanup techniques described in EPA Publication SW-846 or the EPA "Contract Laboratory Statement of Work for Organics Analysis, Multi-Media, Multi-Concentration" in effect as of the date of sample analysis. QA/QC goals are also achieved by the use of the required number of field and laboratory quality control samples as indicated on Table 3-8. The definitions of each QC sample type are found in this QAPP.

Prior to any modifications from the listed test methodologies, the Laboratory Director will contact the SI Project Chemist to review the modification(s).

#### **9.4 QA/QC Objectives for Chemical Measurement**

In general, data quality indicators include precision, accuracy, representativeness, completeness, and comparability (PARCC). Each indicator may be defined as follows:

1. Precision is the agreement or reproducibility among individual measurements of the same property, usually made under the same conditions;
2. Accuracy is the degree of agreement of a measurement with the true or accepted value;
3. Representativeness is the degree to which a measurement accurately and precisely represents a characteristic of a population, parameter, or variations at a sampling point, a process condition, or an environmental condition;
4. Completeness is a measure of the amount of valid data obtained from a measurement system compared with the amount that was expected to be obtained under correct normal conditions; and,

5. Comparability is an expression of the confidence with which one data set can be compared with another data set in regard to the same property.

QA objectives vary according to the specific objectives of each analysis. The *accuracy and precision* of data will be functions of the sample origin, analytical procedures and the specific sample matrices. QC practices used to evaluate these data quality indicators include use of accepted analytical procedures, adherence to sample preservation and hold time, and analysis of QC samples such as blanks, replicates, spikes, calibration standards and reference standards.

For each analytical parameter, quantitative objectives for precision, accuracy and sensitivity (reporting limits) were established in accordance with the specific analytical method employed, published historical data, laboratory method validation studies, and laboratory experience with similar samples. Tables 3-1 through 3-4 summarize the accuracy and precision for groundwater and soil samples, and Table 3-5 identifies the sensitivity goals for the TCL/TAL. Notably, these reporting limits are the minimum reporting limits appropriate for undiluted samples. The actual reporting limits for individual samples and analyses may be elevated due to contaminant concentrations in excess of the method calibration range, sample matrix cleanup procedures, and percent moisture adjustment for soil samples.

*Representativeness* is a qualitative characteristic which primarily addresses proper design of a sampling program in terms of number and location of samples and sample collection techniques. The rationale for the number and location of samples for this project is discussed in the SIP and the sampling procedures are described in Section 8.0 of this Work Plan. The representativeness of the analytical data is also a function of the procedures used to process the samples. Standard USEPA or USEPA-accepted analytical procedures will be followed as identified in Section 9.3 and the LQAP.

*Completeness* is a quantitative characteristic which is defined as the percentage of valid data obtained from a measurement system (sampling and analysis), as compared to that which was planned. Completeness can be less than 100 percent due to low sample

recovery, inaccessibility to sample locations, sample loss during shipment, or disqualification of sample results which are outside of specific quality control criteria due to laboratory error or matrix-specific interference. Completeness is documented through field and laboratory reports which allow the data user to assess the quality and usability of the results. The completeness goal for laboratory measurements will be 90 percent, and the overall project completeness goal (field and laboratory) will be 85 percent.

*Comparability* is a qualitative characteristic which allows for comparison of analytical results with those obtained by other laboratories. This may be accomplished through the use of standard accepted methodologies, traceability of standards to National Bureau of Standards (NBS) or USEPA sources, use of appropriate levels of quality control, reporting results in consistent, standard units of measure and participation in inter-laboratory studies designed to evaluate laboratory performance.

Samples collected during the project will be analyzed for the parameters outlined in Tables 3-1 and 3-3. The PARCC criteria in Tables 3-1 through 3-4 may not always be achievable. The NYSDEC ASP data validation guidelines provide direction for the determination of data usability. Qualified data can often provide useful information, although the degree of certainty associated with the results may not be as planned. Professional judgment will be used to determine data usability with respect to project goals.



## **10.0 CHEMICAL DATA REDUCTION**

NYSDEC ASP will be employed for documentation and reporting of all data. The deliverables package will conform to the latest NYSDEC ASP. Additional deliverables may also be required for data validation.

Laboratory data reduction procedures are identified in the QAPP. In general, identification of all analytes must be accomplished with an authentic standard of the analyte, traceable to National Institute of Standards (NIST) or EPA sources. When authentic standards are not available, identification is tentative (as is the case with volatile and semi-volatile Tentatively Identified Compounds). Other criteria that must be utilized when determining the presence or absence of target compounds are mass spectra comparisons, retention time windows and response factors relative to those of the authentic standard. Data reduction is to be performed by individuals experienced with a particular analysis.

All field records will be compiled and retained in LiRo's project files. Analytical data packages will contain all information necessary for data validation, if data validation should be required. At a minimum, the following information is needed as appropriate to the analytical methodology:

- Case narrative;
- Chain of Custody (COC) records;
- QC summaries (i.e.: blanks, spikes, duplicates, serial dilutions);
- Analytical data report;
- Calibration information (including instrument performance checks);
- Chromatograms;
- Quantitation reports;
- Spectra;
- Analytical sequence logs; and,
- Sample preparation logs.

The laboratory will keep sample evidence files containing the following items:

- COC records;
- Sample log-in information (if applicable);
- Copies of laboratory records and notebook pages;
- Copies of laboratory bench data sheets;
- Instrument raw data, both hardcopy and electronic;
- Chromatograms;
- Pertinent correspondence memoranda; and,
- Final report file.

LiRo will retain relevant and appropriate project information in project files. The information contained in these files includes, but is not limited to, the following items:

- COC records;
- Field notes and information;
- Correspondence and telephone memoranda;
- Meeting notes;
- Laboratory information;
- Data validation information;
- Reference information;
- Audit information; and,
- Copies of reports.

## **10.1 Data Validation**

Validation will be performed by a third party data validator. The data will be audited and validated for compliance with the ASP requirements. Data deliverables will be reviewed for completeness, sample preservation and holding time compliance, calibration and method blank contamination, instrument calibrations, analytical spike recoveries and compound identification. If discrepancies or deviations are found in the data package, the laboratory will be contacted to clarify specific issues.

Data validation techniques include screening and accepting, rejecting or qualifying data on the basis of specific quality control criteria for sample preservation and holding time compliance, instrument calibration, method blank results, analytical spike results, surrogates, and laboratory and field duplicates. Data validation is a process whereby erroneous data may be identified prior to entering the project record. Validation of field measurements will be performed by field personnel in consultation with technical supervisors. Field personnel will validate the field data through review of calibration and duplicate data readings. The data will be reviewed to determine if there are any anomalous readings. Anomalies will be resolved immediately by means such as re-calibration or re-acquisition of the measurement.

For all analytical samples associated with this project, the laboratory will produce NYDEC data packages that will contain all information needed for formal validation of the data. Data validation will be performed in accordance with the USEPA Region II Standard Operating Procedures (SOPs) HW-6, Revision 12 (TCL Organics data) and HW-2, Revision 11 (TAL Inorganics data). These procedures are specific with regard to evaluation of holding time, surrogate and spike recoveries, precision of duplicate measurements, calibration and instrument performance, blank contamination, compound identification, and compound quantification. Data will be qualified as necessary in accordance with the SOPs and any qualification will be explained in a data validation narrative.

Once the validation process is completed, the data usability will be determined. A data usability summary report (DUSR) will be appended to the Site Investigation Report. The data usability report will identify data deficiencies, analytical protocol deviations and quality control problems. The report will include recommendations for data usability and any required resampling or reanalysis.

## **10.2 Quality Control Samples**

Various QA/QC samples will be analyzed to assess the quality of the data resulting from the field sampling and analytical programs. The following identifies the QA/QC samples to be analyzed, at a minimum as well as the frequency of analysis.

### 10.2.1 Laboratory Quality Control Samples

A. Method Blanks: Method blank is defined as laboratory-demonstrated analyte-free water that is carried through the entire analytical procedure. Method and field/rinsate are not expected to contain any target analytes with concentrations greater than the reported detection limit with the possible exception of common laboratory contaminants (i.e., methylene chloride, acetone, 2-butanone, and phthalate esters). Method blanks are analyzed at a frequency defined by the ASP document.

B. Matrix Spike Samples: An aliquot of a matrix (water or soil) is spiked with known concentrations of specific compounds as stipulated in the ASP document. The matrix spike and matrix spike duplicate are subjected to the entire analytical procedure in order to indicate both accuracy and precision of the method for the matrix by measuring the percent recovery and Relative Percent Difference (RPD) of the two spiked samples. MS/MSD data are assessed based upon the percent recovery of spiked analytes using the following equation:

$$\% R = \frac{(SSR - SR)}{SA} \times 100\%$$

where, SSR = Spiked sample result for analyte x;

SR = Sample result for analyte x; and,

SA = Spike added of analyte x.

The relative percent difference between the MS/MSD results is calculated using the RPD equation presented above. Each matrix spike set includes a matrix spike blank sample. MS/MSDs are analyzed at a frequency stated in Table 3-8.

C. Laboratory Control Samples: Laboratory control spike samples (LCS) provide information about the accuracy of the analytical system, independent of matrix. LCS are laboratory-generated sample spikes with target analytes at concentrations appropriate to the analyses. LCS will be analyzed as part of every analytical batch.

## 10.2.2 Field Quality Control Samples

A. Trip Blanks - The primary purpose of the trip blank is to detect additional sources of contamination that might potentially influence contaminant values reported in actual samples both quantitatively and qualitatively. Possible sources of contamination may be laboratory reagent water, sample containers, and sample handling procedures in the field and at the laboratory. Trip blanks will be defined as two 40 ml Volatile Organics Analysis (VOA) vials filled with laboratory-demonstrated analyte-free water. This water must originate from one common source within the laboratory and must be the same water used by the laboratory performing the analysis. Trip blanks should be handled and transported in the same manner as the samples acquired that day, except that trip blanks are not opened in the field. Instead, they travel with the sample containers. Trip blanks must return to the laboratory with the same set of containers they accompanied to the field, and are analyzed for VOAs only.

B. Rinse Blanks - The purpose of a rinse blank is to provide a check on possible sources of contamination resulting from exposure to the ambient air or from improperly cleaned sampling equipment. The rinse blank is opened in the field and the laboratory water is passed through the cleaned sampling equipment and placed in the empty containers. This water must originate from one common source within the laboratory and must be the same water used by the laboratory performing the analysis. The rinse blank should be collected, transported, and analyzed in the same manner as the samples acquired that day. Rinse blanks must be packaged with their associated matrix and will be collected for each matrix as specified in Table 3-8.

C. Field Duplicates – Field duplicates are samples collected simultaneously for the same analyte or set of analytes at one location, after which they are treated as separate samples. If the sampling matrix is homogeneous, field duplicates provide a means of assessing the precision of collection methods. Field duplicates are collected by sampling the same location twice, but the field duplicate is assigned a unique sample identification number. Field duplicate results are assessed based upon relative percent difference (RPD) between values, using the following equation:

i. 
$$\text{RPD} = \frac{(D1 - D2)}{(D1 + D2)/2} \times 100\%$$

where, D1 = Primary sample result; and,

D2 = Duplicate sample result.

D. Split Samples - Split samples are used for performance audits or inter-laboratory comparability of data. At this time, no split sample collection is planned. If split samples are required to be collected, then the following will apply: A split sample will be defined as two separate samples taken from a single aliquot which has been thoroughly mixed or homogenized prior to the formation of the two separate samples.

## **11.0 ENVIRONMENTAL SAMPLE CUSTODY AND SHIPPING PROCEDURES**

The ultimate accuracy of any data generation begins with a sampling and measurement procedure that is well conceived and carefully implemented. The details of the sampling protocols are provided in this section, which presents the procedures with which samples will be acquired or measurements made during the execution of the project. The laboratory methods referenced in this plan are consistent with the NYSDEC ASP.

### **11.1 Sample Custody and Responsibilities**

Procedures contained in the chain-of-custody guidelines outlined in NEIC Policies and Procedures, prepared by the National Enforcement Investigations Center of the USEPA office of Enforcement will be utilized. Specific procedures to be used are described below.

#### **11.1.1 Custody Definitions**

Chain-of-Custody Officer - The Chain-of-Custody Officer will be responsible for oversight of chain-of-custody activities. The lead geologist or lead sampler will usually implement these activities.

A sample is "Under Custody" if:

1. It is in the possession of the Chain-of-Custody Officer; or
2. It is in the view of the Chain-of-Custody Officer, after being in his possession; or
3. It was in his possession and he locked it up; or
4. It is in a designated secure area.

#### **11.1.2 Responsibilities**

The Chain-of-Custody Officer is responsible for monitoring all chain-of-custody activities and for collecting legally admissible copies of chain-of-custody documentation for the permanent project file. He shall be responsible for:

1. An initial review of sample labels and/or tags, closure tapes, and chain-of-custody record and split-sample forms provided by the laboratory. The Chain-of-Custody Officer will document this review in the field logbook.
2. Training of all field sampling personnel in the methodologies for carrying out chain-of-custody procedures and the proper use of all chain-of-custody forms and record documents.
3. Monitoring implementation of chain-of-custody procedures.

The chain-of-custody is initiated in the laboratory when the sample containers and vials are prepared, packed, and shipped to the site. When the sample containers are received they will be checked for any breach of chain-of-custody seals or evidence of tampering.

All samples shall be adequately marked for identification from the time of collection and packaging through shipping and storage. Marking shall be on a sample label attached to the sample container. Sample identification shall include, as a minimum:

- Project name and/or code;
- Sample identification number;
- Analysis requested;
- Chemical preservatives added to the sample container;
- Sample date and time; and,
- Initials of the individual performing the sampling (samples for chemical analysis).

At the time of sampling, the field sampling personnel will record sample information on a chain-off-custody form. Chain-of-custody form entries will be made in indelible ink.

After sampling containers are filled, the field sampling personnel will place the filled containers in coolers preserved with ice and maintain custody of all samples until they are transferred to the field office for processing. After samples are processed, they will be prepared for shipping to Chemtech in Mountainside, New Jersey. Samples will be shipped within 48 hours of sample collection.



## **11.2 Split-Sample Records**

Whenever samples are split, a split-sample receipt will be prepared. The receipt will describe the samples being split, including the quantity (mass or volume) of each sample portion. Both the laboratory (and field sampling personnel, should samples be split in the field) and the recipient of the split samples will retain copies of the receipt. The chain-of-custody forms will be used to document split-sample receipts and will accompany both portions of the sample.

## **12.0 SAMPLE LABELING AND SHIPPING**

Each label will include such information as the following:

- site name
- sample identification
- project number
- date/time
- samplers' initials
- sample preservation (if any) designation
- analysis required

Each sample will be assigned a unique alpha-numeric identification code. An example of this code and a description of its components are presented below:

### **12.1 Sample Identification Codes**

#### ***List of Abbreviations***

##### **Sample Location Identifications**

TP = Test Pit

MW = Groundwater monitoring well

SB = Soil Boring

XX = Depth of Soil Boring

LE = Leachate

##### **Other Label Information**

GW = Groundwater

TB = Trip blank

RB =Field Rinse Blank

FD = Field Duplicate (Will have the same name as the primary sample, with an FD added to the end of the ID)

MS = Matrix Spike

MSD = Matrix Spike Duplicate

The samples collected will be categorized as environmental samples, per EPA/Department of Transportation (DOT) regulations and regulations specified in 49 CFR, Parts 171 through 179. The environmental samples will consist of potentially contaminated groundwater and soils. It is anticipated that the environmental samples that will be collected are likely to have low concentrations of contaminants and shall be handled as such for shipping purposes. Highly contaminated soil or groundwater (contaminated with high levels of organic) will be shipped as environmental samples using the procedures discussed below.

Environmental samples shall be shipped using the following steps:

1. Fill out the chain-of-custody record with relevant information.
2. Place the white original in a ziplock bag to travel with the samples. Tape the bag inside the sample cooler.
3. Cushion the bottom, sides and top of the cooler with bubble pack material.
4. Place bottles in cooler in such a way that they do not touch using bubble pack.
5. Pack coolers with ice in ziplock plastic bags.
6. Secure the cooler lid.
7. Place accompanying documentation (analytical request forms, etc.) in plastic bags and tape with masking or clear plastic tape to inside lid of cooler. Tape cooler drain shut.
8. Wrap cooler around complete circumference with strapping tape at two locations. Secure lid by taping. Do not cover current shipping or marking labels.
9. Affix custody seals on front right of cooler. Cover seals with wide, clear tape
10. Place lab address on top of cooler and ship samples via overnight carrier the same day that they are collected to the laboratory

## **13.0 FIELD QUALITY CONTROL/QUALITY ASSURANCE**

### **13.1 Calibration of Field Equipment**

Field equipment will be calibrated according to the manufacturer's recommended methods, as applicable. The following equipment will be calibrated daily:

- photoionization detector

Other field equipment will be calibrated prior to use and at such intervals as recommended by the manufacturer.

### **13.2 Preventative Maintenance of Field Equipment**

Field equipment will be maintained and serviced according to the manufacturer's recommendations. Equipment will be cleaned on a regular basis and/or decontaminated according to manufacturer's recommendations and the Equipment Decontamination Plan detailed in Section 2.5 of the Site Investigation Plan. A copy of the manufacturers' equipment operating manual for each piece of equipment will be kept at the on-site support vehicle.

## **14.0 CORRECTIVE ACTIONS**

Corrective action is the process of identifying, recommending, approving, and implementing measures to counter unacceptable procedures or out-of-QC performance which can affect data quality. Corrective action can occur during field activities, laboratory analyses, data validation, and data assessment. All corrective actions proposed and implemented will be documented in the regular QA reports to management. Only after approval by the Project Manager or designee will corrective action be implemented.

For noncompliance problems, a formal corrective action program will be determined and implemented at the time the problem is identified. The person who identifies the problem is responsible for notifying the SI Project Chemist, who in turn will notify the Project Manager.

Any nonconformance with the established QC procedures in the QAPP will be identified and corrected in accordance with this QAPP. The SI Project chemist, or designee, will issue a nonconformance report for each nonconformance condition.

### **14.1 Field Corrective Action**

Corrective action in the field may be needed when the sample network is changed (i.e., more/fewer samples, sampling locations other than those specified in the QAPP, etc.), sampling procedures and/or field analytical procedures require modification due to unexpected conditions, problems are identified during the data review and validation, etc. In general the Project Manager or project Geologist may identify the need for corrective action. The Project Manager, in consultation with ECIDA and NYSDEC, will recommend a corrective action. It will be the responsibility of the Project Manager to ensure the corrective action has been properly implemented. A copy of the corrective action documentation will be provided to the Project Chemist on the same day the corrective measure is implemented. This will enable the Project Chemist to include the corrective action in the project status report.

## **14.2 Laboratory Corrective Action**

Corrective action in the laboratory may occur prior to, during, and after initial analysis. A number of conditions (such as broken sample containers, multiple phases, low/high pH readings, potentially high sample concentrations) may be identified during sample log-in or just prior to analysis. Following consultation with lab analysts and section leaders, it may be necessary for the SI Project Chemist to approve the implementation of corrective action. Depending on the condition encountered, the SI Project Chemist may consult the SI QA Officer for input. Conditions during or after analysis that may automatically trigger corrective action or optional procedures include dilution of samples, additional sample extract cleanup, automatic reinjection/reanalysis when certain QC criteria are not met, etc. A summary of method-specific corrective actions is available in the LQAP. All laboratory corrective actions will be documented and also identified in the case narrative of the data packages.

## **14.3 Corrective Action during Data Review / Validation and Assessment**

The need for corrective action may be required during either the data validation or data assessment. Potential types of corrective action may include re-sampling by the field team or re-extraction/re-analysis of samples by the laboratory. These actions are dependent upon the ability to mobilize the field team, the existence of a sufficient amount of sample necessary for reanalysis (including whether or not the remaining sample satisfies holding time requirements), whether the data to be collected is necessary to meet the required QA objectives, etc. If the SI Data Validator identifies a corrective action situation, it is the Project Manager who will be responsible for approving the implementation of corrective action, including re-sampling, during data assessment. The Project Manager will document all corrective actions of this type.

## **14.4 Major Corrective Actions**

Any corrective action that requires re-sampling or changes to the QAPP will be defined as a major corrective action. Major corrective actions include, but are not limited to, measures that change the number of samples collected, alter previously selected sampling locations, or impact the project QC objectives. The Project Manager will be responsible for

contacting the Erie County Industrial Development Agency (client) and NYSDEC to discuss all major corrective actions. The client and NYSDEC should approve major corrective actions before implementation by the Project Manager and field team.

## **15.0 DATA USABILITY SUMMARY REPORT (DUSR)**

After the fieldwork is complete and the final analyses are completed, reviewed and validated, a Data Usability Summary Report (DUSR) will be prepared. The report will summarize the quality assurance, indicating any corrective actions taken and the overall results of QAPP compliance. The third party SI data validator will prepare this final summary in accordance with DER-10 requirements. The report will be utilized during the decision making-process and will be incorporated as part of the final report



**TABLE 3-1**  
**PARCC DATA FOR AQUEOUS SAMPLES**  
**1318 NIAGARA STREET SITE QAPP**

MEASUREMENT PARAMETER	METHOD REFERENCE	LABORATORY PRECISION	FIELD & LABORATORY PRECISION	ACCURACY	COMPLETENESS (a)
TCL Volatile Organics	SW846 8260B	see Table 3-2	<u>+50%</u>	see Table 3-2	85%
TCL Semi-Volatile Organics	SW846 8270C	see Table 3-2	<u>+50%</u>	see Table 3-2	85%
TCL Pesticides/PCBs	SW846 8081/8082	see Table 3-2	<u>+50%</u>	see Table 3-2	85%
TAL Metals	SW846 6010	see Table 3-2	<u>+50%</u>	see Table 3-2	85%
TAL Cyanide	EPA 335.0	see Table 3-2	<u>+50%</u>	see Table 3-2	85%

**NOTES:**

(a) While the goal for completeness of laboratory measurements is 90%, the goal for total completeness (sampling and analytical) is 85%.

1. TCL = CLP Target Compound List; TAL = CLP Target Analyte List. See Table 3-5.
2. Precision expressed as either percent relative standard deviation (%RSD) or relative percent difference (%RPD).
3. Accuracy expressed as percent recovery of matrix spike or laboratory control sample.
4. Precision and accuracy for TCL/TAL parameters provided in Table 3-2.

**TABLE 3-2**  
**LABORATORY PRECISION AND ACCURACY CRITERIA FOR AQUEOUS TCL/TAL SAMPLES**  
**1318 NIAGARA STREET SITE QAPP**

<b>VOLATILE ORGANICS:</b>		<b>QC LIMITS</b>
<u>Target Spike Compound</u>	<u>% Recovery</u>	<u>% RPD</u>
1,1-Dichloroethene	69%-140%	0%-20%
Trichloroethene	68%-150%	0%-14%
Benzene	78%-129%	0%-11%
Toluene	76%-125%	0%-13%
Chlorobenzene	80%-132%	0%-13%
<u>Surrogate Compound</u>		
Toluene-d8	81%-120%	Not Applicable
Bromofluorobenzene	76%-119%	Not Applicable
Dibromofluoromethane	85%-115%	Not Applicable
1,2-Dichloroethane-d4	72%-119%	Not Applicable
<b>SEMI-VOLATILE ORGANICS:</b>		<b>QC LIMITS</b>
<u>Target Spike Compound</u>	<u>% Recovery</u>	<u>% RPD</u>
Phenol	18%-37%	0%-50%
2-Chlorophenol	45%-87%	0%-50%
N-Nitroso-di-n-propylamine	48%-96%	0%-50%
4-Chloro-3-methylphenol	39%-101%	0%-50%
Acenaphthene	56%-104%	0%-50%
4-Nitrophenol	20%-115%	0%-50%
2,4-Dinitrotoluene	57%-103%	0%-50%
Pentachlorophenol	20%-125%	0%-50%
Pyrene	50%-110%	0%-50%
<u>Surrogate Compound</u>		
Nitrobenzene-d5	35%-114%	Not Applicable
2-Fluorobiphenyl	43%-116%	Not Applicable
Terphenyl-d14	33%-141%	Not Applicable
Phenol-d6	10%-94%	Not Applicable
2-Fluorophenol	21%-110%	Not Applicable
2,4,6-Tribromophenol	10%-123%	Not Applicable
2-Chlorophenol-d4 (advisory)	33%-110%	Not Applicable
1,2-Dichlorobenzene-d4 (advisory)	16%-110%	Not Applicable
<b>PESTICIDES:</b>		<b>QC LIMITS</b>
<u>Target Spike Compound</u>	<u>% Recovery</u>	<u>% RPD</u>
gamma-BHC	68%-136%	0%-15%
Heptachlor	77%-131%	0%-20%
Aldrin	71%-129%	0%-22%
Dieldrin	78%-134%	0%-18%
Endrin	70%-118%	0%-21%
4,4'-DDT	69%-139%	0%-27%
<u>Surrogate Compound</u>		
Tetrachloro-m-xylene	30%-150%	Not Applicable
Decachlorobiphenyl	30%-150%	Not Applicable
<b>POLYCHLORINATED BIPHENYLS:</b>		<b>QC LIMITS</b>
<u>Target Spike Compound</u>	<u>% Recovery</u>	<u>% RPD</u>
Aroclor 1016	61%-148%	0%-20%
Aroclor 1260	60%-134%	0%-20%
<u>Surrogate Compound</u>		
Tetrachloro-m-xylene	40%-135%	Not Applicable
Decachlorobiphenyl	42%-133%	Not Applicable
<b>TARGET ANALYTE LIST:</b>		<b>QC LIMITS</b>
<u>Target Spike Compound</u>	<u>% Recovery</u>	<u>% RPD</u>
Metals	75%-125%	±20%
Cyanide	75%-125%	±20%

**NOTES:**

1. VOC, SVOC, PCB and Pesticide accuracy and precision criteria based upon Chemtech established limits.
2. TAL accuracy and precision criteria based upon CLP SOW ILM04.0.
3. Precision criteria for metals is ±CRDL (reporting limit) for results less than 5xCRDL.

**TABLE 3-3**  
**PARCC DATA FOR SOIL SAMPLES**  
**1318 NIAGARA STREET SITE QAPP**

MEASUREMENT PARAMETER	METHOD REFERENCE	LABORATORY PRECISION	FIELD & LABORATORY PRECISION	ACCURACY	COMPLETENESS (a)
TCL Volatile Organics	SW846 8260B	see Table 3-4	±100%	see Table 3-4	85%
TCL Semi-Volatile Organics	SW846 8270C	see Table 3-4	±100%	see Table 3-4	85%
TCL Pesticides/PCBs	SW846 8081/8082	see Table 3-4	±100%	see Table 3-4	85%
TAL Metals	SW846 6010	see Table 3-4	±100%	see Table 3-4	85%
TAL Cyanide	EPA 335.0	see Table 3-4	±100%	see Table 3-4	85%

**NOTES:**

(a) While the goal for completeness of laboratory measurements is 90%, the goal for total completeness (sampling and analytical) is 85%.

1. TCL = CLP Target Compound List; TAL = CLP Target Analyte List. See Table 3-5.
2. Precision expressed as either percent relative standard deviation (%RSD) or relative percent difference (%RPD).
3. Accuracy expressed as percent recovery of matrix spike or laboratory control sample.
4. Precision and accuracy for TCL/TAL parameters provided in Table 3-4.

**TABLE 3-4**  
**LABORATORY PRECISION AND ACCURACY CRITERIA FOR SOIL TCL/TAL SAMPLES**  
**1318 NIAGARA STREET SITE QAPP**

<b>VOLATILE ORGANICS:</b>			<b>QC LIMITS</b>
<u>Target Spike Compound</u>	<u>% Recovery</u>		<u>% RPD</u>
1,1-Dichloroethene	82%-154%		0%-20%
Trichloroethene	81%-128%		0%-24%
Benzene	83%-135%		0%-21%
Toluene	78%-140%		0%-21%
Chlorobenzene	80%-141%		0%-21%
<u>Surrogate Compound</u>			
Toluene-d8	75%-125%		Not Applicable
Bromofluorobenzene	75%-125%		Not Applicable
Dibromofluoromethane	75%-125%		Not Applicable
1,2-Dichloroethane-d4	75%-125%		Not Applicable
<b>SEMI-VOLATILE ORGANICS:</b>			<b>QC LIMITS</b>
<u>Target Spike Compound</u>	<u>% Recovery</u>		<u>% RPD</u>
Phenol	20%-150%		0%-50%
2-Chlorophenol	52%-107%		0%-50%
N-Nitroso-di-n-propylamine	20%-150%		0%-50%
4-Chloro-3-methylphenol	60%-100%		0%-50%
Acenaphthene	65%-100%		0%-50%
4-Nitrophenol	45%-95%		0%-50%
2,4-Dinitrotoluene	56%-104%		0%-50%
Pentachlorophenol	20%-150%		0%-50%
Pyrene	20%-150%		0%-50%
<u>Surrogate Compound</u>			
Nitrobenzene-d5	23%-120%		Not Applicable
2-Fluorobiphenyl	30%-115%		Not Applicable
Terphenyl-d14	18%-137%		Not Applicable
Phenol-d6	24%-113%		Not Applicable
2-Fluorophenol	25%-121%		Not Applicable
2,4,6-Tribromophenol	19%-122%		Not Applicable
2-Chlorophenol-d4 (advisory)	20%-130%		Not Applicable
1,2-Dichlorobenzene-d4 (advisory)	20%-130%		Not Applicable
<b>PESTICIDES:</b>			<b>QC LIMITS</b>
<u>Target Spike Compound</u>	<u>% Recovery</u>		<u>% RPD</u>
gamma-BHC	53%-125%		0%-50%
Heptachlor	56%-129%		0%-31%
Aldrin	50%-123%		0%-43%
Dieldrin	57%-138%		0%-38%
Endrin	54%-129%		0%-45%
4,4'-DDT	53%-184%		0%-50%
<u>Surrogate Compound</u>			
Tetrachloro-m-xylene	30%-150%		Not Applicable
Decachlorobiphenyl	30%-150%		Not Applicable
<b>POLYCHLORINATED BIPHENYLS:</b>			<b>QC LIMITS</b>
<u>Target Spike Compound</u>	<u>% Recovery</u>		<u>% RPD</u>
Aroclor 1016	55%-128%		0%-20%
Aroclor 1260	58%-140%		0%-20%
<u>Surrogate Compound</u>			
Tetrachloro-m-xylene	69%-124%		Not Applicable
Decachlorobiphenyl	58%-125%		Not Applicable
<b>TARGET ANALYTE LIST:</b>			<b>QC LIMITS</b>
<u>Target Spike Compound</u>	<u>% Recovery</u>		<u>% RPD</u>
Metals	75%-125%		±20%
Cyanide	75%-125%		±20%

**NOTES:**

1. VOC, SVOC, PCB and Pesticide accuracy and precision criteria based upon Chemtech established limits.
2. TAL accuracy and precision criteria based upon CLP SOW ILM04.0.
3. Precision criteria for metals is ±CRDL (reporting limit) for results less than 5xCRDL.

**TABLE 3-5  
TARGET COMPOUNDS/REPORTING LIMITS  
1318 NIAGARA STREET SITE QAPP**

	CAS	Low Level	Low Level
<b><i>Volatile Organics</i></b>	Number	Water (µg/L)	Soil (µg/Kg)
Dichlorodifluoromethane	75-71-8	5.0	5.0
Chloromethane	74-87-3	5.0	5.0
Vinyl Chloride	75-01-4	5.0	5.0
Bromomethane	74-83-9	5.0	5.0
Chloroethane	75-00-3	5.0	5.0
Trichlorofluoromethane	75-69-4	5.0	5.0
1,1-Dichloroethene	75-35-4	5.0	5.0
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	5.0	5.0
Acetone	67-64-1	10.0	10.0
Carbon Disulfide	75-15-0	5.0	5.0
Methyl Acetate	79-20-9	5.0	5.0
Methylene chloride	75-09-2	5.0	5.0
trans -1,2-Dichloroethene	156-60-5	5.0	5.0
Methyl tert-Butyl Ether	1634-04-4	5.0	5.0
1,1-Dichloroethane	75-34-3	5.0	5.0
cis -1,2-Dichloroethene	156-59-2	5.0	5.0
2-Butanone	78-93-3	10.0	10.0
Bromochloromethane	74-97-5	5.0	5.0
Chloroform	67-66-3	5.0	5.0
1,1,1-Trichloroethane	71-55-6	5.0	5.0
Cyclohexane	110-82-7	5.0	5.0
Carbon tetrachloride	56-23-5	5.0	5.0
Benzene	71-43-2	5.0	5.0
1,2-Dichloroethane	107-06-2	5.0	5.0
1,4-Dioxane	123-91-1	125.0	125.0
Trichloroethane	79-01-6	5.0	5.0
Methylcyclohexane	108-87-2	5.0	5.0
1,2-Dichloropropane	78-87-5	5.0	5.0
Bromodichloromethane	75-27-4	5.0	5.0
cis -1,3-Dichloropropene	10061-01-5	5.0	5.0
4-methyl-2-pentanone	108-10-1	10.0	10.0
Toluene	108-88-3	5.0	5.0
Trans-1,3-Dichloropropene	10061-02-6	5.0	5.0
1,1,2-Trichloroethane	79-00-5	5.0	5.0
Tetrachloroethene	127-18-4	5.0	5.0
2-Hexanone	591-78-6	10.0	10.0
Dibromochloromethane	124-48-1	5.0	5.0
1,2-Dibromoethane	106-93-4	5.0	5.0
Chlorobenzene	108-90-7	5.0	5.0
Ethylbenzene	100-41-4	5.0	5.0
Xylenes (Total)	1330-20-7	5.0	5.0
Styrene	100-42-5	5.0	5.0
Bromoform	75-25-2	5.0	5.0
Isopropylbenzene	98-82-8	5.0	5.0
1,1,2,2-Tetrachloroethane	79-34-5	5.0	5.0
1,3-Dichlorobenzene	541-73-1	5.0	5.0
1,4-Dichlorobenzene	106-46-7	5.0	5.0
1,2-Dichlorobenzene	95-50-1	5.0	5.0
1,2-Dibromo-3-chloropropane	96-12-8	5.0	5.0

**TABLE 3-5  
TARGET COMPOUNDS/REPORTING LIMITS  
1318 NIAGARA STREET SITE QAPP**

	CAS	Low Level	Low Level
1,2,4-Trichlorobenzene	120-82-1	5.0	5.0
1,2,3-Trichlorobenzene	87-61-6	5.0	5.0

		Water	Low Level
<b>Semivolatile Organics</b>	CAS Number	(µg/L)	Soil (µg/Kg)
Benzaldehyde	100-52-7	5.0	170.0
Phenol	108-95-2	5.0	170.0
Bis -(2-chloroethyl) ether	111-44-4	5.0	170.0
2-Chlorophenol	95-57-8	5.0	170.0
2-Methylphenol	95-48-7	5.0	170.0
2,2'-Oxybis (1-chloropropane)	108-60-1	5.0	170.0
Acetophenone	98-86-2	5.0	170.0
4-Methylphenol	106-44-5	5.0	170.0
N-Nitroso-di-n-propylamine	621-64-7	5.0	170.0
Hexachloroethane	67-72-1	5.0	170.0
Nitrobenzene	98-95-3	5.0	170.0
Isophorone	78-59-1	5.0	170.0
2-Nitrophenol	88-75-5	5.0	170.0
2,4-Dimethylphenol	105-67-9	5.0	170.0
Bis (2-chloroethoxy) methane	111-91-1	5.0	170.0
2,4-Dichlorophenol	120-83-2	5.0	170.0
Naphthalene	91-20-3	5.0	170.0
4-Chloroaniline	106-47-8	5.0	170.0
Hexachlorobutadiene	87-68-3	5.0	170.0
Caprolactam	105-60-2	5.0	170.0
4-Chloro-3-methylphenol	59-50-7	5.0	170.0
2-Methylnaphthalene	91-57-6	5.0	170.0
Hexachlorocyclopentadiene	77-47-4	5.0	170.0
2,4,6-Trichlorophenol	88-06-2	5.0	170.0
2,4,5-Trichlorophenol	95-95-4	10.0	330.0
1,1'-Biphenyl	92-52-4	5.0	170.0
2-Chloronaphthalene	91-58-7	5.0	170.0
2-Nitroaniline	88-74-4	10.0	330.0
Dimethylphthalate	131-11-3	5.0	170.0
2,6-Dinitrotoluene	606-20-2	5.0	170.0
Acenaphthylene	208-96-8	5.0	170.0
3-Nitroaniline	99-09-2	10.0	330.0
Acenaphthene	83-32-9	5.0	170.0
2,4-Dinitrophenol	51-28-5	10.0	330.0
4-Nitrophenol	100-02-7	10.0	330.0
Dibenzofuran	132-64-9	5.0	170.0
2,4-Dinitrotoluene	121-14-2	5.0	170.0
Diethylphthalate	84-66-2	5.0	170.0
Fluorene	86-73-7	5.0	170.0
4-Chlorophenyl-phenyl ether	7005-72-3	5.0	170.0
4-Nitroaniline	100-01-6	10.0	330.0
4,6-Dinitro-2-methylphenol	534-52-1	10.0	330.0
N-Nitrosodiphenylamine	86-30-6	5.0	170.0
1,2,4,5-Tetrachlorobenzene	95-34-3	5.0	170.0
4-Bromophenyl-phenylether	101-55-3	5.0	170.0
Hexachlorobenzene	100-52-7	5.0	170.0
Atrazine	108-95-2	5.0	170.0
Pentachlorophenol	111-44-4	10.0	170.0
Phenanthrene	95-57-8	5.0	170.0

**TABLE 3-5**  
**TARGET COMPOUNDS/REPORTING LIMITS**  
**1318 NIAGARA STREET SITE QAPP**

	CAS	Low Level	Low Level
Anthracene	95-48-7	5.0	170.0
Carbazole	108-60-1	5.0	170.0
Di-n-butylphthalate	98-86-2	5.0	170.0
Fluoroanthene	106-44-5	5.0	170.0
Pyrene	621-64-7	5.0	170.0
Butylbenzylphthalate	67-72-1	5.0	170.0
3,3'-Dichlorobenzidine	98-95-3	5.0	170.0
Benzo (a) anthracene	78-59-1	5.0	170.0
Chrysene	88-75-5	5.0	170.0
Bis (2-ethylhexyl) phthalate	105-67-9	5.0	170.0
Di-n-octylphthalate	111-91-1	5.0	170.0
Benzo (b) fluoranthene	120-83-2	5.0	170.0
Benzo (k) fluoranthene	91-20-3	5.0	170.0
Benzo (a) pyrene	106-47-8	5.0	170.0
Indeno (1,2,3-cd) pyrene	87-68-3	5.0	170.0
Benzo (a,h) anthracene	105-60-2	5.0	170.0
Benzo (g,h,i) perylene	59-50-7	5.0	170.0

<b>Pesticides</b>	CAS Number	Water (µg/L)	Solids (µg/Kg)
alpha-BHC	319-84-6	0.050	1.7
beta-BHC	319-85-7	0.050	1.7
delta-BHC	319-86-8	0.050	1.7
gamma-BHC (Lindane)	58-89-9	0.050	1.7
Heptachlor	76-44-8	0.050	1.7
Aldrin	309-00-2	0.050	1.7
Heptachlor epoxide2	1024-57-3	0.050	1.7
Endosulfan I	959-98-8	0.050	1.7
Dieldrin	60-57-1	0.10	3.3
4,4'-DDE	72-55-9	0.10	3.3
Endrin	72-20-8	0.10	3.3
Endosulfan II	33213-65-9	0.10	3.3
4,4'-DDD	72-54-8	0.10	3.3
Endosulfan sulfate	1031-07-8	0.10	3.3
4,4'-DDT	50-29-3	0.10	3.3
Methoxychlor	72-43-5	0.10	3.3
Endrin ketone	53494-70-5	0.10	3.3
Endrin aldehyde	7421-93-4	0.10	3.3

**TABLE 3-5  
TARGET COMPOUNDS/REPORTING LIMITS  
1318 NIAGARA STREET SITE QAPP**

	CAS	Low Level	Low Level
alpha-Chlordane	5103-71-9	0.050	1.7
gamma-Chlordane	5103-74-2	0.050	1.7
Toxaphene	8001-35-2	5.0	34.0

<b>PCBs</b>	CAS Number	Water (µg/L)	Solids (µg/Kg)
Arochlor-1016	12674-11-2	1.0	33
Arochlor-1221	11104-28-2	1.0	33
Arochlor-1232	11141-16-5	1.0	33
Arochlor-1242	53469-21-9	1.0	33
Arochlor-1248	12672-29-6	1.0	33
Arochlor-1254	11097-69-1	1.0	33
Arochlor-1260	11096-82-5	1.0	33
Arochlor-1262	37324-23-5	1.0	33
Arochlor-1268	11100-14-4	1.0	33

<b>Inorganics</b>	CAS Number	Water (µg/L)	Solids (mg/kg)
Aluminum	7429-90-5	200	40
Antimony	7440-36-0	60	12
Arsenic	7440-38-2	15	3
Barium	7440-39-3	200	40
Beryllium	7440-41-7	5	1
Cadmium	7440-43-9	5	1
Calcium	7440-70-2	5000	1000
Chromium	7440-47-3	10	2
Cobalt	7440-48-4	50	10
Copper	7440-50-8	25	5
Iron	7439-89-6	100	20
Lead	7439-92-1	10	2
Magnesium	7439-95-4	5000	1000
Manganese	7439-96-5	15	3
Mercury	7439-97-6	0.2	0.1
Nickel	7440-02-0	40	8
Potassium	7440-09-7	5000	1000
Selenium	7782-49-2	35	7
Silver	7440-22-4	10	2
Sodium	7440-23-5	5000	1000
Thallium	7440-28-0	25	5
Vanadium	7440-62-2	50	10
Zinc	7440-66-6	60	12
Cyanide	57-12-5	10	1



**TABLE 3-6**  
**ANALYTICAL METHODS, SAMPLE CONTAINERS, PRESERVATION AND ANALYTICAL HOLD TIMES FOR AQUEOUS SAMPLES**  
**1318 NIAGARA STREET SITE QAPP**

PARAMETER	METHODOLOGY	CONTAINER	MINIMUM SAMPLE	PRESERVATION <sup>(1)</sup>	HOLD TIME <sup>(2)</sup>
TCL Volatile Organics	SW846 8260B	3-40 ml G	3 - 40 ml	Cool 4 °C; HCl, pH<2	14 days <sup>(3)</sup>
TCL Semi-Volatile Organics	SW846 8270C	2-1000ml G	1000ml	Cool 4° C	7 days <sup>(4)</sup>
TCL Pesticides/PCBs	SW846 8081/8082	2-1000ml G	1000ml	Cool 4° C	7 days <sup>(4)</sup>
TAL Metals	SW846 6010	1-500 ml P	250 ml	Cool 4° C; HNO <sub>3</sub> , pH<2	180 days <sup>(5)</sup>
TAL Cyanide	EPA 335.0	1-1000ml P	500ml	Cool 4° C; NaOH, pH>12	14 days

**Notes:**

1. Sample preservation is performed by sampler immediately upon sample collection.
  2. Hold time based upon day of sample collection not Verified Time of Sample Receipt.
  3. If sample cannot be preserved due to foaming, unpreserved sample will be analyzed within 7 days.
  4. Hold time is 7 days until start of sample extraction, 40 days following extraction for analysis.
  5. Hold Time for metals is 180 days, except for Mercury which is 28 days.
- P indicates that a Plastic bottle should be used.
- G indicates that a Glass bottle should be used.

**TABLE 3-7**  
**ANALYTICAL METHODS, SAMPLE CONTAINERS, PRESERVATION AND ANALYTICAL HOLD TIMES FOR SOIL SAMPLES**  
**1318 NIAGARA STREET SITE QAPP**

PARAMETER	METHODOLOGY	CONTAINER	MINIMUM SAMPLE	PRESERVATION <sup>(1)</sup>	HOLD TIME <sup>(2)</sup>
TCL Volatile Organics	SW846 8260B	4 EnCore samplers	20 gm	Cool 4 °C	14 days <sup>(3)</sup>
TCL Semi-Volatile Organics	SW846 8270C	4 oz G	30 gm	Cool 4 °C	7 days <sup>(4)</sup>
TCL Pesticides/PCBs	SW846 8081/8082	4 oz G	30 gm	Cool 4 °C	7 days <sup>(4)</sup>
TAL Metals	SW846 6010	4 oz G	30 gm	Cool 4 °C	180 days <sup>(5)</sup>
TAL Cyanide	EPA 335.0	4 oz G	30 gm	Cool 4 °C	14 days

Notes:

1. Sample Preservation is performed by sampler immediately upon sample collection except for VOCs which is performed by laboratory upon receipt (see Note 3).
  2. Hold time based upon day of sample collection not Verified Time of Sample Receipt.
  3. Hold time is 48 hours for preservation using methanol and/or sodium bisulfate and 14 days to analysis.
  4. Hold Time for SVOCs, Pesticides/PCBs is 7 days for extraction and 40 days for analysis.
  5. Hold Time for metals is 180 days, except for Mercury which is 28 days.
- G indicates that a Glass bottle should be used.

**TABLE 3-8**  
**FIELD AND LABORATORY CONTROL SAMPLES**  
**1318 NIAGARA STREET SITE QAPP**

<b>Sample Type</b>	<b>Matrix</b>	<b>Estimated Number of Samples</b>
<b>Soil samples</b>		
<b>Soil Boring</b>	Soil	30
Rinsate Blank	Water	2 (1 per 20)
Trip Blank	Water	2 (1 per 20-VOCs only)
Matrix Spike	Soil	2 (1 per 20)
Matrix Spike Duplicate	Soil	2 (1 per 20)
Duplicate	Soil	2 (1 per 20)
<b>Surface Soil</b>	Soil	6
Rinsate Blank	Water	1 per 20
Trip Blank	Water	1 per 20 (VOCs only)
Matrix Spike	Soil	1 per 20
Matrix Spike Duplicate	Soil	1 per 20
Duplicate	Soil	1 per 20
<b>Groundwater samples</b>		
Groundwater samples	Water	4
Rinsate Blank	Water	1 per 20
Trip Blank	Water	1 per 20 (VOCs only)
Matrix Spike	Water	1 per 20
Matrix Spike Duplicate	Water	1 per 20
Duplicate	Water	1 per 20

**ATTACHMENT 1**  
**Field Activity Forms**

***LiRo Engineers, Inc.***

**BORING NO.**

**PROJECT**

**SHEET:**

**CLIENT**

**JOB NO:**

**BORING CONTRACTOR**

**BORING LOCATION:**

**GROUNDWATER**

**GROUND ELEVATION:**

**DATE**

**TIME**

**LEVEL**

**TYPE**

**TYPE**

**CAS.**

**SAMPLER**

**CORE**

**TUBE**

**DATE STARTED:**

**DATE**

**TIME**

**LEVEL**

**TYPE**

**TYPE**

**DIA.**

**WT.**

**FALL**

**\* POCKET PENETROMETER READING**

**DATE FINISHED:**

**DRILLER:**

**GEOLOGIST:**

**REVIEWED BY:**

DEPTH	STRATA	SAMPLE				DESCRIPTION					REMARKS	
		NO.	TYPE	BLOWS PER 6"	RECOVERY ROD %	COLOR	CONSISTENCY HARDNESS	MATERIAL DESCRIPTION			CLASS USCS	PID moisture
5												
10												
15												
20												
25												
30												
35												

**COMMENTS:**

**PROJECT NO. :**

**BORING NO. :**

<b>DRILLING SUMMARY</b>		
Geologist:		
Drilling Company:		
Driller:		
Rig Make/Model:		
Date:		
<b>GEOLOGIC LOG</b>		
Depth(ft.)	Description	
<b>WELL DESIGN</b>		
<p><b>FLUSH MOUNT</b> Protective Casing and Lockable Cap</p> <p>Elevation _____ Elevation _____</p> <p>Ground Level _____</p> <p><b>AUGERHOLE</b> _____ inch dia. _____ feet length</p> <p><b>PVC CASING</b> _____ inch dia. _____ feet length</p> <p><b>PVC SCREEN</b> _____ inch dia. _____ feet length</p>		
<p>D E P T H</p>		
<p><b>LEGEND</b></p> <p><span style="display: inline-block; width: 20px; height: 10px; background-color: #cccccc; border: 1px solid black;"></span> Cement/Bentonite Grout</p> <p><span style="display: inline-block; width: 20px; height: 10px; background-color: #000000; border: 1px solid black;"></span> Bentonite Seal</p> <p><span style="display: inline-block; width: 20px; height: 10px; background-color: #ffffff; border: 1px solid black;"></span> Silica Sandpack</p>		
<p><b>CASING MATERIAL</b></p> <p>Surface:</p> <p>Monitor:</p>		
<p><b>SCREEN MATERIAL</b></p> <p>Type:</p> <p>Slot Size:</p>		
<p><b>FILTER MATERIAL</b></p> <p>Type:                      Setting:</p> <p><b>SEAL MATERIAL</b></p> <p>Type:                      Setting:</p>		
<p><b>COMMENTS:</b></p>		
<p><b>CLIENT</b></p> <p>The LiRo Group</p>		
<p><b>LOCATION</b></p> <p>MONITORING WELL CONSTRUCTION DETAILS</p>		
<p><b>PROJECT NO.</b></p> <p>Well Number:</p>		

# WELL DEVELOPMENT LOG

*LiRo Engineers*

Project Title:

Well Number:

Site Name:

Date:

Staff:

	Well ID	Volume (gal/ft)
A) Total casing and screen length in feet.	1"	0.04
B) Water level below top of casing in feet.	2"	0.17
C) Number of feet standing water [A-B].	3"	0.38
D) Volume of water/foot of casing (gal.).	4"	0.66
E) Volume of water in casing (gal.) [Cx D].	5"	1.04
F) Volume of water to remove (gal.) [Ex 5].	6"	1.50
G) Volume of water actually removed (gal.).	8"	2.60

$$V = .0408 \times (\text{casing diameter})^2$$

Parameters

pH

Spec Cond (us)

Temp. (°C)

Appearance

Accumulated Volume Purged in Gallons							

Comments:

# WELL PURGE LOG

*LiRo Engineers*

<p><b>Project Title:</b></p> <p><b>Site Name:</b></p> <p><b>Staff:</b></p>	<p><b>Well Number:</b></p> <p><b>Date:</b></p>
--	---

	Well ID	Volume (gal/ft)
A) Total casing and screen length in feet.	1"	0.04
B) Water level below top of casing in feet.	2"	0.17
C) Number of feet standing water [A-B].	3"	0.38
D) Volume of water/foot of casing (gal.).	4"	0.66
E) Volume of water in casing (gal.) [CxD].	5"	1.04
F) Volume of water to remove (gal.) [Ex3].	6"	1.50
G) Volume of water actually removed (gal.).	8"	2.60

$V = .0408 \times (\text{casing diameter})^2$

	Accumulated Volume Purged in Gallons						
Parameters							
pH							
Spec Cond (us)							
Temp. (°C)							
Appearance							

**Comments:**





284 Sheffield Street, Mountainside, NJ 07092  
(908) 789-8900 Fax (908) 789-8922  
www.chemtech.net

CHEMTECH PROJECT NO.

# CHAIN OF CUSTODY RECORD

COC Number

065169

CLIENT INFORMATION				CLIENT PROJECT INFORMATION				CLIENT BILLING INFORMATION			
REPORT TO BE SENT TO:				PROJECT NAME:				BILL TO:			
ADDRESS:				PROJECT NO.:				ADDRESS:			
CITY:				PROJECT MANAGER:				CITY:			
STATE:				e-mail:				STATE:			
ZIP:				PHONE:				ZIP:			
ATTENTION:				FAX:				ATTENTION:			
PHONE:				FAX:				PHONE:			
DATA TURNAROUND INFORMATION				DATA DELIVERABLE INFORMATION				ANALYSIS			
FAX: _____ DAYS *				<input type="checkbox"/> RESULTS ONLY <input type="checkbox"/> USEPA CLP							
HARD COPY: _____ DAYS *				<input type="checkbox"/> RESULTS + QC <input type="checkbox"/> New York State ASP "B"							
EOD: _____ DAYS *				<input type="checkbox"/> New Jersey REDUCED <input type="checkbox"/> New York State ASP "A"							
* TO BE APPROVED BY CHEMTECH				<input type="checkbox"/> New Jersey CLP <input type="checkbox"/> Other _____							
STANDARD TURNAROUND TIME IS 10 BUSINESS DAYS				<input type="checkbox"/> EDD FORMAT _____							
CHEMTECH SAMPLE ID		PROJECT SAMPLE IDENTIFICATION		SAMPLE TYPE		SAMPLE COLLECTION		PRESERVATIVES		COMMENTS	
1.				DATE		TIME		1		1	
2.				DATE		TIME		2		2	
3.				DATE		TIME		3		3	
4.				DATE		TIME		4		4	
5.				DATE		TIME		5		5	
6.				DATE		TIME		6		6	
7.				DATE		TIME		7		7	
8.				DATE		TIME		8		8	
9.				DATE		TIME		9		9	
10.				DATE		TIME		10		10	
SAMPLE CUSTODY MUST BE DOCUMENTED BELOW EACH TIME SAMPLES CHANGE POSSESSION INCLUDING COURIER DELIVERY											
RELINQUISHED BY SAMPLER:		DATE/TIME:		RECEIVED BY:		DATE/TIME:		CONDITIONS OF BOTTLES OR COOLERS AT RECEIPT:		COOLER TEMP.	
1.				1.				<input type="checkbox"/> Compliant <input type="checkbox"/> Non Compliant			
RELINQUISHED BY:		DATE/TIME:		RECEIVED BY:		DATE/TIME:		MeOH extraction requires an additional 4 oz jar for percent solid.		Ice in Cooler?:	
2.				2.							
RELINQUISHED BY:		DATE/TIME:		RECEIVED FOR LAB BY:		DATE/TIME:		Comments:			
3.				3.							
SHIPPED VIA: CLIENT: <input type="checkbox"/> HAND DELIVERED <input type="checkbox"/> OVERNIGHT				CHEMTECH: <input type="checkbox"/> PICKED UP <input type="checkbox"/> OVERNIGHT				Shipment Complete: <input type="checkbox"/> YES <input type="checkbox"/> NO			